ΤΡΟΠΙΣ IV
TROPIS IV

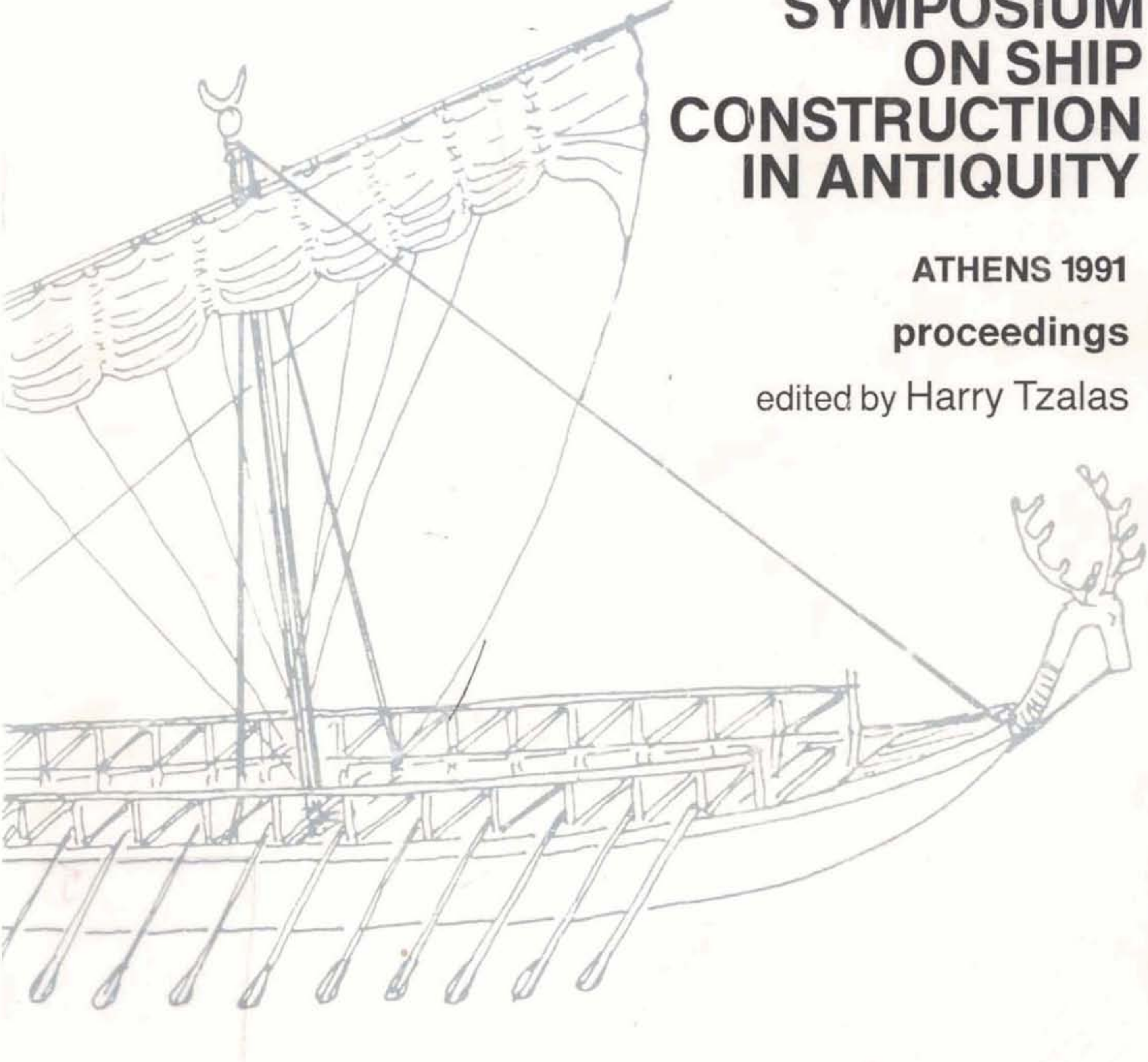
HELLENIC INSTITUTE
FOR THE PRESERVATION
OF NAUTICAL TRADITION

4th INTERNATIONAL SYMPOSIUM ON SHIP CONSTRUCTION IN ANTIQUITY

ATHENS 1991

proceedings

edited by Harry Tzalas



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CENTER FOR THE ACROPOLIS STUDIES
ATHENS 28, 29, 30, 31 AUGUST 1991

proceedings

edited by Harry Tzalas

SPONSORED BY THE GREEK MINISTRY OF CULTURE

Published by the Hellenic Institute for the Preservation of Nautical Tradition
Editor: Harry E. Tzalas
Text preparation: Katerina Poulis
Electronic processing & Design: NOOTROPIA Ltd, 4 Marni str., Athens.
Printed by: CHRISTOS SOULIMIOTIS, Serifou Str. 14, Aghios Dimitrios, Athens, Tel.: 9702616.

The editor would like to thank Dr. Yannis Vichos and Mr. Charalambos Kritzas for their valued assistance in the preparation of this publication.

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ISSN 1105-7947

The Sardinian ship on the front cover is a conjectural reconstruction made by Dott. Marco Bonino, from a bronze model at the Archaeological Museum of Florence, used with the kind permission of the author. [From "Sardinian, Villanovan and Etruscan crafts between the Xth and the XIIth cent. BC from bronze and clay models by Marco Bonino, in *Tropis* III (1995)].

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ΚΕΙΜΕΝΟ ΧΑΙΡΕΤΙΣΜΟΥ ΤΟΥ ΠΡΟΕΔΡΟΥ ΤΗΣ ΟΡΓΑΝΩΤΙΚΗΣ ΕΠΙΤΡΟΠΗΣ κ. ΧΑΡΗ ΤΖΑΛΑ ΓΙΑ ΤΟ 4ο ΣΥΜΠΟΣΙΟ

Κυρία Υπουργέ, Κυρίες και Κύριοι.

Πέρασαν οκτώ χρόνια από το καλοκαίρι του 1985 όταν στον Πειραιά έγινε για πρώτη φορά η συνάντηση μελετητών του αρχαίου πλοίου, ακολούθησαν το Β΄ Συμπόσιο στους Δελφούς και το Γ΄ στην Αθήνα. Σήμερα ξεκινάμε τις εργασίες του Δ΄ Συμποσίου «Ναυπηγικής στην Αρχαιότητα».

Χαίρομαι ιδιαίτερα που ανάμεσα στους συμμετέχοντες στη φετινή μας συνάντηση διακρίνω πολλούς πιστούς φίλους που συμμετείχαν και στα τρία προηγούμενα Συμπόσια.

Διαπιστώνω επίσης με ξεχωριστή ικανοποίηση ότι οι συναντήσεις μας έγιναν θεσμός και έχουν βρει εξέχουσα θέση στο Διεθνές Ημερολόγιο των Συνεδρίων Ναυτικής Αρχαιολογίας.

Ενθαρρυντικός είναι ο συνεχώς αυξανόμενος αριθμός των ανακοινώσεων που παρουσιάζονται και των διακεκριμένων συνέδρων που συμμετέχουν.

ADDRESS BY THE PRESIDENT OF THE ORGANIZING COMMITTEE MR. HARRY TZALAS FOR THE 4th SYMPOSIUM

Mrs Minister, Ladies and Gentlemen.

Since 1985, when in Piraeus, we had the first encounter on "Ancient Ship Construction", eight years have elapsed and two further Symposia were organized in Delphi and in Athens. We are about to start today the works of the "IVth Symposium on Ship Construction in Antiquity".

It gives me great pleasure to see among the participants numerous friends, who attended the three previous Symposia.

I also note with satisfaction that our encounters have become a leading event on the International Calendar of Nautical Archaeology Congresses.

The ever increasing number of papers presented and the large number of participants is encouraging.

Ειδικά για τη φετινή μας εκδήλωση ήταν τόσο μεγάλη η προσφορά σημαντικών εργασιών που εάν αποδεχόμαστε και τις καθυστερημένες προτάσεις, θα χρειαζόμασταν πέντε ημέρες εργασίας αντί των τριών που είχαμε προγραμματίσει. Πιθανότατα κατά το 5ο Συμπόσιο που ελπίζω ότι θα πραγματοποιηθεί, πάλι στην Ελλάδα, το 1993, να χρειαστούμε τέσσερις μέρες για να μην απογοητεύσουμε τους επιστήμονες εκείνους — και είναι πολλοί— που ανταποκρίνονται θετικά στο κάλεσμά μας.

Συνάδελφος με ρώτησε: «μα πού θα βρεις καινούρια λόγια μιλώντας για τέταρτη φορά, κατά την έναρξη του ίδιου Συμποσίου, σε περίπου το ίδιο ακροατήριο;»

Εγώ πιστεύω ότι για όποιον ζει στην χώρα αυτή, την Ελλάδα, περικυκλωμένος από νησιά και θάλασσες, με τα χιλιάδες πλεούμενα να αυλακώνουν το Αρχιπέλαγος, δεν μπορεί να δυσκολευτεί να βρει κάτι καινούριο για να πει από την αστείρευτη πηγή που λέγεται Ελληνική ναυτοσύνη.

Το καράβι, το πολυπλοκότερο κατασκεύασμα των αρχαίων, υπήρξε από τους πανάρχαιους χρόνους ένα μέσο συνάντησης των λαών της Μεσογείου. Βεβαίως σε αρκετές περιπτώσεις το καράβι σαν μέσο πολέμου μας χώρισε, αλλά για πολύ μεγαλύτερα διαστήματα και σε άπειρα περισσότερες περιπτώσεις ήταν το μέσο μεταφοράς αγαθών και πολιτισμού που μας ένωσε με τους γείτονές μας. Ο Ελληνικός πολιτισμός δεν

Especially for our present meeting the proposed number of papers was so important that if we had accepted all the delayed participations, five full days would have been needed instead of the three programmed. We should perhaps contemplate for our next encounter which hopefully will be held in Greece in 1993, to increase the working sessions to four days so not to discourage those scholars who want to contribute.

A colleague asked me: "will you find anything new to say addressing for the fourth time to nearly the same audience? Well I believe that for someone who lives in this land, in Greece, surrounded by islands and seas, with thousands of sea-crafts scattered around the Archipelago, it is certainly not difficult to find something new to say drawing from the inexhaustible spring of Greek seamanship.

The ship, the most intricate construction in Antiquity was, since the dawn of history, a mean of peaceful encounters for the Mediterranean people. Certainly there have been repeated instances when the ship, as a war machine, did separate the nations, but for innumerably lengthier periods, the ship was a way of transportation of commodities and a mean of spreading civilization that brought us closer to our neighbors. Greek civilization was not μεταφέρθηκε με ρόδες αλλά ταξίδεψε με πλοία.

Για αυτή την τέχνη του αρχαίου καραβομαραγκού, στον οποίο εμείς οι Έλληνες χρωστάμε τόσα πολλά, είμαστε σήμερα εδώ συγκεντρωμένοι για να μάθουμε περισσότερα.

Δεν θα μπορούσα προτού κλείσω αυτό το σύντομο χαιρετισμό να μην αναφερθώ σε έναν μεγάλο απόντα, στον άνθρωπο που ξόδεψε το μεγαλύτερο μέρος της ζωής του ερευνώντας το βυθό της Ανατολικής Μεσογείου, μελετώντας τα λείψανα των αρχαίων ναυαγείων. Ο Peter Throkmorton που δίκαια ονομάστηκε ο πατέρας της Ενάλιας Αρχαιολογίας, έφυγε πρόωρα από κοντά μας. Είχε εκδηλώσει πέρσι την επιθυμία να συμμετάσχει για μία ακόμα φορά στο Συμπόσιό μας αλλά δεν πρόλαβε, σάλπαρε για το μεγάλο ταξίδι.

Η θλίψη όλων μας είναι μεγάλη, αλλά παρήγορο είναι ότι στην αίθουσα αυτή διακρίνω πολλούς από τους παλιούς συνεργάτες του αγαπητού Peter που συνεχίζουν το έργο του, ενώ ακόμα πιο ενθαρρυντικό είναι να βλέπω τους ανθρώπους της νέας γενιάς που παίρνουν την σκυτάλη εμπνεόμενοι από τον ίδιο ζήλο και ενθουσιασμό που είχε ο μεγάλος αυτός ερευνητής του βυθού και λάτρης του πλοίου.

Για να γίνει ένα Συνέδριο, για να πετύχει, για να φύγουν οι Σύνεδροι ικανοποιημένοι χρειάζεται πολλή δουλειά. Για να προετοιμαστούν αυτές οι τρεις ημέρες, χρειάζεται συνεχής

transported on wheels but it traveled with ships.

We have gathered here to learn more about the art of the ancient ship builders to who we Greeks owe so much.

I feel that I could not close this brief address without referring to a great absent, to the man who dedicated the greater part of his life searching the depths of the Eastern Mediterranean studying the remains of ancient ships.

Peter Throkmorton who justly was called "the father of Under-water Archaeology", is no long among us. Last year he had indicated his intention to attend once again our Symposium. He did not make it as in the meantime, he set sail for the "long voyage".

Our sorrow is great but it is recomforting to see in this room several of the colleagues of our beloved Peter, who are continuing the work he loved, but even better I see the new generation, of those inspired by the same zeal and enthusiasm and the love for the ship.

To organize a conference and to attempt a success necessitate, a lot of work. To prepare these three days, not less than two years of efforts were needed. I have to acknowledge the προσπάθεια δύο χρόνων. Στο έργο αυτό είχα τη συμπαράσταση όλων των μελών της οργανωτικής επιτροπής. Χρησιμότατες οι συμβουλές των κ.κ. Lucien Basch και D. Blackman παρόλη την απόσταση που μας χωρίζει. Θετικά, με βοήθησαν οι Έλληνες φίλοι: ο κος Χαράλαμπος Κριτζάς, ο Πλοίαρχος Τάσος Τζαμτζής και ο κος Νίκος Λιανός. Τους ευχαριστώ όπως ευχαριστώ και τα μέλη της εκτελεστικής για τη βοήθειά τους. Θα ήμουνα άδικος εάν δεν επεσήμαινα την ξεχωριστή προσφορά των κοριτσιών της γραμματείας που δούλεψαν, ιδιαίτερα τις τελευταίες εβδομάδες με αυτοθυσία. Ευχαριστώ τις δεσποινίδες Κ. Καραμανλή, Ν. Ανθοπούλου και Μαρία Πούλου.

Αλλά καθοριστική στην πραγματοποίηση αυτής της συνάντησης είναι η συνεχής βοήθεια του Υπουργείου Πολιτισμού και με την ευκαιρία θα ήθελα να ευχαριστήσω την Υπουργό Πολιτισμού κα Άννα Ψαρούδα-Μπενάκη αλλά και τον προκάτοχό της, τον Αντιπρόεδρο της Κυβέρνησης κο Τζαννή Τζαννετάκη για την αμέριστη συμπαράστασή τους.

Τέλος, ένα μεγάλο ευχαριστώ στον οικοδεσπότη μας, τον Έφορο Αρχαιοτήτων κο Πέτρο Καλλιγά και στους συνεργάτες του που μας φιλοξενούν σε αυτόν τον ωραίο χώρο, στην σκιά της Ακροπόλεως, και όπου βρήκαμε όχι μόνο στοργή για το έργο μας αλλά και αποτελεσματικότητα.

cooperation and the support of all the members of the Organizing Committee. I have much valued the advice of Mr. Lucien Basch and Dr. David Blackman notwithstanding the distance that separate us. I also acknowledge the assistance from our Greek friends: Mr. Harry Kritzas, Cpt. Tasos Tsamtzis and Mr. Nikos Lianos. I express my gratitude to the members of the Executive Committee. It would be unjust if I did not praise the contribution of our secretaries who, in particular the last weeks, worked under a great pressure, I thank Miss K. Karamanli, N. Anthopoulou and M. Poulou.

What, however, is decisive for the materialization of our encounters is the continuing assistance of the Ministry of Culture and I take this opportunity to express my thanks to the Minister of Culture Mrs. Anna Psarouda-Benaki as well as to the former Minister Mr. Tzannis Tzannetakis, Vice President of the present government, for their great assistance.

Last, but not least, our many thanks to our host, the Ephore of Antiquities Dr. Peter Calligas and to his collaborators who are hosting us to this beautiful building under the Acropolis. We did not only find kindness and assistance but also efficiency.

Εκ μέρους όλων των μελών της Διεθνούς Οργανωτικής Επιτροπής και της Εκτελεστικής Επιτροπής που έχω την τιμή να προεδρεύω, σας καλοσωρίζω και εύχομαι η συνάντησή μας αυτή να είναι καρποφόρα και η παραμονή σας στη χώρα του Ποσειδώνα αλλά και του Ξένιου Δία, να είναι ευχάριστη.

On behalf of all the members of the international Organizing Committee and of the Executive Committee which I have the honor to preside, I welcome you and I wish that our meeting will be fruitful and that your stay on the land of Poseidon and of Xenios Zeus, patron of hospitality, will be pleasant.

ΠΡΟΣΦΩΝΗΣΗ ΤΗΣ ΥΠΟΥΡΓΟΥ ΠΟΛΙΤΙΣΜΟΥ κας ΑΝΝΑΣ ΨΑΡΟΥΔΑ-ΜΠΕΝΑΚΗ

Με ιδιαίτερη χαρά αποδέχθηκα την πρόσκληση να παραστώ στην σημερινή εναρκτήρια συνεδρίαση του Τέταρτου διεθνούς Συμποσίου Αρχαίας Ναυπηγικής, που οργανώνει το Ελληνικό Ινστιτούτο Προστασίας της Ναυτικής Παράδοσης και ευχαριστώ τον Πρόεδρο και τους οργανωτές γι' αυτή την ευγενική πρόσκληση.

Για μία χώρα όπως η Ελλάδα με την πλούσια ναυτική παράδοση και τους ιδιαίτερους δεσμούς με τη θάλασσα, όπου η ζωή, η οικονομία και ο πολιτισμός είναι άρρηκτα συνδεδεμένα με τους θαλάσσιους δρόμους, η ιστορική και αρχαιολογική αναδρομή στις πηγές της ναυτικής τέχνης και τεχνικής έχει πρωταρχική σημασία. Γι' αυτό και οι εργασίες του Συνεδρίου αυτού, που καλύπτουν όλους τους τομείς της έρευνας για την αρχαία ναυπηγική, αποτελούν συγχρόνως και μια ξεχωριστή συμβολή στην Ιστορία και την Αρχαιολογία αυτού του τόπου. Εξ άλλου τα αρχαία ναυάγια, που αφθονούν στις ελληνικές θάλασσες και περικλείουν αρχαιολογικούς θησαυρούς υψίστης σημασίας, αποτελούν αστείρευτη πηγή πληροφοριών για την ναυπηγική τέχνη, αλλά και για το εμπόριο, την κοινωνική και πολιτική ζωή, τις σχέσεις μεταξύ των ανθρώπων και για πολλά άλλα στην αρχαιότητα.

Με το Συνέδριό σας δίνετε, λοιπόν στην Πολιτεία και ένα επιπλέον

ADDRESS BY THE GREEK MINISTER OF CULTURE PROF. ANNA PSAROUDA-BENAKI

With great pleasure I accepted the invitation to attend the opening session of the 4th International Symposium on "Ancient Shipbuilding", organized by the Hellenic Institute for the Preservation of Nautical Tradition and I thank the President of the Organizing Committee for this kind invitation.

For a country like Greece with a very rich naval tradition and special ties with the sea, a country where life, economy and culture is firmly connected with the sea, the historical and archaeological research into the sources of naval skill has immense importance. That is why the works of the Congress, covering all fields of research on ancient shipbuilding, constitute an important contribution to history and archaeology of this country. Also ancient shipwrecks containing archaeological finds of great value, which are abundant in the Greek sea, constitute a permanent source of information not only on naval skill, but also commerce, social and political life as well as human relations in the ancient world.

Thus your Conference offers an additional motive for our Ministry of έναυσμα για να προωθήσει τις ενάλιες αρχαιολογικές έρευνες, προσφέροντας τα απαραίτητα μέσα σε έμψυχο υλικό και υποδομή.

Ωστόσο αισθάνομαι την ανάγκη, πέραν της επιστημονικής σημασίας της προφοράς σας, να εξάρω και το ψυχικό σθένος και την δεξιοτεχνία, που απαιτεί το ενάλιο ερευνητικό σας έργο. Χρειάζεται μεθοδική, επίμονη και εξαιρετικά επίπονη εργασία καθώς και συνεχή ανάληψη κινδύνων. Με συγκίνηση λοιπόν αναφέρομαι στην πρόσφατη απώλεια ενός νέου και σεμνού υποβρύχιου ερευνητή, του αρχιτέκτονα Αμπατζόγλου που πραγματικά θρηνεί η ελληνική επιστημονική οικογένεια. Εύχομαι τέτοιες θυσίες να μην υπάρξουν άλλες στο μέλλον.

Με τις σκέψεις αυτές εγκαινιάζω το Τέταρτο Διεθνές Συμπόσιο Αρχαίας Ναυπηγικής και εύχομαι την καλύτερη επιτυχία στις εργασίες του.

Culture to promote the underwater archaeological research.

Nevertheless, I feel the need to stress, together with the scientific importance of your contribution, the moral strength that is needed for your research work. Indispensable is systematic consistent and really hard work. Underwater excavations often mean confronting risks and I refer with deep sorrow to the recent loss of a young and devoted underwater scientist-architect Abatzoglou, whose death spread sorrow among the Greek archaeological community. I wish that such sacrifices happen no more.

With these thoughts I declare the opening of the "4th International Symposium on Ancient Shipbuilding" and wish success to your works.

THE MYSTERY OF THE ORIENTAL WARSHIP

"The first who sailed the sea in ships which are tarred (or pitched) and nailed, rather than sewn and oiled, and their form is flat rather than having two poles, is al Hàggāg ibn Yūsuf".

This piece of information has been preserved in a book written at the beginning of the tenth century by a Moslem Persian author, Ibn Rustah[1]. It appears in a chapter where the writer gives a list of pioneers in various fields and describes the "innovation" of the governor of Iraq who ruled between 694 and 714 AD, under the Ummayyad caliphs 'Abd alMalik and alWalid

I. The ships alHàggāg built were not merchantmen. He needed them to fight the Indian pirates at the entrance to the Persian Gulf, and ended up conquering Sind by combined land and sea operations[2].

When Ibn Rustah said "the sea" he meant the India Ocean, or rather its western basin. Like the Mediterranean, this ocean is divided in two by Sri-Lanka and the Maldive islands. In the eastern basin, a separate shipping tradition was dominant, led by the people of south-east Asia, with an important Chinese influence. This study is concerned with the western basin and mainly with its two extremities - the Red Sea and Persian Gulf. These waters were traditionally referred to as the "Arabian Sea". They have specific geophysical and meteorological conditions, which have determined the nature of seafaring through the ages[3].

The above statement makes two important points: a. it implies the beginning of a tradition, i.e. - the building of "Mediterranean type" ships in the Arabian Sea; b. it makes a detailed distinction between the two types of ship-hulls, the Mediterranean and the Eastern ones.

A. Was alHàggāg really the first who built Mediterranean type ships in the area? Most of the mediaeval Arab, Persian and Western sources which describe shipping in the Indian Ocean allude to merchantmen. The Moslem travellers, especially Ibn Gubair[4], describe in detail the general nature and the construction method of these ships. The iconographic sources also depict cargo and passenger ships, as in the well-known miniature illuminations to the manuscript of Maqāmāt alḢarīrī[5], frequently misused to represent Mediterranean Moslem ships as well[6]. These sources should be supplemented by the important studies of local craft which had existed up to World War II[7]. They all describe the typical oriental merchantman as a sewn, double-ended craft, carrying a fore-and-aft sail, the so-called Arab Lateen, and equipped with a precocious stern rudder. Some of the sources, like Ibn Gubair, Ibn Batūta and Marco Polo[8], complain of the poor quality of these ships and the misery of the seafarers. The miniatures also describe baling the water out as a routine operation of the crew.

The few allusions to warships add up to a strange picture. It seems that whenever a naval action was carried out in the Red Sea, ship-parts were being built in Mediterranean arsenals, then transported on camel-back to one of the ports on the Red Sea shore. There they would undergo assemblage, nailing and final construction. Then the ships would be launched, ready for battle[9]. The most famous example of this practice was the naval campaign carried out by Renauld de Chatillon, the Crusader Lord of Transjordan, in the Red Sea in AD 1182-3[10]. Less known is the fact that Saladin, his adversary, also moved Mediterranean fighting vessels to eastern waters on several occasions, as when he sent his fleet against that of Renauld, and twelve years earlier, when he captured Gazīrat Far'un, île de Graye of the crusaders[11]. At the end of the thirteenth century, as the final blow was being dealt to the Crusader Kingdom, several Genoese galleys were active in the Persian gulf, in the service of the Mongols[12]. As late as the sixteenth century, the Ottomans were fighting the Portuguese in the Red Sea with Mediterranean war fleets[13].

All these instances are later than alHággāg times, but things were no different in earlier days. The practice is attested too in the Roman and even Hellenistic periods, perhaps earlier yet. To give but a few well-known examples: The Assyrian king Sancheriv (705-681 BC) moved Phoenician shipwrights to Ninveh, where they built a war-fleet to fight "the land of the sea" (modern Kuweit?)[14]. Alexander the Great transferred Phoenician fleets to the Persian Gulf[15] and one of his successors, Ptolemy the Second, defeated the Nabateans in the Gulf of Eilat by using quadriremes (c. 275 BC)[16]. The Roman Aelus Gallus carried out in 25-4 BC an unfortunate trireme campaign to Aden[17]. According to recent Egyptian excavations at a Red Sea port site, this was the case also in Pharaonic times[18].

These examples add up to a long standing tradition. In the case of the Red Sea, the ships were constructed in the traditional shipyards and transported, mostly on land (!), to the theatre of war. When the ancient canal linking the Nile with the Red Sea was in use, the ships could pass through it, although we have no direct evidence for this practice[19]. In the Persian Gulf and beyond, the ships were constructed in situ. When these ships were constructed in the eastern arsenals, it may be assumed that Mediterranean master shipwrights were employed, using Mediterranean-basin timber like Aleppo pine, and the Mediterranean method of construction. In classical times, the warship was of the trireme type, while in the medieval period it was of the galley type, called in the Mediterranean area Ghurāb or Shīnī. In the East, these ships seem to have been called by the generic name Mu'abbada - constructed, processed[20]. The practice of "importing" warships is understandable in the case of Mediterranean sea-powers pushing into foreign waters. Even in this case, we would expect the enemy to adopt eventually the superior design and tactics of the intruding warships, as would normally happen in a similar situation. But it did not happen here, although Mediterranean warships were not only moved into eastern waters, but were repeatedly constructed there.

From the preceding evidence it is clear that alHàggāg represents a link in a chain of long-standing tradition. He was neither the first nor the last. But his project did not have any prolonged impact on the eastern shipbuilding industry. Over 150 years after alHàggāg's times, the complete dichotomy between the two shipbuilding traditions, that of the Mediterranean and the Indian Ocean, is attested by a tale ascribed to "Sulaiman the Merchant", who was active in the eastern trade around the middle of the ninth century[21]. He says that:

> "now we know something which our predecessors did not know, namely that the Ocean bordering on China and India is connected with the Mediterranean. It has been proven by a part of a sewn Arab ship hull, found in the Mediterranean. The ship must have been wrecked and this part of the hull was carried by the waves to the Caspian Sea, from there to the Black Sea, whence it got into the Mediterranean. Now we know that only the ships of Siraf (on the Persian Gulf) are sewn, while Syrian and Byzantine ships are nailed and not sewn".

He obviously did not know about the sewn boats of the Mediterranean[22], and his knowledge of the northern waterways leaves something to be desired, but he certainly made his point[23].

Egypt, with coasts on both the Mediterranean and the Red Sea, is an enigma. Throughout its medieval history, Egypt had close relations with Mecca and Medina, a flourishing trade with the Far East and a constant need to protect its long eastern border[24]. Nevertheless, it seems that it always had Mediterranean warships as patrols in its eastern waters, and that these did not affect the local ships industry, even during periods of intensive maritime activity, as under Ummayyad and Fatimid rule. Qulzum, Qusair, Aidhāb, at-Tur and other coastal towns served at different periods as important ship-building centers, but they turned out sewn merchantmen, unaffected by the Mediterranean tradition.

B. The comparison made by Ibn Rustah is undoubtedly describing the main differences in construction and profile between Mediterranean and Eastern ships. I would like to emphasize the contrast "tarred (or pitched) and not oiled" in connection with the effort, brought up to date by L. Basch, to follow the etymology and origin of "calfatage"[25]. Ibn Rustah writes more than three hundred years after the Greek Papyrus mentioning "kalaphates" for the first time, and a hundred years before the Serçe Liman wreck, preserving real caulking, and before the first mention of calfatage in the Arabic sources[26].

No doubt the Mediterranean ships Ibn Rustah is describing are already built frame-first, as is evident by the date and by the term "nailed" he uses; but he does not use the term "qalfata" but rather qayyara, which may apply to the protective layer of hemp and pitch and not necessarily to forced or "true" caulking. Several Abbasid poets who were contemporaries of Ibn Rustah also used Muqayyara and not muqalfata. The Persian orbit of language and culture did not adopt this term, and continued to use the rather unspeciffic qyr. Here there was not much use for it, as the ships which needed caulking were indeed rare east of Suez.

The term qalfata in Arabic means only true calfatage, as in the European languages. To be sure, this four letter root is definitely alien to Arabic. Originally it was a three letter regular semitic root which made the round and came back into the Arabic via the Greek. The Byzantine term is derived in my opinion from the Syrian and Aramaic, and its remote origins are in Mesopotamian boat building (as Noah's Arc, Genesis 6, 14) and Egyptian ship construction (Moses boat, Exodus 2, 3). The root qlf does not appear in the Old Testament. It is quite prevalent in the Talmud, where it means as in Aramaic - shell, outer skin[27].

The transmission must have occured during Hellenistic or early Roman times, when Greek and Western semitic languages influenced each other to a great extent. In the beginning, the word meant protecting the hull by asphalt, bitumen and the like, and only later it became specialized to true caulking. In my view, the sixth century papyrus still uses the word in this general sense. When "qalfata" appears in Arabic for the first time (no later then the eleventh century), it is by any way of the Byzantine Greek term, as the added final "ta" shows. The Turkish term may have come either via the Greek or the Arabic, but not vice versa, as it is neither a Turkish nor a Persian root.

On the whole, naval activity in this region was very sporadic. When describing Gallus' campaign, Strabo said[28]:

> "Now this was the first mistake of Gallus, to build long boats, since there was no naval war at hand, or even to be expected; for the Arabians are not very good warriors even on land, rather being hucksters and merchants, to say nothing of fighting at sea".

This statement remained valid for the western Indian Ocean for hundreds of years to come, although in the Mediterranean the same Arabs rapidly developed into a naval power to be reckoned with. Hourani in his pioneering study of this topic has commented on the lack of naval tradition even within the seafaring tribes of south and east Arabia[29].

Most modern treatments of the subject of Moslem Eastern seafaring deal mainly with commercial expansion, note the technical characteristics in ship construction and types, but fail to emphasize the absence of warships and naval actions from the eastern sphere[30]. A.R. Lewis, in this study of Indian Ocean shipping in the late Middle Ages, concludes that the eastern system of free trade lasted from pre-Islamic times to the age of the great discoveries and was totally different from the military commerce prevailing in the West[31]. This point was justly elaborated on by Christides and others[32]. But Christides maintains also that:

> "on the one hand, [eastern warships] had to be constructed in accordance with the model of the merchant passenger vessels..., and on the other, much was borrowed from the Mediterranean naval technology, since there was a constant interchange of naval technology in the construction of vessels between the two areas"[33].

The evidence seems to point in the opposite direction. The specialized warships of the western Indian Ocean were "imported" Mediterranean ships, and there was no lasting influence between the two types. The need to "import" warships from western arsenals and the sporadic nature of naval warfare in the East reflect two distinct concepts of sea power.

Piracy, however, continued to be a major problem throughout the Middle Ages[34]. The south-Arabian tribes engaged in piracy from times immemorial, as an extension of the caravan robbery on land. The straits of Tiran, Bab alMandab and Hormuz and the adjacent islands (Soccotra, Bahrein, the mouth of the Indus), were well-feared pirate nests. State-or-region organized campaigns against them usually failed. This endemic situation in another aspect of the lack of naval power in this area.

The absence of specialized warships had far-reaching implications on the nature of maritime commerce and the dominion of the seas. In the western Indian Ocean, commerce was free and open to all, and the style of international relations up to the great discoveries was not violent, but depended on diplomatic missions like that of the Queen of Sheba in the tenth century BC or the Ming Dynasty voyages at the beginning of the fourteenth century AD[35]. At the end of the Middle Ages, the fusion of the seafaring traditions of the Mediterranean and Atlantic Ocean led to European victory over the oceans and the dominion of the whole world[36]. In the East, no mutual influence occured between the seafaring traditions of the Mediterranean and Indian Ocean. The absence of the oriental warship may be regarded as a major factor in the inferiority of the East at this crucial moment in history.

The reasons for these developments, or rather lack of them, are beyond the scope of this paper. A glimpse into the mentality which lay behind them is found in an eloquent passage, quoted in the name of a Persian sage, talking of the differences between land and naval tactics[37]:

> "Chess is similar to land-battle, while backgammon represents a sea battle. The backgammon player places his pieces in choice positions and stays on guard, but the dice come up with what does not agree with his plan, so there is no use for his watchfulness, and his stratagem comes to nothing, as with the shifting winds and the everchanging sea".

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NOTES

1. "Wa 'awwal man agra fi albaḣr as-sufun almuqayyara almusammara ġair almak̂hruza almadhuna walmusattaḣa ġair d̂hawat alga 'āgi alḣaggāg ibn yūsuf", Ibn Rusta, Ala 'lāq an-nafīsa, ed. M.J. De Goeje, M.J., (Leiden 1879), R. Brill, 1967, pp. 195-6; Trans. G. Wiet, *Les Atours Precieux*, Cairo 1955, p. 227.
2 Baladhury, *Futūh albuldan*, ed. M.J. de Goeje, (Leiden 1866), R. Brill 1968, pp. 435-6, 444-6; Trans. K.P. Hitti & F.C. Murgotten, *The origins of the Islamic State*, N.Y. 1916-24. See A.S.S. Nadvi, *Arab Navigation*, Lahore 1966, p. 41 (originally in *Islamic Culture* vols. XV-XVI, 1941-2). Apart from the fact that merchantmen were not usually built by the state, the ground for this assertion will become clearer further on.
3 See my "Ships and Shipping: the Red Sea and Persian Gulf", forthcoming in the *Dictionary of the Middle Ages* by Scribners' Sons, Publishers, N.Y.
4. Ibn Gubair, Riḣla, ed. & trans. W. Wright, Leiden 1907, p. 70-74; English trans. by R.J.C. Broadhurst, London 1952.
5. Bibliothèque Nationale, Schefer collection, Ms. Ar. 5847, fol. 119v; reproduced fully in R. Ettinghausen, *Arab Painting*, London 1977; partial reproductions in G.F. Hourani, G.F., *Arab*

Seafaring in the Indian Ocean in Ancient and Early Medieval Times, Princeton University Press, 1951, L. Casson, *An illustrated History of Ships and Boats*, N.Y. 1963 and others.

6. See for instance V. Christides, *The conquest of Crete by the Arabs (c. 824) - a turning point in the struggle between Byzantium and Islam*, Athens 1984, p. 69 f.
7. Hornell, J., "A tentative classification of Arab Seacraft", *Mariner's Mirror* 28/1942, 11-40. Nougarède, M.P., "Qualités nautiques des navires arabes", *Océan Indien et Mediteranée, Travaux du 6ème Colloque International d'Histoire Maritime*, Paris, S.E.V.P.E.N. 1964, pp. 95-122. See J.S. Illsley, *A Database Bibliography of Underwater Archaeology*, Bangor 1989.
8. Marco Polo, *Travels*, ed. & translation P. Latham, Penguin 1958, p. 66; Ibn Gubair, ibid.; Ibn Batūta, Riḣla, ed. & trans. C Defremery and B.R. Sanguinetti, Paris 1879-93, 4 vols, vol. IV, pp. 158-163.
9. A passage describing this procedure is erroneously ascribed to Ibn alAthīr in several of the leading naval histories written in Arabic. See: Su'ad Māhir. Albaḣriyya fi miṡr alislamiyya, Cairo 1940, p. 190; Muhammad Yasin alḢinawi, Tarikh al 'ustūl alarabi, Damascus 1945, p. 60. See note 11. I have been unable to find the true source of their quotation, but it must come from a much later author, as the details are distorted and reflect conditions at the time when at-Tūr became an important port of embarkation for the Red Sea.
10. Lebrousse, H., "La guerre de course en mer Rouge pendant les croisades", *Course et Piraterie, Travaux du XVe Colloque Intenational d'Histoire Maritime (CIHM)*, ed. M. Mollat, Paris 1977, I, pp. 36-77.
11. Ibn al-Athīr, Alkāmil fi at-ta'rikh, 12 vols., Beirut 1966, R. of C.J. Tornberg edition, Leiden 1853, XI 365, 490-1.
12. Guillaume Adam, *Recueil des Historiens des Croisades, Documents Armeniens II* (1906), ed. C. Kohler, pp. 549-555 see Richard, J., "Les navigations des occidentaux dans l'Océan Indien et la Mer Caspiènne", *Societés et compagnies de commerce en Orient et dans l'Océan Indien, Travaux du VIIIe C.I.H.M.*, ed. M. Mollat, Paris, S.E.V.P.E.N.,1970, pp. 353-363.
13. Hess, A.C., "The evolution of the Ottoman seaborne empire in the age of the oceanic discoveries", *American Historical Review 75* (1970), 1892-1919;
Soucek, S., "Certain types of ships in Ottoman-Turkish terminology", *Turcica 7* (1975), 233-249.
Guilmartin, Jr., J.F., *Gunpowder and Galleys, Changing Technologies and Mediterranean Warfare at Sea in the Sixteenth Century*, Camb. U.P., 1974, esp. pp. 7-15 (Gedda 1517).
14. Luckenbill, S., *Ancient Records of Assyria and Babylonia*, Chicago 1927, II, secs. 318-321.
15. Arrian, *Anabasis* VII, chs. 19-20, Loeb Classical Library. All quotations from the classical sources are according to the LCL; The translations from the Arabic are the author's.
16. Agatharchides, chs. 83-8; Strabo XVII, ch. I, 44-5.
17. Strabo XVI, ch. 4, 23; Pliny, *Naturalis Historia*, II, 168. Notes 14-17 are quoted by Hourani, ibid, ch. I.
18. Abdel Monem A.H. Sayed, "New light on the recently discovered port on the Red Sea shore", *Chronique d'Egypte* 58/1983, 23-37, esp. p. 30. Qulzum may be an exception, with Mediterranean warships being built in its Arsenal. Qulzum started declining in the tenth century AD and was completely in ruins by the fourteenth.
19. Hallberg, C.W. *The Suez Canal, its History and Diplomatic Importance*, N.Y. 1974, Ch. I.
20. Al-Ḣimaqi. 112 (citing a poem by Ḣasan ibn Ḣani, Abu Nuwās). The root 'abd is synonymous to ṡn'a, whence Dar aṡ-ṡina'a, arsenal, the place were warships were constructed in the Mediterranean world.
21. Silsilat at-tawārīkh, in *Relation des voyages faits par les Arabes et les Persans dans l'Inde et la Chine dans le IXe siècle de l'ère Chrétienne*, texte Langles, trad. M. Reinaud, 2 vols., Paris 1845, p. 87.
22. Pomey, P., "L'épave de Bon-Porté et les bateaux cousus de Mediterranée", *Mariner's Mirror* LXVII/1981, pp. 225-243. See the reports on the wrecks of Giglio and Gela (western and southern Italy, respectively) and Ma'agan Michael (Israel) in *TROPIS III*.

23. Nontheless, the route he describes is navigable, with short portages, the other way around, and was indeed practiced by the Varangians at his time. See:
    Ellis Davidson, H.R., *The Viking Road to Byzantium*, London, Allen & Unwin, 1976.
    Lewis A.R., *Northern Seas, 300-1100*, Princeton University Press, 1958.
24. Labib, S.Y., *Handelsgeschichte Ägyptens im Spätmittelalter (1171-1517)*, Wiesbaden 1965.
25. Basch, L., "Note sur le Calfatage, la chose et le mot", *Archaeonautica* VI/1986, pp. 187-198.
26. Kahane, H. & R., and Tietze, A., *The Lingua Franca in the Levant, Turkish nautical terms of Italian and Greek Origin*, Urbana, 1958, p. 513.
27. The nouns derived from the root qlf became quite important in Jewish Kabbalistic circles, denoting the material shells of existence, the dark side of Creation, etc.
28. Strabo, *Geography* XVI, ch. 4, 23.
29. Hourani, p. 55 - "It will by now be clear that the maritime activity of the ancient Arabs was restricted to commerce and piracy. However many Yamanis and Bahraynis took part in the invasions of Egypt and Syria, their nautical knowledge would be quite useless in a sea battle", see also p. 31.
30. Al'Ibādi, A.M. and Sālem, A.A., Ta'rīkh albaḣriyya alislamiyya fi miśr wash-shām, Beirut, 1972.
    Doctora Safā Hāfīz 'Abdul Fatāh, Almawāni waththugūr almisriyya min alfatḣ alislami ḣatta nihayat al'asr alfātimi, Cairo, s.d.
    See also Māhir and Ḣimawi, note 9 above.
31. A.R. Lewis, "Les marchands dans l'Océan Indien, AD 1100-1500", *Revue d'Histoire Economique et Sociale*, LIV/1976, 468, 475.
32. Christides, V., "Some remarks on the Mediterranean and Red Sea ships in Ancient and Medieval times: A preliminary report", *TROPIS I*/1985, pp. 75-82; *TROPIS II*/1987, pp. 87-99. See also his "Milāḣa" in the *Encyclopaedia of Islam*, new edition.
33. Christides, *TROPIS II*, pp. 88.
34. Toussaint, A., "La course et la piraterie dans l'Océan Indien", *Course et Piraterie*, II, pp. 703-743. The main sources are: Barhebraeus, *Chronography*, ed. & trans. E.A.W. Budge, Oxford 1932, pp. 130, 133; Tabari, *Annals*, ed. M.J. De Goeje and others, Leiden 1879-1901, v. III p. 1582; Ibn Batūta IV 59-60; Marco Polo, p. 290-1;
35. Levenson, J.R. ed., *European Expansion and the Counter-example of Asia, 1300-1600*, Cambridge, Mas. 1957. Filesi, T., *China and Africa in the Middle Ages*, Trans. D.L. Morrison, London, F. Cass, 1972.
36. Villain-Gandossi, C., Busuttil, S., Adam, P., eds., *Medieval ships and the birth of technological societies*, 2 vols., Malta, Foundation of International Studies, 1989-92.
37. AlḢasan, ibn 'Abd-allah, Athār aluwal fi tartīb a-duwal, quoted by alḢimawi, p. 112. I have been unable to check this quotation.

REPRESENTATIONS DE NAVIRES DE L' AGE DU BRONGE EN ESPAGNE

Des représentations rupestres d'embarcations ont été identifiées dans la péninsule de Morrazo (prov. de Galice), dans le Nord-Ouest de l'Espagne. Leur situation géographique les place parmi les cultures indigènes de tradition atlantique.

Les thème de ces gravures rupestres est à ce jour unique dans la Péninsule Ibérique, aussi, on s'interoge sur l'origine de ce type d'embarcations. Leur forme n'est pas étrangère dans le monde atlantique mais, les antécédants de tels navires doivent peut-être être recherchés en Mediteranée orientale ou en Egée.

A la question des origines de ces navires est liée celle des voies de circulation qu'ils empruntaient, ce qui nous conduit à envisager l'existence de navigations vers le Nord, entre la côte atlantique de la Péninsule Ibérique jusqu'à la Manche et vers le Sud, peut-être jusqu'au bassin mediterranéen. L'évaluation des enjeux économiques que rassemble la Péninsule Ibérique pour le Monde Atlantique et le Monde Méditerranéen devrait permettre d'éclaircir une partie des questions posées, notamment celle de l'origine des embarcations représentées.

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EDITOR'S NOTE

This is the abstract of Miss Aubert communication as no text was received for publication

N OTES SUR L'EPERON

La découverte, en 1980, de l'éperon d' Athlit[1] a confirmé ce que toute l'iconographie permettait de prévoir: depuis 400 av. J.-C. au moins, l'éperon que portaient les grands navires de guerre antiques était un engin de bronze à trois lames horizontales superposées et réunies, à la face antérieure, par une lame verticale. Quand ce type d' éperon est-il tombé en désuétude?

A ce propos, L. Casson écrit: "Shortly after the middle of the first century A.D. a single pointed ram makes its appearance"[2]. Cette manière de répondre à la question posée ci-dessus, qui fut aussi celle de H. Seyrig[3] n'est fondée, dans le raisonnement de ces deux auteurs, que sur les seules émissions monétaires romaines impériales. Or on ne peut perdre de vue que lorsqu'un Etat ou une cité dont la puissance repose principalement sur ses forces navales choisit de faire figurer sur ses monnaies un navire de guerre, celui-ci est toujours le plus caractéristique, c'est-à-dire, en pratique, le plus puissant de sa marine. Il n'est pas douteux que la trière, puis, à l'époque hellénistique, tous les navires d'un rang supérieur à celle-ci, étaient pourvus de l'éperon à trois branches (que j'appellerai dans la suite l'"éperon classique"); comme même des cités mineures comme Cius ou Phaselis pouvaient s' offrir au moins une trière, il n'est pas étonnant de rencontrer cet éperon sur les monnaies grecques, phéniciennes, puniques et romaines, du 3e au 1er s. av. J.-C. L'éperon à pointe unique, dont l'existence est attestée en Grèce au moins depuis l'époque géométrique avait-il pour autant disparu, ou avait-il coexisté avec l'éperon classique? Je me propose de démontrer ici cette coexistence, au moyen, principalement, de l'iconographie, mais aussi de sources écrites - pour terminer par l'examen du seul vestige connu d'un tel éperon, celui de l'épave punique dite "Sister Ship", bien connue par les publications de Miss Honor Frost[4].

De l'Age du Bronze à l'Age du Fer.

Dans l'état actuel de nos connaissances, il devient de plus en plus clair que le navire de guerre proprement dit, c'est-à-dire spécialisé de telle façon que ses formes sont conçues en vue de la guerre sur mer au point de le distinguer complètement du navire marchand est né à la fin de l'Age du Bronze[5];

- l'évolution de l'architecture navale n'a pas, au contraire de bien d'autres techniques, dont l'écriture et l'architecture, connu d'extinction, ni même de ralentissement au cours de cette époque de transition[6], ainsi que l'ont notamment démontré les dernières découvertes de Madame Dakoronia à Kynos[7].

- l'éperon était pleinement développé à l'époque géometrique (même si son efficacité pose des problèmes), mais qu'il existait déjà sous une forme embryonnaire à la fin de l'époque mycénienne[8].

On peut même se demander si sur le sarcophage de Gazi, vers 1200, l'éperon n'avait pas dépassé cet état pour devenir déjà une arme: la projection vigoureuse de la quille sur une telle longueur au-délà de l'étrave (Fig. 1 A) était certes de nature à favoriser la vitesse du bâtiment, mais n'était-ce pas là un effet secondaire? En fait deux éléments empêchent d'être sûr que la projection de la quille était un véritable éperon:

- la "figure de proue", gênante en cas de choc; toutefois, rien ne semble s'être opposé à l'éperonnage de bateaux de bas bord;

- surtout: la liaison de l'étrave inclinée avec la quille horizontale semble faible pour affronter un choc sans dommage pour le navire lui-même.

S'il avait existé une pièce de liaison X entre la projection de la quille et l'étrave (Fig. 1 B), le choc aurait été absorbé par un massif complexe lui-même relié, par l'intermédiaire de l'étrave, aux préceintes qui y sont fixées (Fig. 1B, P) et dans ce cas il n'y aurait guère d'hésitation: le navire de Gazi aurait été doté d'un véritable éperon. Toutefois, même tel qu'il se présente, l'hypothèse selon laquelle la projection serait un éperon ne peut être exclue.

L'évolution qui se situe au plus tard vers 1050 vise précisément l'adjonction de l'"élément X"[9], ce qui aboutit à la silhouette bien connue de l'époque géométrique, celle d'une courbe continue de la pointe de l'éperon au sommet de l'étrave.

C'est ici l'endroit de se poser la question: pourquoi l'éperon? En effet, un navire tel celui de Kynos, datant de la fin de l'Age du Bronze (il est attribué à l'HR IIIC) (Fig. 2) est certes un navire de guerre, mais uniquement en raison de son "chargement" de guerriers dont témoigne la rangée de boucliers; on voit fort bien un tel navire se livrer à diverses opérations guerrières, tels des raids et des pillages à terre et à l'abordage, mais dépourvu d'éperon, il ne peut compter que sur les armes et la bravoure des soldats (ou pirates) embarqués. Un tel navire convient parfaitement à l'exercice de la piraterie, d'autant plus que son aspect général est celui d'un navire marchand et qu'il pouvait, jusqu'à la dernière minute, se faire passer comme tel auprès d'une future proie sans défense: un éperon est inutile pour cette activité, puisqu'il vise à la destruction de l'adversaire, alors que la piraterie n'est lucrative que si elle permet de s'emparer d'un navire et de sa cargaison intacts - et de ses passagers aussi indemnes que possible: le tout pouvait être utilisé ou vendu[10]. L'éperon suppose donc l'existence de flottes destinées à la guerre navale proprement dite, et, par conséquent, de groupes sociaux fortement organisés et déterminés à éliminer la puissance navale de groupes adverses similaires - ou à se défendre contre eux. La fonction de l'éperon étant ainsi définie, un examen attentif du navire peint sur un vase géométrique de Khaniale Tekke s'impose (Fig. 3): il aboutit aux conclusions suivantes:

1. Il est évident que ce navire "descend" de celui de Gazi; la "figure de proue" a été totalement supprimée, un château de proue (déjà présent sur le navire de Tragana (HR III C)[11]) a été ajouté et la projection de la quille, très allongée, est devenue un véritable éperon: ici, l'"élément X" a été ajouté.

2. Remarquablement long, cet éperon devait, en dépit du renforcement dû à son épaisseur, être fragile; par ailleurs, il existait, pour le vaisseau qui le portait, un autre danger que la rupture de l'éperon: celui, en cas de choc, de voir le navire attaqué basculer violemment vers son agresseur, dont toute la partie antérieure ferait un plongeon, au risque de chavirer[12]. C'est ici que devait, sans doute, intervenir le proembolon inférieur (Fig. 3, B), d'une forme unique: celle d'un tampon, ou d'un butoir. On ne peut qu'admirer la perspicacité de A. Cartault, qui écrivait en 1881, à propos de la fonction du proembolon de l'époque classique: "le προεμβόλιον avait à la fois pour fonction de compléter l'oeuvre de destruction (de l'éperon) en fracassant les parties hautes du vaisseau attaqué et d'arrêter le navire dans son élan une fois le coup d'éperon porté"[13]. Au vrai, le rôle que j'attribue ici au proembolon inférieur du navire de Khaniale Tekke, celui de butoir destiné à arrêter le mouvement de basculement du navire agressé n'est pas exactement celui que lui attribuait Cartault, mais il serrait la vérité de très près; et je crois qu' à l'époque classique, le proembolon remplissait les deux fonctions bien aperçues par Cartault, plus celle de butoir contre le chavirement du navire ennemi. Le rôle du proembolon supérieur, sur le navire Khaniale Tekke, qui a exactement la même forme que le proembolon inférieur, pouvait jouer un rôle identique à l'égard des superstructures du navire attaqué, bien que celles-ci, à l'exception du mât, aient dû être peu considérables; il est possible qu'il existait, en réalité, deux proembola juxtaposés, l'un à bâbord, l'autre à

tribord, représentés par convention l'un au-dessus de l'autre.

L'éperon à l'époque géométrique.

L'éperon strictement horizontal de Khaniale Tekke se retrouve dans les peintures décorant la céramique attique, parfois sans proembola (Fig. 4). Un exemplaire particulièrement intéressant, parce qu'il peut être assez précisément daté des environs de 775, a été récemment découvert sur le site corinthien de Cromyon (l' oenochoé est une importation attique) (Fig. 5)[14]. A première vue, l'éperon semble recourbé franchement vers le haut, mais un examen attentif démontre qu'une telle courbe est très improbable. En effet, l'oenochoé est décorée de cercles clairs concentriques qui se détachent sur un fond noir et d'une métope qui devrait logiquement être rectangulaire, mais qui, "entraînée" par le mouvement circulaire général de la décoration, est trapézoïdale - avec une base arrondie en parallèle avec les cercles clairs (Fig. 6). Or c'est dans cette métope que s'inscrit le navire de la Fig. 5. On voit donc qu'en raison du style décoratif, la silhouette du navire lui-même est déformée en forme de croissant: la quille, jusqu' à la pointe de l'éperon, est pratiquement parallèle au bord inférieur de la métope, donc, horizontale dans la réalité. On notera la présence, unique dans la peinture géométrique attique, de deux vigoureux proembola, version probablement simplifiée de ceux du navire Khaniale Tekke, ce qui atteste la continuité dans l'évolution de l'architecture navale grecque au cours du 8e s. L'époque géométrique connaît cependant deux autres formes d'éperon.

1. A l'époque de l'"école du Dipylon", vers le milieu du 8e s., on aperçoit des éperons franchement recourbés vers le haut: on ne constate plus le parallélisme de l'éperon avec la base de la zone décorée (Fig. 7 et 8). Il est beaucoup plus difficile ici que dans le cas du navire de Khaniale Tekke de définir l' emplacement de la ligne de flottaison - qui détermine celui de l'éperon - mais il est évident que le coup porté par un tel éperon "relevé" ne portait plus sur la partie la plus basse des oeuvres vives; il me semble que le choc devait se produire peu au-dessous de la ligne de flottaison. Un tel choc évitait en grande partie le basculement du navire ennemi, ce qui - peut - être - explique la rareté du proembolon à l'époque géométrique, son utilité étant devenue problématique[15].

2. L'éperon recourbé devait présenter un fâcheux inconvénient, qui n'avait pas été entièrement compensé par sa pointe aiguë et effilée - précisément en raison de la fragilité inhérente à une telle forme. Il n'est pas du tout surprenant que les Grecs aient introduit, vers la fin du 8e s., une innovation capitale dans l'histoire de l'éperon: on voit apparaitre, vers 725 environ, des navires de guerre

attiques - notamment sur un bandeau d'or découvert à Athènes - dont l'extrémité (l'éperon) n'était plus pointue, mais comme "tranchée" de façon verticale (Fig. 9 et 10)[16].

Un tel type d'éperon devait présenter sur les deux types précédents (pointe horizontale et pointe recourbée) plusieurs avantages:

- l'extrémité était beaucoup moins fragile;
- il ne risquait pas (ou moins) de rester fiché dans la coque adverse;
- il frappait d' un seul coup non un point précis de cette coque, mais toute une zone des oeuvres vives; le but visé au moyen d' un tel éperon ne pouvait plus être de percer violemment un trou dans la coque agressée, mais de défoncer sur une surface plus ou moins étendue des bordages assemblés à tenons et mortaises (ou par ligatures) et de provoquer ainsi une voie d'eau irréparable au cours de l'action.

Ce type d'éperon "à lame verticale" fut une invention capitale, dont on n'a peut-être pas perçu suffisamment l'importance, mais dont on verra l'immense succès en Grèce.

Les deux formes (éperon à pointe et éperon "à lame verticale") semblent avoir longtemps coexisté: on constate une étrave du second type dès le deuxième quart du 8e s. sur une fibule en or du British Museum[17], mais on voit l'éperon à pointe persister sur des fibules "béotiennes" de la première moitié du 7e s[18].:

L'éperon en Grèce à l'époque archaïque

Jusqu'ici, les représentations, toutes en silhouettes, ne permettent pas de trancher avec certitude la question de savoir si l'éperon ou sa pointe seulement recevaient un revêtement métallique (ce qui, pour des raisons pratiques, paraît cependant probable). Deux images du 7e s. montrent qu'il en était en tout cas ainsi à cette époque.

La première est une fibule datée de 700 (ou peu après) (Fig. 11): il s'agit d'un éperon à forme de lame bien caractéristique; la manière dont l'artiste a gravé son image, très différente de celle employée pour traiter la coque, ne permet guère de douter de l'existence d'un revêtement métallique. On en doutera encore moins en considérant un graffito de Théra, attribuable à la même époque (Fig. 12), montrant une coque surmontée d'un casque[19]. Non seulement le revêtement est ici particulièrement bien visible, mais le graffito (en fait, une gravure rupestre, profondément gravée dans le rocher) semble avoir été l'oeuvre d'un "artiste" ayant eu pour but de mettre en relief ce revêtement, qui recouvre à la fois l'extrémité de la quille formant l'éperon et la partie inférieure de l'étrave, preuve, s'il en fallait, que ces deux éléments étaient étroitement liés pour former l'éperon proprement dit. Ici, on ne peut douter un instant qu'il était situé complètement sous le niveau de la flottaison (le navire est évidemment figuré jusqu'à la quille) et destiné à frapper profondément sous l'eau[20].

L'existence d'un revêtement métallique - évidemment du bronze - au 6e siècle dans l'univers grec ne pose plus aucun problème: tous les Grecs, du Nord - en Macédoine (Fig. 13) - au Sud - à Karnak (Fig. 14) adoptent, pour "orner" l'éperon de leurs navires de guerre une tête de sanglier recouvrant l'éperon[21]. Cet éperon si caractéristique doit être examiné sous divers angles.

1. La forme de son extrémité. Les meilleures représentations, à cet égard, sont les plus "caricaturales", c'est-à-dire celles qui insistent sur cet aspect: on peut y voir le triomphe de l'"éperon-lame", que ce soit en Béotie (Fig. 15 et 16) ou à Corinthe (Fig. 17). Dans l'iconographie "artistique", l'"éperon-pointe" a disparu.

2. Sa structure. Il faut ici insister sur un point très important: le revêtement de bronze en forme de tête de sanglier recouvre, comme sur le graffito de Théra (Fig. 12), mais plus complètement, l'extrémité de la quille et la base de l'étrave, mais les préceintes ne sont jamais directement reliées à l'éperon. Pourtant l'une au moins de ces préceintes, la préceinte inférieure, est bien visible sur la quasi-totalité des représentations de navires à éperon en forme de tête de sanglier; on ne la verra jamais mieux que sur les deux navires de guerre de la coupe B 436 du British Museum (Fig. 18). Un tel éperon devait nécessairement être à peine moins fragile que les précédents; voilà qui explique pourquoi à la bataille navale d'Alalia, vers 535, une flotte phocéenne de soixante navires, victorieuse d'une escadre étrusco-punique, perdit quarante bâtiments, les vingt survivants étant mis hors service parce que leur éperon était faussé (preuve qu'il avait été utilisé) (Hérodote, I, 166).

3. Son emplacement. Les très nombreuses représentations que nous possédons de ce type d'éperon le montrent tantôt

-émergé[22];

-immergé[23];

-au niveau de la flottaison[24].

Il faut, pour déterminer l'emplacement exact, tenir compte du fait que les peintres de vases, désireux de montrer une tête de sanglier, ne pouvaient que souhaiter la représenter tout entière, facteur susceptible de fausser la valeur documentaire de cette iconographie: il est évident que les peintres devaient avoir tendance à préférer la version "émergée" à la version "immergée". L'ensemble de ces images tend à faire croire que la lame verticale devait frapper très légèrement au-dessous du niveau de la flottaison; cette manière d' éperonner entraîne un moindre risque de basculement du navire-victime vers le navire éperonneur et elle rendait inutile, ou presque, l'emploi de "proembola-butoirs". Et de fait, on n'observe que très exceptionnellement des proembola au 6e s.25.

4. Pourquoi une tête de sanglier?

Edgar Poe écrivait, dans The Purloined letter: "These (large characters), like overlargerly lettered signs and placards of the street, escape observations by dint of being excessively obvious"[26]. Cette observation est, ici, tout à fait justifiée. En effet, personne, à ma connaissance, ne s'est jamais posé la question de savoir pourquoi, brusquement et toutes ensemble, les cités de la Grèce adoptent pour leurs éperons une tête de sanglier, alors que les traditions de construction navale n'étaient vraisemblablement pas toutes identiques[27]. Je n'aurais pas songé à ce problème si M. Paul Forsythe Johnston, dans son livre Ship and Boat Models in Ancient Greece (Annapolis, 1985), n'avait pas écrit, à titre d'hypothèse, qu'une base de statue archaïque, de forme triangulaire et datant de la fin du 7e s., conservée au Musée de Délos, aurait pu représenter une proue de navire[28]. L'angle "antérieur" (celui qui fait face au spectateur) est orné d'une tête de bélier, les deux autres d'une tête de Gorgone; sa forme ne ressemble en rien à une proue de navire et ce petit monument doit, à mon avis, être écarté de l'iconographie navale. Or il n'existe pas de représentation d'éperon d'un navire grec d'époque archaïque en forme de bélier, le sanglier ayant un monopole. Cependant, à la réflexion, une tête de bélier n'aurait-elle pas été infiniment plus logique à la proue d'un navire éperonneur qu'une tête de sanglier? La réponse est évidemment affirmative, du moins à première vue, et sans l'hypothèse émise par M. Paul Forsythe Johnston, je doute que le problème eut été posé[29]. Lorsqu'un engin est conçu en vue de percer violemment une paroi résistante et que l'on veut, par une métaphore imagée, lui donner le nom d'un animal, c'est tout naturellement au bélier que l'on songe. Dans l'Antiquité, l'arme de siège destinée à ébranler les murailles des fortifications était, tout naturellement, appelée "bélier" (krios en grec, aries en latin). Le Musée d'Olympie conserve un tel engin, ou du moins son extrémité de bronze, dans laquelle venait s'encastrer une poutre de bois, datant de la première moitié du 5e s. av. J.-C. (Fig. 19, A,B); ce krios est d'ailleurs orné d'une tête de bélier: un ornement "parlant". On notera que l'éperon (naval) se nomme également "bélier" en anglais (ram), en néerlandais (ram), et en allemand (rammsporn). Le "bélier naval" agissant aussi par percussion, rien n'eût été plus normal que de voir l'extrémité de la proue porter une tête de bélier. L'explication de cette singularité devrait-elle être trouvée dans le domaine de la mythologie ou des superstitions maritimes? Ceci me paraît exclu: si certains animaux, tel le cheval, favori de Poséidon, ou la corneille de mer, chère à Athéna[30] ont des connexions maritimes évidentes, le sanglier, pas plus que le bélier d'ailleurs, n' en a aucune. D. Wachsmuth, dans sa thèse monumentale sur les croyances maritimes de l'Antiquité (1967) semble avoir été embarrassé par cette question: il cite un fragment de Sophocle associant le sanglier à Arès[31], mais le dieu de la guerre n'a pas de lien particulier avec la mer. L'association du sanglier avec la férocité de la guerre est d'ailleurs loin d'être évidente: on retrouve le bélier, et non le sanglier, comme ornement du casque de bronze no B 4667 (6e s.) du Musée d'Olympie[32] et de celui que porte le célèbre buste de guerrier dit "buste de Léonidas" du Musée de Sparte.

L'usage de la tête de sanglier comme éperon naval s'étendait fort loin dans le monde grec: jusqu'à Phaselis, en Lycie, dont les monnaies ont eu la particularité d'être les seules dans le monde hellénique dont les deux faces représentent une partie d'un vaisseau de guerre: une proue sur une face, une poupe sur l'autre. Sur les monnaies antérieures à 467/66, date à laquelle Phaselis fut intégrée à la première confédération athénienne, le type de la proue est celui d'un navire à tête de sanglier (Fig. 20, A et B), mais ici c'est le navire tout entier qui est assimilé à l'animal. On distingue en effet, dans ces deux exemples, les pattes antérieures du sanglier dans l'attitude caractéristique de la charge (pattes qui n'existaient évidemment pas sur le navire réel!); sur la Fig. 20, B, la fusion de l'animal et du navire n'est même pas complète: l'oeil du premier est distinct de l'oculus qui appartient en propre au navire[33]. Il est clair que l'intention du graveur des monnaies archaïques de Phaselis (monnaies encore émises au cours du premier quart du 5e s.) était de montrer un navire doté d'un éperon en train de charger à la manière du sanglier. Or la manière de charger d'un sanglier est très différente de celle du bélier, qui fonce tête baissée, droit devant lui, suivant une trajectoire rectiligne: le choc est reçu par la victime de manière horizontale, de même que le krios ou l'aries frappait un mur. Quant au sanglier, voici ce qu'en écrit un expert: il "cherche à déchirer l'ennemi à coups de boutoir et de défenses en frappant obliquement de *bas en haut* (souligné par moi)..."[34] - ce qu'aucun chasseur ne démentira.

Etait-il utile qu'un navire à éperon attaquât à la manière d'un sanglier, c'est-à-dire en faisant plonger son éperon au moment d'aborder son adversaire, pour le relever au moment du choc? Certainement, puisque l'histoire de l'éperon, telle que je viens de l'esquisser, fait clairement apparaître une continuelle hésitation des constructeurs grecs quant à l'emplacement idéal de l'éperon; vers le milieu du 7e s. encore, on trouve, à peu près contemporains, l'éperon destiné à frapper à la base de la coque (Fig. 13) et, à Samos, sur un ex-voto de bois, un éperon bien plus relevé (Fig. 21); un navire à éperon "réglable", donc susceptible de frapper les ceuvres vives en divers endroits en profondeur (toujours une zone relativement étendue: l'éperon à tête de sanglier appartenait à la famille des éperons-lames) et par conséquent susceptible d'adopter la technique d'assaut du sanglier, fournissait évidemment une solution, même imparfaite, de ce problème.

Si cette tactique était souhaitable et utile, était-elle pour autant techniquement réalisable? Il existe à cet égard des témoignages difficiles à réfuter. Jean Zonaras, écrivain ecclésiastique byzantin et dignitaire à la cour d'Alexis Comnène, avant de se faire moine au Mont Athos où il mourut vers 1130, passe pour avoir été un modèle de science historique en raison des Annales fondées sur des écrits disparus d'auteurs de l'Antiquité, ce qui rend les siens d'autant plus précieux. Sur la base d'une Histoire de Rome, perdue, de Dion Cassius, il écrit qu'en 247 av. J.-C. une flotte romaine fut piégée dans le port d'Hippone par les habitants du lieu, qui tendirent une chaîne au travers de l'embouchure du port; les navires romains foncèrent sur la chaîne et lorsque leur éperon était sur le point de s'y empêtrer, une partie de l'équipage qui se trouvait sur le pont se massa vers la poupe; les poues, allégées, se soulevèrent et franchirent la chaîne; aussitôt, les équipages se massèrent sur l'avant et les poupes, cette fois, s'élevèrent; le piège fut ainsi déjoué[35]. Quarante-six ans plus tard, à la bataille de Chios (201), les Rhodiens, alliés à Attale de Pergame contre la flotte de Philippe V de Macédoine, employèrent une technique similaire: "... les lemboi (macédoniens) fonçaient tantôt sur les rames (des navires rhodiens), tantôt sur leurs proues et parfois aussi sur leurs poupes, paralysant ainsi les officiers pilotes et les rameurs. Pour les attaques de front, les Rhodiens avaient mis au point un procédé ingénieux. Ils faisaient piquer de l'avant leurs navires, en sorte qu'ils recevaient les coups au-dessus de la ligne de flottaison, tandis qu'ils touchaient leurs adversaires au-dessous, ouvrant ainsi dans leurs coques des brèches irréparables"[36]. Il me paraît qu'il convient de mettre en lumière le mot "procédé": τι τεχνικόν, qui désigne "ce qui constitue un art habile". Il me paraît aussi résulter du texte de Polybe que l'exercice d'un tel "procédé" par les navires rhodiens de manière simultanée, et non individuelle, ne peut avoir été improvisé sur le théâtre du combat - précisément pour cette raison.

On peut aisément se représenter l'envoi par l'amiral ou le chef d'escadre rhodien d'un signal "no 32", signifiant l'ordre de procéder à l'enfoncement des proues. Cette déduction est fortifiée par la suite du texte de Polybe: "Mais, en l'occurence, ils (les Rhodiens) recouraient rarement (σπανίως) à ce procédé, car ils s'efforçaient, d'une manière générale, d'éviter les abordages, à cause de la vaillance dont faisaient preuve les soldats macédoniens postés sur les ponts dans les combats corps à corps"[37]. "Rarement", sans doute, mais l'emploi même de ce mot signifie nécessairement qu'il figurait parmi les cas de figure envisagés par l'Amirauté rhodienne, dans une espèce de manuel où devait se trouver cette manoeuvre sous la rubrique "à n'employer que de manière exceptionnelle". L'important est que nous tenons ici la preuve, non seulement du fait que le procédé fut employé à la bataille de Chios, mais que ce procédé était bien connu et parfaitement réalisable.

Comment? Si l'on réfère à l'incident d'Hippone, rapporté par Dion Cassius et Zonaras à sa suite, par un déplacement d'une partie de l'équipage. Il me paraît difficile de croire que c'est à cette technique que les Rhodiens eurent recours à Chios: les flottes de Rhodes et de Pergame réunies comptaient soixante-cinq vaisseaux cataphractes (y compris un certains nombre de navires venant de Byzance), de neuf trihémiolies et de trois trières[38]: donc, les vaisseaux "lourds" étaient largement majoritaires; on sait d'ailleurs par diverses sources que les Rhodiens étaient spécialistes des tétrères et des pentères. On ne sait malheureusement que peu de choses au sujet de ces bâtiments, mais on peut se demander, avec une certaine dose de doute, s'il suffisait du déplacement d'une partie des soldats embarqués sur le pont pour obtenir le plongeon de la proue. Mais un autre procédé me semble pouvoir avoir été utilisé.

Dans une étude consacrée aux bisquines (bateaux de pêche de Bretagne à deux ou trois mâts) un passage est consacré aux régates qui opposaient celles de Cancale à celles de Granville, à la fin du siècle dernier et au début du nôtre: "Les coques étaient soigneusement poncées, les voiles judicieusement choisies... Paradoxalement, c'était ce jour-là aussi que l'équipage était le plus nombreux: douze hommes[39]. C'est qu'il fallait manoeuvrer vivement, et surtout déplacer sans cesse le lest embarqué, constitué d'une cinquantaine de sacs de sable de cinquante kilos"[40]. Si douze hommes, ou plus exactement une partie d' entre eux, suffisaient à modifier grâce à la manipulation de sacs de sable d'un poids judicieux (à la fois parce que leur transport n'excédait pas les forces humaines et parce qu'un tel poids permettait d'agir "en délicatesse", selon les nécessités) l'assiette d'une bisquine, je crois que l'équipage d'un navire cataphracte (tétrère ou pentère), tellement plus nombreux, pouvait aisément se livrer à une manoeuvre similaire: l'éperon classique frappait probablement au voisinage de la flottaison, et, on l'a vu, tel était aussi le cas de l'éperon à tête de sanglier: il suffisait donc de faire varier de peu un certain nombre de sacs de sable embarqués, à fond de cale, pour faire plonger l'éperon, puis de le redresser.

Une telle technique était sans aucun doute à la portée des constructeurs de navires à éperons en forme de tête de sanglier, et je ne puis voir ailleurs la raison de l'usage généralisé de cet emblème.

L'éperon classique

Nul ne peut dire actuellement où ni à quelle date il fut inventé. Il vaut d'être noté que sur la seule représentation d' un navire complet dans la peinture de vases à figures rouges sur fond noir, le stamnos E 440 du British Museum, vers 500[41], la tête de sanglier a disparu pour faire place à un simple éperon à lame verticale, déjà bien connu, et non à l'éperon classique. Celui-ci n' apparaît pour première fois dans l'iconographie que vers 400, sur la stèle dite de Démocléidès (Fig. 22). Le navire qui, ici, le porte ne peut avoir été qu'une trière, mais rien n'interdit de croire que l'éperon classique, si perfectionné, ait été inventé en même temps que la trière elle-même, et pour elle[42].

Il n'est pas question de décrire ici cette coiffe de bronze qui couvrait un massif de bois d'une extrême complexité[43], mais je soulignerai deux de ses particularités.

1. Son aspect. Il parait, à première vue, complètement neuf, sans rapport avec les formes d'éperon vus jusqu'ici. En réalité, cet aspect si frappant est certes un perfectionnement, spectaculaire, mais c'est peut-être sa caractéristique la moins révolutionnaire: il s'agit, en fait, d'une amélioration de l'"éperon-lame". La lame verticale est toujours présente, mais il lui a été ajouté trois lames horizontales (Fig. 23). On a vu que l'avantage, à l'époque géométrique, de l'éperon-lame sur l'éperon-pointe était de disloquer toute une zone de bordages au lieu de percer un endroit précis; l'adjonction à la lame verticale de trois lames horizontales avait pour effet d'augmenter considérablement la surface de la zone frappée: perfectionnement, donc, mais non révolution.

2. Sa structure. C'est elle qui est révolutionnaire. En 1975, j'avais exposé que, d'après l'iconographie, la force de cet éperon provenait de ce qu'il s'appuyait sur les préceintes du bâtiment, ce qui ne fut jamais le cas auparavant, de telle sorte que le choc n'était pas absorbé par une partie de la coque (l'ensemble formé par l'extrémité de la quille et la partie inférieure de l'étrave), mais par la coque

toute entière[44]. Cette analyse a été confirmée pleinement par l'examen de l'éperon d'Athlit[45]; le rôle capital joué par les préceintes est bien mis en lumière du fait que leur mise en place définitive, sur le chantier, précédait même celle de l'étrave[46], dont le rôle devenait relativement secondaire.

Le succès de cet éperon fut tel qu'il fut adopté par toutes les flottes de Méditerranée jusqu'à la première moitié du Ier siècle de notre ère, sur tous les grands navires de guerre, qu'ils fussent grecs, ptolémaïques, puniques ou romains.

On le trouve, par exemple, sur l'hyper-galère qu'était l'Isis[47], alors que, n'étant appuyé sur aucune préceinte, il n'était probablement plus qu'un 'status symbol', mais, comme tel, indispensable.

Voilà ce qu'enseigne l'iconographie "officielle", c'est-à-dire certains monuments et peintures et, surtout, les monnaies. Mais l'iconographie "officielle" ne s'est jamais intéressée qu'aux navires importants, les trières et les bâtiments d'un rang surérieur. Qu'en était-il des navires d'un rang moins élevés que la trière? Etaient-ils aussi pourvus de l'éperon classique?

Mais les trières n'auraient-elles pas, aux 5e et 4e s., chassé des mers les navires d'un rang moindre? C'est l'impression que peut laisser la lecture de Thucydide et de Xénophon: pendant la guerre du Péloponnèse, les trières athéniennes n'étaient pas seulement des navires de ligne, elles jouaient aussi, par exemple, le rôle de porteurs de dépêches. Mais on note une apparition des triacontores (navires à quinze rames par bord, connus depuis plusieurs siècles) dans les listes de la marine de guerre athénienne à partir de l'année 330/29 [48].

D'aussi modestes bâtiments, réapparaissant au moment où des tétrères et des pentères commencent aussi à figurer dans listes navales d'Athènes, ne peuvent avoir eu un rôle en première ligne: c'étaient évidemment des éclaireurs, des porteurs de dépêches ou des transports de troupes rapides[49].

En fait, des triacontores étaient déjà utilisées dans le monde grec avant leur incorporation sur les listes officielles de la marine athénienne: Polyen relate (III, 9.63) que l'Athénien Iphicrate commandait une centaine de triacontores pour opérer des razzias sur des régions côtières. Iphicrate fut une espèce de *condottiere* au service d'Athènes de 390 à 386, en Thrace et en Syrie entre 386 et 373, puis à nouveau au service d'Athènes entre 373 et 355; la date des evénements rapportés par Polyen n'est malheureusement pas connue, mais il est intéressant de noter que ces petits bâtiments, qui devaient déjà exister à l'époque homérique, étaient encore employés au 4e s. comme navires corsaires ou pirates avant leur adoption dans une "flotte d'Etat", celle de l'Etat athénien. On verra ce phénomène se reproduire régulièrement à l'époque hellénistique.

Aucun document du 4e s. ne permet d'affirmer qu'ils étaient armés d'un éperon, ni, dans l'affirmative, quelle était la forme de cet éperon.

L'époque hellénistique.

A partir du 3e s., le rôle des navires d'un rang inférieur à la trière s'accroît considérablement, de même d'ailleurs que celui des rangs supérieurs, ce qui me parait traduire une plus grande diversification des fonctions dévolues aux marines de guerre en général. Il est frappant de constater que la quasi-totalité de ces petites unités avaient pour origine un type de navire utilisé par des pirates. En voici trois des principaux.

1. Le lembos. Ce petit navire, inventé par les pirates, fort actifs, d'Illyrie[50] prit rang dans les flottes de Syrie, de Macédoine, de Sparte et de Rome[51].

2. La liburne. Cet autre type de bâtiment léger, créé par les pirates de Dalmatie, était probablement voisin du précédent, dont il n'était sans doute qu'une variante. Son destin fut cependant, très différent: la liburne connut, sous l'Empire romain, une faveur extraordinaire, ainsi qu' on le verra plus loin. Comme l'écrit L. Casson, "the earliest certain mention of liburnians is at the battle of Naulochus in 36 B.C., but there is no reason why they could not have been in use long before"[52], d'autant plus que le cousin de la liburne, le lembos, était depuis longtemps en service dans la flotte romaine.

3. Le myoparon. Son origine géographique est incertaine, mais il est sûr que ce type était extrêmement prisé par les pirates[53]. Comme les deux précédents, il fut souvent intégré dans des "flottes d' Etat", en particulier celles de Rome et de Carthage[54].

Ces navires présentent des traits communs.

1. Caractéristiques générales.

Ce qui frappe d'abord, d'après les sources littéraires (pratiquement les seules dont nous disposions) est, dans chaque catégorie, l'extrême diversité des types: le nombre des rames, par exemple, lorsqu'il est mentionné, est souvent très différent et on en trouve aussi bien à un qu'à deux rangs de rames[55]. Il est fort possible que les caractéristiques d'origine des navires de pirates qu'ils étaient furent modifiées, notamment dans le sens de l'uniformité, en raison des besoins des "flottes d'Etat", en particulier celles de Rome et de Carthage. Toutefois, ils ne semble pas qu'ils aient, à l'origine, été pontés: ils n'ont donc jamais cessé, quelles que fussent les modifications ultérieures, d'être des navires légers.

2. Leur usage.

Lui aussi fut très divers. Des lemboi furent utilisés par les Romains comme éclaireurs du gros de leur flotte[56]. Ils furent aussi utilisés comme transports de troupes rapides: en 216, Philippe V de Macédoine fit construire en Illyrie cent lemboi dans ce but, selon ce que rapporte Polybe (5. 109). L'historien ajoute que cette flotte (ou une partie de celle-ci) prit la fuite en apprenant l'arrivée d'une escadre romaine forte de dix quinquérèmes, alors qu'elle aurait pu "selon toute vraisemblance" capturer ces dix navires (Polybe, 5.110), ce qui démontre bien que ces lemboi, conçus comme transports rapides, pouvaient vaincre des navires de ligne, à la condition toutefois de disposer de l'avantage décisif du nombre[57]. De toute façon, que ce soit comme navires pirates, transports rapides, éclaireurs ou navires de combat légers dans des "flottes d'Etat", la caractéristique commune des lemboi, des liburnes et des myoparones était, avant tout, d' être rapides et manoeuvrants. Jamais ils ne sont signalés comme remarquables par leur "force de frappe".

3. L'éperon.

Il eût été surprenant que des navires de guerre antiques eussent été comlètement dépourvus d'éperon et il est clair, d'après le récit de Polybe (16, 1-9) que les lemboi de Philippe V, à la bataille de Chios (201) en étaient dotés. Mais cet éperon était-il l'éperon classique? Rien ne permet de l'affirmer dans ce cas précis, ni, d'une manière générale, pour les trois types de navires de pirates examinés ici, du moins d'après les sources écrites. Avant de recourir à l'iconographie, deux remarques s'imposent.

A. L'étude approfondie de l'éperon d' Athlit par L. Casson et J. Steffy[58] a fait apparaître qu'à côté de ses grands avantages, il devait nécessairement présenter un inconvénient: son coût et la nécessité, pour le produire - et pour produire les navires qui le portaient - d'une importante infrastructure; seuls des états riches et organisés pouvaient s'offrir en grands nombres des navires exigeant une main d'oeuvre très qualifiée en grande quantité et d'importantes ressources naturelles, notamment diverses essences de bois. Or tel n'était généralement pas le cas des pirates dalmates ou illyriens.

B. L. Casson a fait une très importante constatation: il existait, aux côtés de lemboi armés d'un éperon, d'autres qui en étaient dépourvus[59]. Or, grâce aux études de J.R. Steffy, il est devenu absolument évident que toute la structure d'un navire porteur d'un éperon classique était conditionnée par l'existence de cet éperon. En d'autres termes, il est parfaitement absurde d'imaginer qu'un tel navire ait pu figurer dans une flotte sans éperon, ce qui n'était nullement le cas du lembos, qui pouvait en être dépourvu. Ces deux observations, réunies, permettent de douter fortement que l'éperon des "navires légers" ait été l'éperon classique; celui-ci n'aurait donc pas été aussi omniprésent que l'iconographie permettrait de le penser. Une telle hypothèse, qui cessera d'en être une pour devenir une certitude après l'examen qui va suivre de quelques documents, naît d'ailleurs du bon sens: l'histoire de l'éperon ne paraît être linéaire, ou plutôt: ne peut être suivie que de manière linéaire, qu'en raison de l'existence de documents artistiques émanant généralement de cités, d'états ou de confédérations qui disposaient de forces navales: voilà qui nous permet de suivre l'évolution de l'éperon en Attique, à Corinthe, en Béotie, en Phénicie, à Carthage ou dans le monde romain. Mais il est tout à fait certain que la piraterie, fort en honneur à l'époque homérique, n'avait jamais cessé d'exister, même lorsque Athènes, devenue puissance impériale au 5e s. en mer Egée, tenta d'y extirper la piraterie: elle n'y parvint jamais complètement[60] et d'ailleurs Isocrate, écrivant en 380, se plaint que les mers sont infestées de pirates[61]. Toutefois, les actions anti-pirates d'Athènes et d'autres cités soucieuses de protéger leur commerce maritime au 5e s. durent avoir des répercussions sur l'architecture navale des navires des pirates: il ne pouvait être question de grands navires, pareils à ceux qui équiperont au 1er s. av. J.-C. les redoutables flottes de pirates de Cilicie; les pirates, au 5e s., et probablement encore au 4e, devaient être réduits à la construction d'embarcations modestes, tout chantier quelque peu important étant susceptible d'être repéré et détruit par les flottes qui tentaient d'assurer la police des mers. On a vu que l'éperon n'était pas du tout indispensable à l'exercice de la piraterie, tant qu'il s'agissait d'aborder, afin de le piller, le navire convoité, et il me paraît certain que de simples barques embarquant des malandrins décidés pouvaient suffire à maîtriser un navire isolé et encalminé. Toutefois, un éperon présentait quand même une double utilité: en premier lieu, son effet hydrodynamique (à largeur égale, une plus grande longueur à la flottaison ne pouvait que favoriser la vitesse du navire) et en second lieu, un éperon même très inférieur en qualité à l'éperon classique (mais ne nécessitant pas la structure complexe qu'il exigeait absolument) pouvait, en cas de rencontre avec un navire de guerre "régulier", servir d'argument dissuasif. Ces quelques considérations démontrent qu'une histoire "linéaire" de l'éperon serait fallacieuse et que l'éperon dont les pirates d'Illyrie, de Dalmatie ou d'ailleurs équipaient leurs navires était sans doute soit fort proche de ceux des époques géométrique et archaïque, soit un modèle de leur invention, forcément simple, faute de disposer de la haute technologie et des chantiers importants exigés pour la production de l'éperon classique.

Ces réflexions sont confirmées par des témoignages iconographiques peu nombreux (on a vu les raisons de cette rareté), mais décisifs.

1o Lorsque les Romains, en 229, accordèrent leur protection à Dyrrhachium, en Illyrie (actuellement Durres - Durazzo, en italien - dans l'actuelle (1991) Albanie), véritable nid de pirates, ils autorisèrent la cité à conserver une certaine autonomie, sous leur protection et leur surveillance. Cette autonomie, qui subsista jusqu'à 100 av. J.-C. environ, permit à Dyrrhachium de poursuivre l'émission de ses propres monnaies[62]. L'une de celles-ci présente, au revers, une proue de navire d'un type complètement inusité dans les autres "représentations officielles" que sont les monnaies, aux 3e et 2e s. (Fig. 24). Si l'image est plutôt grossière, elle permet cependant de constater sous le stolos (l'ornement de proue) un éperon à pointe unique présentant une légère courbure vers le haut. Si les autorités de Dyrrhachium ont choisi un tel type de proue, il n'y a aucun doute: il ne peut s'agir que d' un emblème exigé par la fierté nationale: une proue illyrienne caractéristique. D'ailleurs, un examen comparé des monnaies contemporaines au type de la proue permet d'affirmer que si Dyrrhachium avait disposé de navires à éperon classique, c'est ce type de proue qui aurait été représenté.

2o Le gymnase de Délos fut construit pendant la première moitié du 3e s. et remanié aprés 166, date à laquelle Athènes exerça à nouveau son autorité, abolie en 314, sur l'île. L'abandon de cet édifice semble devoir être situé en 88, lorsque Délos fut envahie et en partie détruite par les troupes de Mithridate[63]. Les graffiti, très nombreux, incisés dans les bancs de marbre du gymnase sont sûrement l'oeuvre de la classe aisée qui fréquentait ces lieux: les invocations, souvent adressées à Apollon et à Hermès, seraient inconcevables sans une évidente éducation intellectuelle[64]. Ces graffiti diffèrent complètement de ceux qui, généralement anépigraphiques[65], sont l'oeuvre de "squatters", probablement des soldats et des marins débarqués lors des invasions de Délos en 88 et en 69, graffiti qui représentent fréquemment un navire. Parmi les graffiti du gymnase figure un petit navire, très soigneusement gravé, vu par bâbord et portant sur le flanc le nom "Theodoros" (Fig. 25)[66]. Il porte un très long éperon à pointe unique, recourbé vers le haut. Il est possible que l'auteur du graffito ait poussé jusqu'à la caricature les particularités de cet éperon, mais on ne caricature que ce qui est caractéristique. Il est d'autant plus exclu, ici, que la projection à la base de la proue ait été un taillemer que l'auteur du graffito a soigneusement délimité une zone particulière de la proue (Fig. 26), ce qui ne se justifie que si son aspect extérieur différait du reste de la coque: comment ne pas y voir l'indication du revêtement métallique de l'éperon? Il s'agit bien ici d'une arme, évidemment très différente de l'éperon classique et guère différente de celui de l'époque géométrique, mais adaptée à un navire de taille manifestement réduite. La représentation d'aussi humbles bateaux était bannie de l'"iconographie officielle".

3. On compte, parmi les graffiti incisés dans les stucs des habitations déliennes, évoqués plus haut, des dizaines de représentations de navires, tant de commerce que de guerre. Parmi ces derniers, quatre images de navires à éperon doivent attirer particulièrement l'attention.

- Fig. 27, 28 et 29. Ces trois éperons appartiennent à la même famille que l'éperon du Theodoros, l'éperon-pointe; dans deux cas (Fig. 27 et 28), l'éperon est surmonté d'un proembolon. La proue du navire de la Fig. 28 est dessinée de manière à faire croire, me semble-t-il, que l'éperon est fait de métal, ou recouvert de métal. De tels bâtiments étaient plus petits qu'une trière (ce qui est tout à fait clair dans le cas du navire de la Fig. 27, à un seul rang de rames): que sont-ce, sinon des liburnes, des lemboi ou des myoparones?

- Fig. 30: l'un des exemples les plus évidents de la survivance de l'antique éperon à lame verticale, tracé avec un soin particulier: l'un des gouvernails latéraux est plongé dans l'eau, l'autre, celui de bâbord, est relevé, preuve que les deux gouvernails n'étaient pas forcément en usage de manière simultanée[67].

Une stèle funéraire de Cyzique, du 2e ou du 1er s. av. J.-C., au British Museum (Fig. 31) montre un petit bâtiment doté du même éperon-lame, ainsi que d'un proembolon[68].

3o Le Musée Archéologique de Rethymnon conserve une lampe en bronze (No Inv. 150) en forme de navire, longue de 235 mm, trouvée en mer, au large de Haghia Galini (Crète) (Fig. 32)[69]. Le lieu de la trouvaille interdit toute datation précise: l'objet est soit hellénistique, soit romain, ce qui, pour notre propos, n'a guère d'importance. La première question qui se pose au point de vue de la valeur documentaire de cette lampe est de savoir si, du fait de sa fonction, la représentation du navire a été gravement déformée. A mon avis, la réponse est négative: les trois orifices de la Fig. 32 b (A, B, C) servent évidemment au passage de l'huile et de la mèche, mais la "plate-forme" dans laquelle sont percés les orifices B et C peut parfaitement avoir existé; la "partie-lampe" a certainement affecté la partie hachurée de la Fig. 32 b, ce qui n'affecte pas l'essentiel de la forme du navire, qui est certainement un "vaisseau long", comme le montre la proportion longueur /

largeur de la coque. Surtout, la quête (inclinaison vers la poupe de la partie arrière), si élégante, achève de donner l'impression d'un léger navire de guerre. On ne saurait jurer que les formes transversales en V correspondent exactement à la réalité, mais il aurait été plus pratique pour l'auteur d'aplatir le fond de la lampe, pour permettre de l'asseoir horizontalement; il est donc évident que l'auteur de la lampe a voulu donner l'impression d'un navire propre à fendre les flots et sans doute cette impression correspond-elle à la réalité. S'agit-il d'un navire de guerre de haut rang? Certainement pas: les quelques vestiges de tolets qui subsistent s'appuient toutes sur le plat-bord: la lampe représente donc un petit bâtiment, une monère non pontée, dont l'atout principal n'était pas le mince éperon, mais sa vitesse.

On voit qu'il est inexact d'affirmer que l'éperon à pointe unique apparaît au cours du 1er s. ap. J.-C. pour remplacer l'éperon classique: il existait, comme le démontre l'iconographie, depuis le 2e s. av. J.-C. et, dans la réalité, il n'avait probablement jamais disparu, mais été conservé sur des bâtiments de guerre de rang inférieur à la trière et inspiré (ou imité) de navires pirates. Sa fragilité est évidente, si on le compare à l'éperon classique, mais tel était aussi le cas des éperons des époques géométrique et archaïque, et il ne devait pas être (ni plus, ni moins) efficace que ceux-ci.

L'éperon sous l'Empire romain.

La liburne originelle est un petit navire caractéristique de la côte illyrienne, dont l'éperon est à pointe unique et dont les capacités d'agression ne font aucun doute, mais dont l'emploi dans une "flotte d'Etat", composée sous la République romaine, du 3e au 1er s. av. J.-C., principalement de quinquérèmes, fut certainement celui d'auxiliaires - auxiliaires indispensables, il faut le souligner, mais dont on ne peut pas plus confondre le rôle avec celui des "navires de ligne" contemporains que celui des corvettes et des sloops avec la fonction des vaisseaux au XVIIIe s.

Qu'en était-il à la bataille d'Actium?

Très tôt, le mérite de la victoire sera attribué aux liburnes de la flotte d'Octavien: on trouve un germe de cette version du combat dès la publication des Elégies de Properce, dix ans à peine après la bataille[70]. Cette version sera reprise par Tite-Live, écrivant à la fin du règne d'Auguste et elle est affirmée clairement par Plutarque (qui avait eu accès aux Mémoires, en grande partie perdus, d'Auguste), qui impose l'image d'Antoine fuyant sur une quinquérème, poursuivi par les liburnes de son adversaire[71]. Le rôle essentiel d'artisans de la victoire attribué aux liburnes grandira jusqu' à la fin de l'Empire: Prudence (348 - v. 415) écrit qu'à Actium de fragiles navires (qu'il nomme "phaselis") ont vaincu la flotte égyptienne pourvue de rostres[72]. Cette légende, la victoire d'Octavien - David sur Antoine - Goliath, si flatteuse pour le premier, connaît son sommet dans l'oeuvre de Végèce, contemporain de Prudence: il écrit qu'en raison (ergo) du rôle principal joué par les liburnes à Actium, les Empereurs romains, après Auguste, construisirent leurs navires de guerre à la ressembance (ou: à la manière: *similitudine*), des liburnes et en leur donnant leur nom (*nomine*) [73].

Si le rôle des liburnes à Actium fut important, il a été démontré qu'il fut loin d'être essentiel[74]. Ce qui est essentiel est de retenir que selon l'idéologie impériale, qui ne semble pas avoir été contestée, la victoire d'Actium, fondatrice de l'autorité légitime du maître de Rome sur la Méditerranée entière, fut le résultat de l'écrasement des lourds et arrogants vaisseaux d'Orient par des navires légers, agiles et fragiles obéissant au génie d'Octavien. Toutefois, si la version officielle de la bataille fut légendaire, elle le fut avec une telle force que, en fin de compte, on constate que Végèce a dit vrai:

- quant à l'appelation (*nomine*): dès Suétone (v. 69-125 ap. J.-C.), il est clair que "liburne" est devenu rigourement synonyme de "navire de guerre" en général, y compris des plus grands, puisque cet historien qualifie de "liburniques" les décères ("navires à dix rangs de rames") de Caligula[75]; quant à Végèce, il appelle "liburnes" des navires à un seul, deux, trois et quatre rangs de rames[76];

- quant à la "similitude": ici, le problème est bien plus complexe que celui de l'appelation: que signifie "construire à la manière des liburnes" (navires légers par excellence) des navires aussi différents qu'une monère et une décère, en passant par les types intermédiaires? Nul ne peut, faute d'épave d'un navire de guerre d'époque impériale, répondre à cette question, mais ici encore l'iconographie peut fournir des éléments de réponse. En effet, à partir du règne de Néron[77] les monnaies impériales montrent des navires dont l'éperon est à pointe unique, le plus souvent recourbée vers le haut[78]. Or nous savons que les monnaies représentent le navire le plus typique de l'Empire, sinon celui de l'empereur lui - même. Par ailleurs, les navires de la Colonne Trajane présentent la même caractéristique[79]. Ces faits sont bien connus, mais on a peut-être moins remarqué que la préceinte basse, si intimement liée à l'éperon classique, a elle aussi disparu, ce qui est parfaitement logique, mais en dit long sur la profonde différence de structure de la coque toute entière entre les navires impériaux à partir de Néron et ceux qui leur étaient antérieurs. Il s'ensuit que la "similitude" signalée par Végèce était bien réelle et que les Romains ont abandonné, après la bataille d'Actium, même pour leurs plus grands bâtiments de guerre, une structure inventée en même temps que la trière grecque pour adopter une structure simplifiée - et, à certains égards, archaïque[80].

Ce phénomène signifie-t-il que les Romains avaient, sous l'Empire, renoncé à l'emploi de l'éperon? Une distinction, ici, me semble nécessaire: la manoeuvre d'éperonnage "à la manière du sanglier" restait possible pour la majorité des navires représentés sur la Colonne Trajane, navires légers, mais il est loin d'être évident qu'un navire tel celui dont l'avant figure ici (Fig. 33) ait encore pu l'exécuter, en raison de la masse du château de proue.

Faut-il, dès lors, conclure que l'éperon des grands navires impériaux était devenu un simple "status symbol"? Une telle conclusion serait hâtive: elle n'explique pas la présence de proembola sur certains navires de la colonne Trajane[81] et même de deux ou trois proembola superposés, fort mis en valeur par le graveur sur de nombreuses monnaies d'Hadrien[82].

Est-ce à dire que les navires de la flotte de l'Empire étaient dépourvus de valeur militaire en raison d'un éperon de qualité inférieure à celui de l'éperon classique, ainsi qu'on l'a parfois soutenu[83]? La Pax Romana est trompeuse si l'on songe, par exemple, aux événements de 68/69, qui virent se succéder Néron, Galba, Othon et Vitellius: chaque fois, la partie de la flotte aux ordres de l'un ou de l'autre des prétendants était en mesure de jouer une partie décisive et si la flotte n'était pas restée passive, Vespasien, chef des armées de Judée, proclamé empereur par le préfet d'Egypte, Tiberius Alexander, n'aurait probablement pas pu se saisir du pouvoir effectif. Cette situation était susceptible de se répéter et exigeait des armées navales toujours prêtes au combat. L'éperon ne fut jamais abandonné comme arme navale sous l'Empire et c'est d'ailleurs grâce à lui que la flotte byzantine, en 551, vainquit celle des Goths à la bataille de Sinigallia[84]. On ne saurait toutefois être sûr de la forme de l'éperon à cette époque, d'autant moins qu'au Bas Empire, de nombreuses représentations montrent de humbles barques de pêche pourvues d'un stolos, d'un proembolon et d'un éperon à pointe recourbée qui, ici, ne sont certainement qu'un "status symbol" - et aussi hommage, probablement inconscient, à l'idéologie impériale de la "forme (similitudo) liburne" (Fig. 34).

L'éperon du Sister Ship de Marsala (Fig. 35,36)

La projection à la proue de l'épave punique de 3e s., dite *Sister Ship*, trouvée au large de Marsala, a été identifiée par l'auteur de la découverte, Miss Honor

Frost, et par moi-même, comme un éperon - arme navale, et plus précisément comme celui d'un navire de la famille des liburnes[85]. L'analyse des documents iconographiques des Fig. 25 à 29 ne peut que confirmer, par comparaison, cette identification, qui a cependant été plusieurs fois mise en doute, encore récemment par le très regretté Jean Rougé, qui y voyait un élément "purement décoratif"[86].

Je regrette de devoir qualifier cette opinion de peu sérieuse: la projection en question étant située sous l'eau, on voit mal l'intérêt d'une décoration destinée à provoquer l'admiration des poissons.

Une autre contestation émane de L. Casson, qui a fourni ses arguments dans deux publications[87]. Sa conclusion est que la "projection" du Sister Ship est "a curiously shaped cutwater"[88]. Or nous possédons à présent un témoignage archéologique relatif à un taillemer, grâce à la fouille conduite par A. Tchernia et P. Pomey de l'épave de la Madrague de Giens, celui d'un navire marchand romain qui fit naufrage entre 75 et 30 av. J.-C.: on voit (Fig. 37) qu'il s'agit d'un dispositif relativement simple et, en tout cas, sans aucune analogie avec la "projection" du Sister Ship. Sans entrer dans les détails de la fouille de la Madrague de Giens, on voit qu'une allonge de la quille, prolongée au-delà de l'étrave, reçoit un plan vertical dont la face antérieure, non conservée, mais qu'il est aisé de reconstituer grâce à une très abondante iconographie des navires marchands romains, était oblique[89]. Il est très difficile de comprendre comment L. Casson a pu écrire, à propos de la "projection": "what it (l'épave de Marsala) actually has is a pair of light wooden arms extending forward from *the cutwater*"[90]; (ces derniers mots ont été soulignés par moi, car il posent à eux seuls un problème: comment "a curiously shaped cutwater" pourrait-il consister en une paire de "wooden arms extending ... from the cutwater"?) Par ailleurs, il suffit de considérer la Fig. 35 (connue de L. Casson par les diverses publications de Miss Honor Frost) et la Fig. 36, qui ne fait que rendre la précédente plus explicite, pour s'apercevoir que "what it has" est une paire de pièces de bois courbes, en forme de défenses de sanglier, défenses qui ne s'étendent pas "en avant à partir du taillemer" (qui n'existe pas), mais qui sont cloués à leur base de part et d'autre de la quille.

La raison d'être de ces "défenses" était de toute évidence de maintenir entre elles un élément qui a disparu[91], mais non sans laisser de nombreuses traces:

1. une mortaise dans la face antérieure de l'étrave, destinée à maintenir l'élément central de manière verticale le long de celle-ci;

2. la présence de clous en fer, tout au long des défenses, manifestement destinés à maintenir entre elles cet élément central;

3. les restes, sur les “défenses” et sur la quille, d’une espèce de résine et surtout, la trouvaille d’une lamelle de bronze “collée” à une couche de cette même résine, découverte dans une fente située entre l’étrave et les défenses (Fig. 36, X);

4. des pointes en cuivre destinées à fixer une couche de bronze, dont la lamelle n’ est qu’un vestige, sur la “projection”.

Non seulement l’ensemble de ces éléments aurait été parfaitement inutile pour un taillemer, mais il est évident qu’un taillemer n’aurait en aucun cas exigé une construction aussi sophistiquée. En outre, la partie de la proue conservée (malheureusement peu de chose, il est vrai) montre des lignes d’eau si fines que la présence d’un taillemer aurait probablement été superflue.

La seule explication possible d’un assemblage aussi complexe est que nous sommes en présence des vestiges d’une proue munie d’un éperon à pointe unique (l’élément central a disparu) dont l’apparence extérieure se rapprochait très probablement de celui du navire léger dont la lampe de Haghia Galini (Fig. 32) représente, à mon avis, une image crédible, sinon totalement fidèle.

En 1983, défendant l’identification de la “projection” comme un éperon[92], je soulignais

- qu’il était destiné à frapper le navire adverse sous l’eau;
- qu’il était d’une grande fragilité et devait se briser au moment de l’éperonnage, laissant absolument intacte la coque du navire qui le portait.

L. Casson a commenté avec une très vive ironie ces deux points de vue, que je reprendrai ici.

1. J’avais écrit que cet éperon était suffisant pour endommager la coque ennemie en son “ventre mou” (“soft underbelly”). L. Casson remarque que l’épaisseur des bordages de l’épave d’Athlit situés sous l’eau était d’environ 7, 4cm, et que les oeuvres vives ne sauraient être considérées comme un “ventre mou”[93], expression que j’avais évidemment employée dans un sens figuré. Sans vouloir, bien sûr, contester la solidité des fonds de coque des navires de guerre antiques, j’observe que Polybe écrit, dans sa description de la bataille navale de Chios, que le navire amiral d’Attale entama la bataille en donnant à une octère un coup d’éperon “au bon endroit (καιρίαν), sous l’eau (ὕφαλον)” (Polybe, XVI, 3.1).

Que l’éperon ait frappé sous l’eau (comme Polybe l’évoquera encore un peu plus loin: les "ὕφαλα τραύματα" (XVI, 4.12) sont des voies d'eau sous la flottaison) quoi d'étonnant? Depuis le navire de Khaniale Tekke (Fig. 3), en passant par celui de Théra (Fig. 12) jusqu'à ceux de Délos (Fig. 25 à 29), la plupart des éperons grecs étaient conçus pour frapper, non à la ligne de flottaison, mais au-dessous de celle-ci. Si celui d'Athlit devait frapper au voisinage de la flottaison, plusieurs monnaies ou monuments attestent qu'il existait une variété d'éperons classiques conçus pour frapper sous l'eau[94]. Les plus intéressants de ces documents sont, notamment en raison de leur netteté, deux graffiti provenant de Délos (Fig. 38). On ne peut, ici, invoquer l'argument selon lequel les représentations similaires, sur les monnaies, d'un éperon classique incliné vers le bas auraient été imposées par la forme ronde du support: l'auteur du graffito disposait évidemment de toute la surface qu' il pouvait souhaiter. L'emploi par Polybe de καιρίαν est encore plus intéressant, si l'on est attentif d'autres emplois de termes voisins; citons, parmi de nombreux autres exemples:

- ἐν καιρίῳ (*Iliade*, 4, 185); κατα καίριον (Iliade, 11, 439): "à l'endroit propice pour infliger des blessures mortelles";

- καιρία πληγή (Eschyle, *Agamemnon*, 1292, 1343): "blessures mortelles";

- τά καίρια (Xénophon, *De l'équitation*, 12, 2): "parties du corps où les blessures sont mortelles".

Le coup d'éperon créant une voie d'eau "mortelle" était donc certainement, selon Polybe, celui qui frappait sous l' eau. L'argument de L. Casson, fondé sur les épaisseurs respectives des bordages des oeuvres vives et des oeuvres mortes est d'autant plus contestable que l'on peut voir dans la plus grande épaisseur des premières la preuve que les constructeurs les fortifiaient d'autant plus qu'ils les savaient plus visées par l'éperon et donc plus vulnérables.

2. J'écrivais aussi que l'éperon du Sister Ship était fragile[95]; A. Sleeswyk démontre qu'il l'était moins que je ne le supposais[96], mais sa fragilité, surtout si on le compare à l'éperon classique, n'en demeure pas moins vraie; il était en tout cas conçu pour ne pas endommager, en cas de choc, le navire qui le portait, ce qui constituait un progrès évident par rapport aux navires grecs qui combattirent à Alalia vers 535[97].

J'écrivais, en outre, qu'un tel éperon pouvait, en raison de sa relative simplicité de construction, être facilement remplacé, mais seulement après un passage par l'arsenal[98]. Sur ce dernier point, je crois avoir eu tort: le remplacement d'un tel éperon n'exigeait pas forcément un passage par l'arsenal, un chantier improvisé pouvait suffire. Un exemple récent a prouvé qu'une structure légère, plutôt fragile, pouvait, sur un navire de guerre, présenter des avantages sur une structure solide: N. Friedman note que l'expérience de la guerre de 1941-1945 dans le Pacifique avait justifié la conception américaine du porte-avions pourvu d'un pont d'envol léger en bois, qui pouvait être rapidement réparé (sans devoir rentrer à l'arsenal!), alors qu'un pont d'envol blindé (selon les conceptions britanniques) endommagé ne pouvait être remis en état hors d' une base navale importante[99].

A propos de cette relative fragilité, L. Casson, toujours aussi joyeusement ironique, écrit: "How many would a modern navy of a class of ships designed to go into action with a single round of ammunition?"[100].

J'apprécie le goût l'ironie, mais je m'étonne qu'un historien de la marine aussi éminent que L. Casson semble ignorer l'existence de nombreuses séries de navires allant au combat "with a single round of ammunition": il suffit de penser à l'usage de la torpille, d'abord portée au bout d'une hampe (la "spartorpedo"), notamment par les Davids de la guerre de Sécession, puis, avec le succès de la torpille Whitehead,

- sur des classes entières de torpilleurs, surtout des chantiers Yarrow et Thornycroft, vers 1875[101];
- sur les CMB britanniques, très efficaces, de 1919, qui n'embarquaient qu'une seule torpille[102];
- les premiers MTB britanniques, qui, vers 1934-35, n'embarquaient que deux torpilles[103].

Tous ces petits bâtiments étaient dépourvus de torpilles de rechange. Toutefois, la vérité historique ayant ainsi retrouvé ses droits, il importe d'insister sur le fait que le point de vue de L. Casson est erroné dans son principe s'il considère que le Sister Ship était, à l'instar d'une trière, conçue et construite en vue de combats à l'éperon. Ce n'est qu'à partir d'un tel point de vue que l'emploi de l'éperon du Sister Ship est difficile à envisager.

Tenant compte, d'une part, de la méthode de construction (l'éperon n'est pas soutenu par une préceinte, au contraire de l'éperon classique, mais de manière similaire à ceux de la colonne Trajane[104]), et d'autre part du fait de la similitude de cet éperon avec divers éperons à pointe unique de la période hellénistique, il me paraît plus que jamais assuré que le Sister Ship faisait partie de la famille des liburnes - ou de ses cousins, les lemboi.

Or on a vu (p.12) que le rôle de ces navires, incorporés dans des flottes d'Etat, pouvait être d'éclairer les escadres, de porter des dépêches ou même de servir de transports de troupes rapides; même dans un tel rôle, un éperon, était fort utile pour remplir une fonction de dissuasion. Ainsi, le Sister Ship, même privé d'éperon, pouvait encore être utilisé dans une flotte de guerre, en attendant une réparation.

Je précise que, sur ce point, je ne partage pas l'opinion de A.W. Sleeswyk lorsqu'il écrit: " ... the ram might have been a later addition to the hull which had been designed so that, that could be done in an emergency in order to convert the merchant galley into a warship"[105] et, plus loin: "The Sister Ship was perhaps built as a merchant galley which could serve as an auxiliary warship. It was designed to be equipped with a ram when war imminent"[106].

Cette hypothèse suppose que le Sister Ship était conçu, dès le départ, pour naviguer sans l'éperon. Or l'angle formé par l'étrave et la quille, unis à la base par un écart très complexe, est d'environ 80°, sans aucun arrondi. Une telle forme d'assemblage est, à ma connaissance, sans équivalent dans l'archéologie navale comparée: on constate toujours, lorsqu'une étrave est verticale, qu'il existe un arrondi au point de jonction avec la quille[107]. En témoignent, par exemple, pour l'Antiquité, le graffito du navire Europa, à Pompéi[108] ou, de nos jours, les bateaux maltais[109]. La raison en est évidente: cet assemblage est, par nature, un point vulnérable de la coque, lors d'un échouage par exemple, et l'arrondi atténuait cette faiblesse. Deux ou trois croisières auraient suffi à endommager un brion purement angulaire, ce qui, toujours dans l'hypothèse de A. Sleeswyk, aurait eu un effet particulièrement désastreux: un brion endommagé n'aurait plus permis l'adaptation d'un éperon, à moins de procéder à une délicate réparation de la quille et de remplacer l'étrave. Aussi suis-je d'avis que le navire fut doté, dès l'origine, de l'éperon pour lequel il fut conçu - *même si l'usage de cet éperon n'était pas sa fonction essentielle.*

Comment ne pas admirer que le hasard des fouilles a fait apparaître, à quelques années de distance, l'éperon d'Athlit, type même de l'éperon classique, celui de Marsala, qui appartient à la catégorie des éperons hellénistiques à pointe unique[110], et un taillemer, celui de l'épave de la Madrague de Giens: nous n'en sommes plus réduits, pour étudier l'histoire de l'éperon, aux seules sources écrites ou iconographiques.

L'éperon semble bien avoir été l'apanage des navires de la Méditerranée antique - nous dirons un mot de sa brève renaissance après l'Antiquité. Rien d'étonnant: seule la technologie du navire dont le système propulsif - la rame - le rendait autonome, indépendant du vent, permettait de donner naissance à cette arme. Cette technologie semble être née en Grèce, à la fin de l'Age du Bronze[111]. S'il fallait tirer une conclusion générale de l'histoire de l'éperon antique, c' est qu'il ne semble jamais, sauf peut-être brièvement au 5e s., avoir été une arme totalement satisfaisante: les nombreux tâtonnements dont il fut l'objet, les hésitations continuelles quant à son emplacement "idéal" sont là en abondance pour en témoigner.

Thucydide, décrivant la bataille navale qui opposa, devant les îles Sybota, en 433, la flotte corinthienne à celle de Corcyre, écrit que "des deux côtés, les tillacs des navires étaient chargés d'hoplites, d'archers et de soldats armés de javelots", ajoutant, avec dédain: "les deux adversaires, qui manquaient d'expérience, s'en tenaient à l'ancienne tactique" (Thuc., I, 49). Certes, ce dédain est compréhensible de la part du grand historien athénien, mais la persistance de l'"ancienne tactique", celle du combat de pont à pont, dont nous possédons une représentation remontant à la fin de l'Age du Bronze (Fig. 2), suffit à démontrer que l'éperon ne fut jamais, jusqu'au 5e s., l'arme navale unique. Et après la fin du 4e s. apparaissent sur les navires de guerre, la baliste, la catapulte, le "corvus" romain et la "marmite à feu"[112], tous engins qui réduisirent l'éperon à une arme d'appoint et même - dès la bataille d'Actium peut-être-au rôle de "status symbol"[113].

L'éperon après l'Antiquité.

L'éperon existait-il encore sur les navires byzantins? L'iconographie ne nous fournit aucun élément à cet égard, mais on peut conclure d'un écrit de l'empereur Léon VI qu'un éperon sous-marin était encore utilisé au 10e siècle[114]. Un type d'éperon tout différent apparaît au plus tard au 12e s.: le calcar, qui apparaît lors des Croisades, mais dont les inventeurs demeurent inconnus. Jal en donne une définition qui me paraît irréprochable: "L'éperon qu' on nommait *Calcar* n'était point la proue de la galère, mais une arme d'attaque fixée à peu près horizontalement à la proue; et puis cette arme n'était point faite d'une pièce de bois: c'était une sorte de pyramide quadrangulaire en fer, en airain ou en chêne, garnie sur ses faces et à sa pointe de lames de fer"[115]. Du point de vue iconographique, on voit le calcar apparaître dans une chronique illustrée des campagnes de l'empereur Henri VI en Italie méridionale et en Sicile, due à Petrus de Edulo, le "Liber ad Honorem Augusti" (Palerme, vers 1195; Codex 120 de la Burgerbibliothek de Berne) (Fig. 39). Ce type d'éperon sera celui qui équipera toutes les galères méditerranéennes jusqu' à leur extinction à la fin du 18e s.

Cet éperon situé au sommet de la proue a-t-il coexisté avec l'éperon sous-marin? C'est ce que donnent à penser plusieurs graffiti de la petite église de Saint Nicolas de Mavrika, dans l'île d'Egine: parmi une véritable "flotte de galères", incisée dans les fresques du sanctuaire, certainement par des auteurs différents, probablement au 16e s., figurent, côte à côte, des galères à la proue classique à cette époque et des galères à éperon sous - marin (Fig. 40).

M. Ovcarov a relevé, parmi de nombreux graffiti de l'"Imaret dzamija" à Plovdiv (Bulgarie), une représentation d'un navire, attribuable à la fin du 15e ou au début du 16s s., dont l'éperon rappelle de manière étonnante l'éperon du Sister Ship (Fig. 41). A côté de ces documents qui attestent de manière incontestable une survivance bien plus longue de l'éperon antique que l'iconographie donnerait à le penser (d'où l'importance des graffiti!), j'ajouterai, avec hésitation, deux graffiti relevés par M. Guitakos: l'un (Fig. 42) a été publié, sans indication de lieu ni de date (il fut cependant trouvé en Grèce)[116], l'autre (Fig. 43) me fut aimablement communiqué par M. Guitakos; il m'écrivit qu' il l'avait relevé sur une église du kastro de Nea Epidavros. Au cours d'une visite du kastro, en 1978, je n'en trouvai plus aucune trace, mais des travaux de restauration ont pu le faire disparaître.

L'introduction de l'artillerie à bord des galères devait sonner le glas de l'éperon-calcar: le plus gros canon était monté à la proue et il tirait nécessairement dans l'axe du navire, donc au-dessus de l'éperon, rendant celui-ci de moins en moins utile; par ailleurs, un vaisseau armé de canons sur ses flancs aurait facilement pu écraser d'une bordée la galère audacieuse s'approchant pour éperonner.

Les galères turques qui participèrent au siège de Malte en étaient cependant encore équipées[117], de même que les galéasses vénitiennes à la bataille de Lépante (1571) (Fig. 44). Il est toutefois certain que ces galéasses décidèrent du sort de la bataille grâce à leur artillerie et qu'elles n'utilisèrent pas leur majestueux calcar, bien conforme à la description de Jal.

Aux 17e et 18e s., les galères conservent toujours au sommet de l'étrave une longue et mince projection, faite de bois, qui porte le nom d'éperon (ou sperone), mais qui n'a plus qu'un rôle de souvenir - et d'esthétique. L'ironie du sort veut que ce soit à cette époque que l'éperon, désormais dépourvu de valeur militaire, est orné d'une tête de bélier[118]!

Si, en pratique, l'éperon frappant au-dessus de l'eau a cessé d'exister au plus tard au début du 17e s., l'idée de frapper l'ennemi sous l'eau est si naturelle que plusieurs savants de la Renaissance continuèrent d'y songer et envisagèrent divers procédés pour y parvenir. Ce n'est pas ici le lieu de retracer l'histoire de ces idées, mais il serait injuste de ne pas s'arrêter un instant au plus illustre d'entre eux, Léonard de Vinci, qui n'avait pas imaginé moins de quatre moyens de frapper une coque ennemie sous la flottaison: le sous-marin[119], le scaphandrier muni d'une tarière destinée à forer un trou dans la coque d'un navire au mouillage[120], un levier à crochet frappant sous l'eau (Fig. 45) et un bateau-éperon qu'il a représenté et décrit ainsi:

"Si tu veux construire une flotte de guerre, fais usage de ces vaisseaux pour défoncer les navires ennemis; c'est-à-dire fais des vaisseaux de cent pieds de long et huit de large, et dispose-les de façon que les rameurs de gauche soient assis à tribord et ceux de droite à bâbord comme il est montré en M (Fig. 46) pour que les leviers des rames soient plus longs. Ce navire aura un pied et demi d'épaisseur, c'est-à-dire qu'il sera fait de poutres fixées intérieurement et extérieurement par des planches entrecroisées. Et qu'à un pied au-dessous de l'eau, le vaisseau ait un éperon ferré, du poids et de la grosseur d'une enclume. A force de rames, le vaisseau pourra reculer après avoir donné le premier coup, puis se reporter violemment en avant pour asséner le second, et beaucoup d' autres, jusqu'à la destruction du navire ennemi"[121].

A ma connaissance, aucun de ces projets n'aboutit à une réalisation.

*

Parmi les nombreuses innovations techniques navales de la première moitié du 19e s., il en est deux qui devaient nécessairement provoquer la résurgence de l'idée de l'éperon sous-marin: la généralisation de la propulsion à la vapeur et l'hélice, qui rendaient, comme jamais auparavant, le navire autonome et entièrement libéré des caprices du vent. Parmi les nombreux auteurs de projets d'éperon, il convient de signaler Nicolas-Hippolyte Labrousse, brillant officier de la marine française, qui parvint, en 1840, à persuader le Conseil d' Amirauté de procéder à des expérimentations d'éperon à Lorient[122].

Les premiers cuirassés, la *Gloire* (en bois - France, 1859) et *Warrior* (en fer - Grande-Bretagne, 1860) ne furent cependant pas munis d'un éperon, mais leurs successeurs immédiats, respectivement les cuirassés *Magenta* et *Solférino* (Fig. 47) (France - mis sur cale en juin 1859) et *Defence* et *Resistance* (Grande-Bretagne - mis sur cale en décembre 1859) furent, dès l'origine, conçus pour recevoir cette arme.

Le 8 mars 1862, le navire cuirassé confédéral *Virginia* (ex - Merrimack) coula d'un coup d'éperon le sloop fédéral *Cumberland* et il tenta, le lendemain, d'envoyer son adversaire, le *Monitor*, par le fond de la même manière. Mal en prit au *Virginia*, qui, se heurtant au blindage de son ennemi, ne réussit qu'à créer une voie d'eau à sa propre proue - ce qui rapelle les déboires de la flotte grecque à Alalia, 2400 ans auparavant.

Le 20 juillet 1866, à la bataille de Lissa, le cuirassé autrichien *Erzherzog Ferdinand Max* réussit à couler le cuirassé italien *Re d'Italia* par un coup d'éperon. Cette fois, l'engouement pour l'éperon gagna toutes les marines du monde, même pour les petites unités: l'histoire se répétant, les canonnières, avisos et éclaireurs en furent munis.

En France, le *Taureau*, mis sur cale en 1863, fut conçu pour porter l'éperon comme arme principale; il était situé à environ 30 cm sous l'eau. Le *Taureau* était armé en outre d'un canon de 240 mm. Il fut suivi, en 1865, de quatre navires semblables: la classe *"Bélier"*(!). La Grande-Bretagne suivit en 1868 avec le *Hotspur*, d'un type voisin, lui aussi pourvu d'artillerie.

Le navire-éperonneur le plus extraordinaire fut sans conteste le USS *Katahdin*, mis sur cale en 1891: il était pratiquement dépourvu d'artillerie (il n'avait que quatre pièces de 6 livres contre les torpilleurs) et complètement de tubes lance-torpilles; donc: un pur navire-éperon. (Fig. 48)[123]. Le *Katahdin* fut un échec total: les seuls services qu'il rendit à la marine américaine fut de servir de bâtiment-cible en 1909, mais J.D. Alden écrit à son sujet: "in spite of the antiquitated concept, the green-painted *Katahdin* was an innovative craft, presaging the development of the submarine in several features. Her lower hull, dish-shaped and curving gracefully upwards at each end, was fitted with a double bottom thoroughout and *could be partially flooded to fighting trim*" (souligné par moi)[124]. Comment ne pas penser à la "technique du sanglier", ainsi qu'à la manoeuvre des navires rhodiens à la bataille de Chios en 201, telle que Polybe l'a rapportée?

La fin de l'éperon, définitive cette fois, fut due à la conjonction de deux phénomènes:

- le fait qu' en temps de paix l'éperon se révéla en effet efficace, mais en endommageant ou en coulant plusieurs fois des navires amis, l'accident le plus spectaculaire étant l'éperonnage du HMS *Victoria* par le HMS *Camperdown* le 22 juin 1893[125];

- et surtout: l'invention de la torpille Whitehead, qui, frappant - de manière explosive - sous l'eau, rendait l'éperon définitivement inutile.

N'y aura-t-il plus d'éperonnage belliqueux à l'avenir? Dans la mesure où il est permis de souhaiter l'avènement de la paix universelle et définitive, je l'espère bien. Toutefois de nombreux sous-marins furent coulés par éperonnage au cours des deux guerres mondiales[126] et un caprice du destin a voulu que le HMS *Dreadnought* (1906), célèbre pour la révolution qu'il introduisit dans l'architecture navale par la disposition et la puissance de son artillerie, fît pour principale victime le sous-marin allemand U 29 qu'il envoya au fond, le 18 mars 1915 ... par éperonnage.

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NOTES

Note liminaire

La communication que j'ai faite le 30 août 1991 à Athènes avait pour titre "L'appendice de proue de la "Nave Punica" (Marsala): éperon ou taillemer?". Le temps de parole étant de vingt minutes, j'avais limité mon sujet à l'examen de l'épave proprement dite. Toutefois, j'ai la conviction qu'on ne peut répondre à la question que pose l'épave de Marsala qu'en la situant dans celle de l'évolution de l'éperon antique dans son ensemble. La communication du 30 août 1991 n'était donc qu'un résumé schématique de celle-ci. Je remercie H. Frost et A.W. Sleeswyk d'avoir bien voulu participer à des échanges de correspondance auxquels la rédaction de ce texte doit beaucoup.

1. Steffy (1983); Casson et Steffy (1991).
2. *SSAW*, p. 146.
3. Seyrig (1951), p. 109, qui note cependant (note 3) les monnaies hellénistiques "exceptionnelles" de Dyrrhachium (Fig. 24), dont on verra plus loin l'importance.
4. surtout: Frost (1981)
5. Basch (1991)
6. A ce sujet: *MIMA*, p. 156, 157.
7. Dakoronia (1990).
8. *MIMA*, pp. 141-145.
9. cf. *MIMA*, p. 151, Fig. 318.
10. Je souscris à l'interprétation donnée par L. Casson aux scènes figurant sur la coupe attique n0 B. 436 (v. 510) du British Museum (*SSAW*, Fig. 81; *MIMA*, Fig. 461-464), qui y voit deux stades de l'attaque d'un navire marchand par un navire armé d'un éperon (Casson (1958)), mais l'avantage que l'éperon donne à l'attaquant est uniquement celui de la vitesse.
11. *SSAW*, Fig. 28; *MIMA*, Fig. 298.
12. Cf. Sleeswyk (1996.) A.
13. Cartault (1881), p.77. Le passage souligné l'est par moi.
14. Tzahou-Alexandri (1990), pp. 333-334.
15. On note cependant un "proembolon-tampon" semblable à ceux du navire de Khaniale Tekke sur une oenochoé géométrique provenant de Thèbes (fin du 8e s. - Musée de Berlin, n0 3143) (*MIMA*, Fig. 395).
16. Tzahou-Alexandri (1990), pp. 336-338. La Fig. 9 correspond à la Fig. 393, p. 187 du *MIMA*, que j'avais donnée d'après une photographie publiée dans *A History of the Hellenic World. The Archaic Period* (Athènes, 1971), p. 202. Malheureusement, cette photo était incomplète (l'extrémité de l'éperon était omise) et inversée.
17 Fibule en or de la collection Elgin, 2e quart de 8e s. (*MIMA*, Fig. 401).
18. P. ex.: *MIMA*, Fig. 404 et 407.
19. Un casque très semblable figure sur un bouclier votif en terre cuite datant de 700 environ, trouvé à Tirynthe: Greenhalgh (1973), p. 68, Fig. 41.
20. C'est-à dire: un retour complet à l'éperon du navire de Khaniale Tekke.
21. La question est beaucoup plus obscure en Phénicie, domaine que je m'abstiens d'aborder ici. Je noterai cependant que l'élément de collier égyptien d'époque saïte, dit "de Nechao", au Musée du Louvre (*MIMA*, Fig. 719, 720), s'il présente de très nombreux traits révélant des influences phéniciennes, est pourvu d'un éperon qui se termine par une lame verticale, absolument inconnue en Phénicie et pourrait être un emprunt à l'architecture navale grecque.
22. *MIMA*, Fig. 428, 432, 436 B et C, 444, 452.
23. *MIMA*, Fig. 431, 454, 455.
24. *MIMA*, Fig. 434, 438, 440, 447.
25. En Attique, une exception notable: GOS, pl. 20, d; *MIMA*, Fig. 469. Ailleurs dans le monde grec, on en relève à Samos (*MIMA*, Fig. 519, 520) et à Siphnos (*MIMA*, Fig. 522).
26. "Ces mots-là, comme les enseignes et affiches à lettres énormes, échappent à l'observation par le fait même de leur excessive évidence" (traduction de Baudelaire).
27. Voir plus loin, au sujet des ex-voto de l'Heraion de Samos.
28. Johnston (1985), p. 74, Arch. 53.
29. En fait, A. Göttlicher (1978) avait déjà rangé cette base dans son catalogue (p. 65, no 348): je ne l'avais pas remarqué avant l'observation de Johnston.
30. Sur la corneille de mer: Detienne et Vernant (1974), pp. 201-241, qui soulignent son importance dans les croyances grecques relatives à la mer.
31. Wachsmuth (1967), p. 245, note 908.
32. Yalouris, A. et N. (1987), p. 64, Fig. d. On notera que l'on trouve des têtes de bélier comme

ornement des proembola de navires étrusques de 2e s. (Moll (1929), pl. B III a, 45, 48 à 51), mais le rôle des proembola est totalement différent de celui de l'éperon.
33. On constate le même phénomène sur l'oenochoé attique du British Museum B 508 (v. 510): GOS, pl. 20, d; *MIMA*, Fig. 469.
34. Verlinden (1954), p. 238.
35. Je remercie L. Casson d'avoir attiré mon attention sur ce texte en m'envoyant un tirage à part de son article "Polybius 16.3.8: ΑΝΑΣΤΕΙΡΟΣ", *Classical Quarterly*, 39, 1989, pp. 262-3. Le texte de Zonaras (8.16) consulté par moi est celui de l'édition Weber (Bonn, 1944).
36. Polybe, 16, 4. 11-13.
37. Polybe, 16, 4.13.
38. Polybe, 16, 2.7.
39. L'équipage normal des grandes bisquines était de sept hommes.
40. Gloux et Manach (1976), pp. 188-9. Le déplacement de l'assiette d'un navire par celui d'un lest était connu dans l'Antiquité, comme en témoigne une manoeuvre des Tyriens assiégés par Alexandre en 332: ils tentèrent de détruire le môle que le Macédonien construisait pour relier l'île de Tyr à la terre ferme en y lançant un brûlot dont ils avaient relevé la proue pour mieux percuter le but. A cette fin, ils avaient empilé des pierres à la poupe (Arrien, Anabase, II, 19.2). Toutefois, ce "relevage de proue", longuement préparé, n'a rien de commun avec la soudaineté de manoeuvre des Romains à Hippone, des Rhodiens à Chios et des champions de régates de bisquines.
41. GOS, pl. 21, e; *MIMA*, Fig. 574.
42. Ce n'est cependant pas ce que suggère le célèbre dessin de dal Pozzo représentant la partie antérieure d'un trière, si ce document (*MIMA*, Fig. 612) reproduit fidèlement un original grec: l'éperon appartient au type "éperon-lame". Sur cette question: Basch (1988), p. 184.
43. Voir Steffy (1983) et Casson et Steffy (1991).
44. Basch (1975), p. 206.
45. Steffy (1983), p. 241.
46. Steffy, in: Casson et Steffy (1991), p. 30.
47. Basch (1985); *MIMA*, pp. 493-6.
48. IG II^2 1627, 410-14 et, pour l'année 325/4: IG^2 II, 1629, 91-110 et 128-144.
49. Sur les triacontores de l'époque hellénistique: *SSAW*, p. 125, n. 102.
50. *SSAW*, p. 125.
51. Nombreux exemples dans *SSAW*, p. 126, n. 104.
52. *SSAW*, p. 142.
53. *SSAW*, p. 132.
54. *SSAW*, p. 132, n. 125.
55. Pour le lembos: *SSAW*, p. 126.
56. Polybe, 1, 53.8.
57. C'est la tactique que Phillippe V tenta de mettre en oeuvre à la bataille de Chios contre les forces de Pergame et de Rhodes. Ce ne fut pas un succès, puisque sur les 150 lemboi et pristeis (autre type de navire léger) qu'il engagea, il perdit environ 65 lemboi (Polybe, 16, 7).
58. Casson et Steffy (1991).
59. *SSAW*, p. 126, n. 108.
60. Ormerod (1924), p. 110.
61. *Panégyrique*, 115.
62. Gardner (1883), p. xl.
63. Bruneau et Ducat (1983), p. 203.
64. Les graffites du gymnase ont été publiés par M. -Th. Couilloud dans: Audiat (1970), pp. 101-137. Un grand nombre d'entre eux portent des inscriptions plus ou moins longues.
65. Il existe quelques rares exceptions, dont celle d'un graffito accompagné de la "signature" de l'artiste: ΑΛΕΞΑC ΕΠΟΙΗCΕΝ (*Bulletin de Correspondance Hellénique*, 89, 1965, p. 985 et

MIMA, p. 381).

66. Le "THEODOROS" a été publié par M.- Th. Couilloud dans: Audiat (1970), p. 126 (texte) et p. 124, Fig. 5 (dessin); ce dernier est malheureusement inexact: l'éperon y est représenté comme une aiguille démesurée, alors qu'en réalité, comme le montre ici la Fig. 25, l'éperon était bien plus vigoureux. J'exprime ici ma gratitude envers M. Jean-Yves Empereur (CNRS - Centre d'Etudes Alexandrines), qui a bien voulu prendre la peine de rechercher cette plaque de marbre dans les réserves du Musée de Délos, en août 1991, pour me permettre de l'examiner.
67. *MIMA*, p. 378, no 45. Un autre exemple, d'ailleurs contemporain, de la persistance de l'éperon-lame, sur un grand bâtiment, cette fois, est celui du modèle en terre cuite du Musée de Sparte, absolument identique (Basch, 1968; *MIMA*, pp. 432-3). On notera, dans les deux cas, l'absence totale de proembolon.
68. La stèle est publiée dans: Marshall (1916), p. 154. Les quatre tolets, au centre, indiquent, s'il faut s'en tenir strictement à la représentation, une barque propulsée par huit rameurs. Dans ce cas, cette barque n'aurait fait qu'imiter, à une échelle réduite, un navire de guerre muni d'un éperon-lame. Mais une autre hypothèse se présente: ce navire est long d'environ 30 cm et il devait être techniquement difficile d'y faire figurer un plus grand nombre de tolets, de telle sorte que le navire représenté a pu en avoir, dans la réalité, un plus grand nombre. Nous serions, dans ce cas, en présence - très probablement - d'une triacontore.
69. Je remercie vivement M. Harry Kritzas d'avoir bien voulu prendre, à ma demande, les trois photographies de la Fig. 32, 1, 2, 3.
70. Properce, III, 11, 41-44.
71. *Vie d'Antoine*, 67.2.
72. *C. Symm., II*, 530-531.
73. Végèce, IV, 33. Sur l'évolution du terme "liburna", l'article essentiel, et probablement exhaustif, est celui de Panciera (1956). Sur le rôle de l'idéologie impériale dans l'évolution du sens de ce terme: Murray et Petsas (1989), pp. 143-151.
74. Ferrabino (1924); Tarn (1931).
75. *Caligula*, 37.2.
76. Végèce, IV, 37.
77. Les premières monnaies montrant une galère impériale de haut rang à éperon à pointe unique semblent, sous le règne de Néron, avoir été émises à Corinthe: Seyrig (1951), p. 109, n. 3 (B.V. Head, *Brit. Mus. Catal., Corinth*, pl. XVIII, 4; 6).
78. P. ex. *MIMA*, Fig. 1007, 1008.
79. Basch (1983), p. 138, Fig. 10; *MIMA*, Fig. 990-994.
80. Ceci correspond parfaitement à la structure du Sister Ship, dont l'éperon est également dépourvu de connexion avec une préceinte, comme en Grèce au 6e s. (cf. Fig. 18). A cet égard, l'éperon du *Sister Ship* peut être qualifié d' archaïque (au point de vue technique: cette appréciation ne comporte aucun sous-entendu péjoratif).
81. *MIMA*, Fig. 982, 985, 990, 991, 993.
82. *MIMA*, Fig. 1004 à 1008.
83. Cf. Courtois (1939).
84. Procope, *Guerres*, 8.23.24.
85. Basch (1975); Frost (1975); Frost (1981), p. 270; Basch (1983).
86. Rougé (1991), p. 670, n.6.
87. Casson (1985) et seconde édition de *SSAW* (1986), citée ci-après: *SSAW2*.
88. *SSAW2*, p. 444, 95.
89. Notamment: *MIMA*, Fig. 1055 à 1060, 1109-1110.
90. Casson (1985), p. 18, n. 24.
91. Cet élément était, de toute évidence, celui qui était destiné à frapper l'adversaire sous la flottaison, probablement selon la "technique du sanglier".

92. Basch (1983).
93. *SSAW* 2, p. 444, 95 et p. 445, 116.
94. Basch (1983), p. 136, Fig. 8; *MIMA*, pp. 299-300.
95. Basch (1983).
96. Sleeswyk (199.) B.
97. Hérodote, I. 166.
98. Basch (1983).
99. Friedman (1981), p. 143. L'auteur cite le cas du porte-avions *Essex*, frappé par un kamikaze le 25 novembre 1944; l'explosion tua 15 hommes et en blessa 44. Trente minutes plus tard, le pont d'envol était à nouveau opérationnel. Friedman ajoute: "To some extent this result vindicated the US Navy's belief that a thin wooden deck could be repaired rapidly after battle damage whereas an armored deck might not be reparable outside a major base".
100. Casson (1985), p. 18, n. 24.
101. Fock (1979), pp. 14-51.
102. Phelan et Brice (1977), pp. 65-73.
103. *Ibid*, pp. 92-100.
104. Cf. note 80.
105. Sleeswyk (1996) B.
106. Ibid.
107. Les exceptions ne sont qu'apparentes:
- *le beden-seyad* (Pâris (1843), pl. 8) a un brion angulaire à 900, mais il s'agit ici d'une fausse étrave, propre à ce bateau archaïque d'Arabie;
- un graffito d'Oseberg (Norvège), du 9e s., montre ce qui *semble* être un brion angulaire à 900 (B. Landström, *The Ship* (1961), p. 57, Fig. 141); en réalité, il s'agit d'un taillemer, qui pouvait aisément supporter quelques dégâts mineurs.

108. *MIMA*, Fig. 1051.
109. *MIMA*, Fig. 53.
110. qui deviendront l'éperon "par excellence", on l'a vu, à l'époque impériale.
111. Il est possible, mais nullement démontré, que l'extrémité de la projection de la proue sur les navires égyptiens combattant ceux des Peuples de la Mer, représentés au temple de Ramsès III à Medinet Habu (*SSAW*, Fig. 61; *MIMA*, Fig. 13) ait été une arme agissant par percussion au-dessus de la flottaison, mais même s'il en était ainsi, il serait complètement étranger à la longue tradition de l'éperon méditerranéen antique.
112. Polybe, 21, 3.7.; *MIMA*, Fig. 807.
113. A ce sujet, je me réfère à mes observations au sujet de: Murray et Petsas (1989), dans: *The Mariner's Mirror*, 76, 1990, pp. 367, 368: est-il sûr que les éperons capturés sur la flotte d'Antoine à Actium aient plus servi que ceux des galéasses vénitiennes à Lépante (c'est-à-dire: pas du tout)?
114. Dolley (1948), p. 49.
115. Jal (1848), Vo "Calcar".
116. Alexandri (1956)., p. 81.
117. Miss Honor Frost m'a informé que certains de ces éperons, capturés sur des galères turques auraient été conservés à Malte comme ex-voto.
118. Musée de la Marine, Paris, n0 37 OA 24.
119. Tursini (1953), spécialement pl. XI.
120. Tursini (1953), pl. XIV; Tursini (1954), pl. LXXIV, 2; pl. LXXXVI. Cette technique, modernisée, fut celle qui permit à des nageurs de combat italiens, le 19 décembre 1941, d'envoyer par le fond, dans le port d'Alexandrie, les cuirassés *Queen Elizabeth et Valiant.*
121. Ms. 2037, Bib. Nat., 3 r. Traduction de L. Servicen.
122. Sur les débuts de cette renaissance de l'éperon: Baxter (1937).
123. Sur le *Katahdin*: Allen (1988).

124. Alden (1972), p. 48.
125. Brown et Pugh (1990) (l'article essentiel sur l'éperon au 19e s.) citent 17 accidents entre navires de guerre, dus à l'éperon, en temps de paix, entre 1868 et 1903 (p. 21).
126. Brown et Pugh (1990), pp. 32-33.

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3 A. Navire peint sur un tesson géométrique de Khaniale Tekke (Crète). D'après: J. Boardman, "The Khaniale Tekke tombs", *Annual of the British School at Athens*, 62, 1967, pl. 14, 21.
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4 Fragment de vase géométrique attique. Louvre. Dessin de C. Torr.
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35 La proue du Sister Ship, plan (H. Frost).
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D: "défenses".
E: étrave.
M: mortaise peu profonde creusée dans la face antérieure de l'étrave, destinée à recevoir l'élément central, disparu, maintenu entre les "défenses" par les broches Z 2.
Z 1: broches fixant la "défense" tribord latéralement sur la quille.
Zone en gris: couche de "résine" couvrant l'ensemble formé par l'étrave, les défenses et la quille.
N: lamelle de bronze (partie hachurée), adhérant à une couche de "résine" et percée d'orifices permettant sa fixation par des pointes.
X: endroit où fut trouvé la lamelle N.
P: pointes de cuivre trouvées dans le sable.
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Les dessins et photographies des Fig. 1 b, 2, 3, 5, 9, 10, 13, 15, 16, 19, 20, 22, 26, 30, 32, (4, 5), 33 et 40 sont de l'auteur.

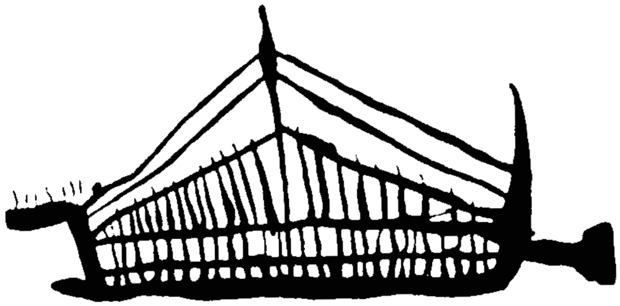


Fig. 1a

Fig. 1b

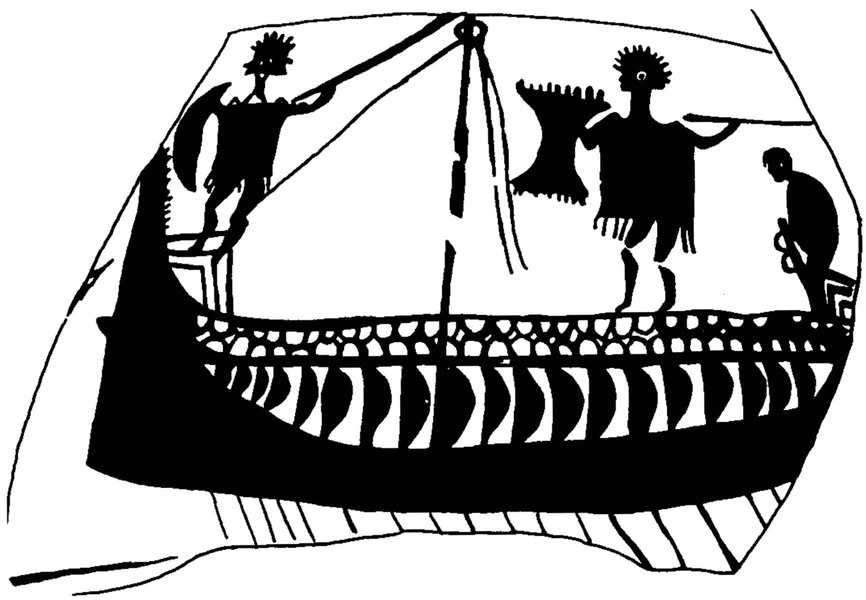
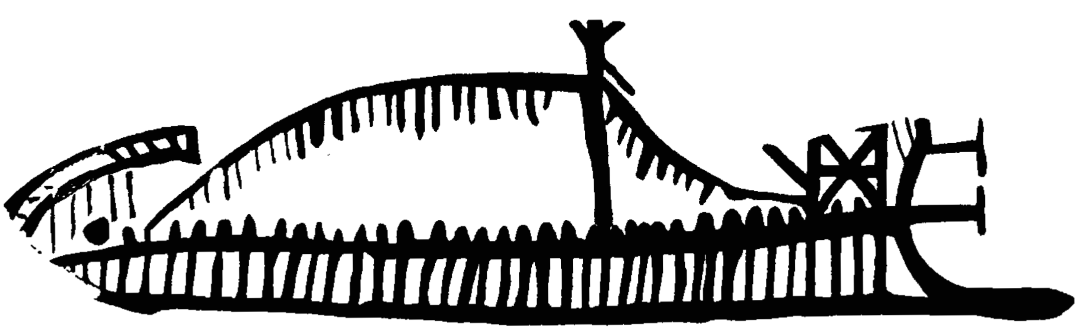
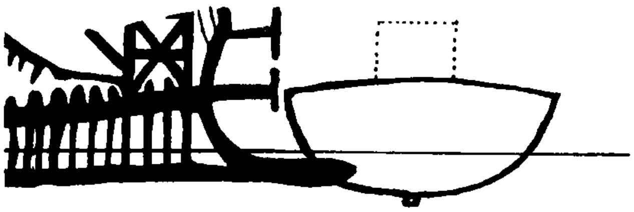


Fig. 2

Fig. 3a





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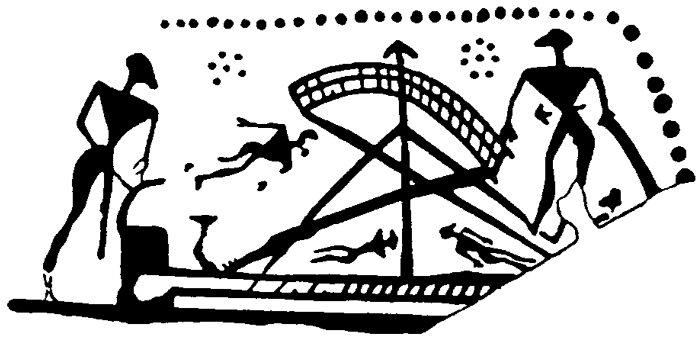

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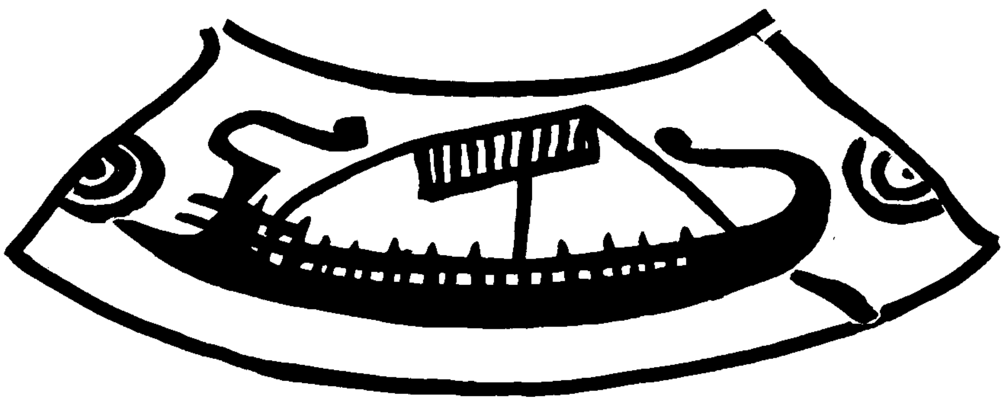

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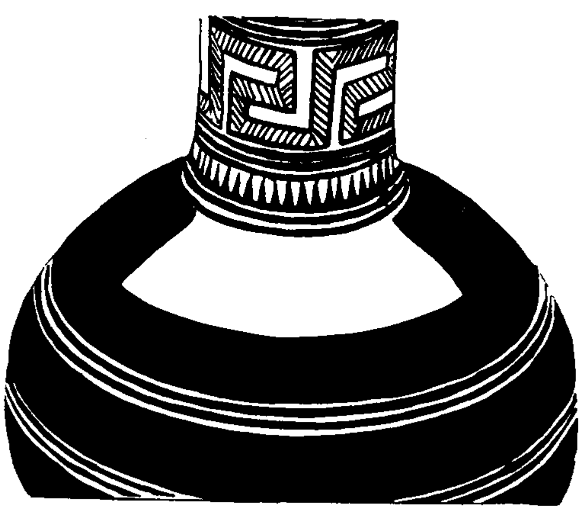

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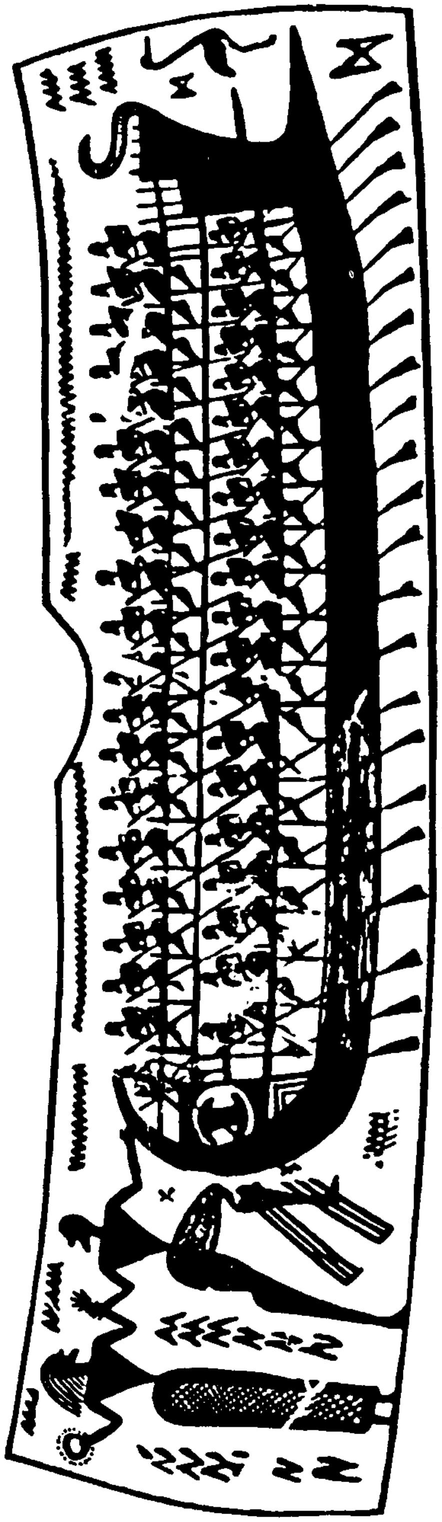

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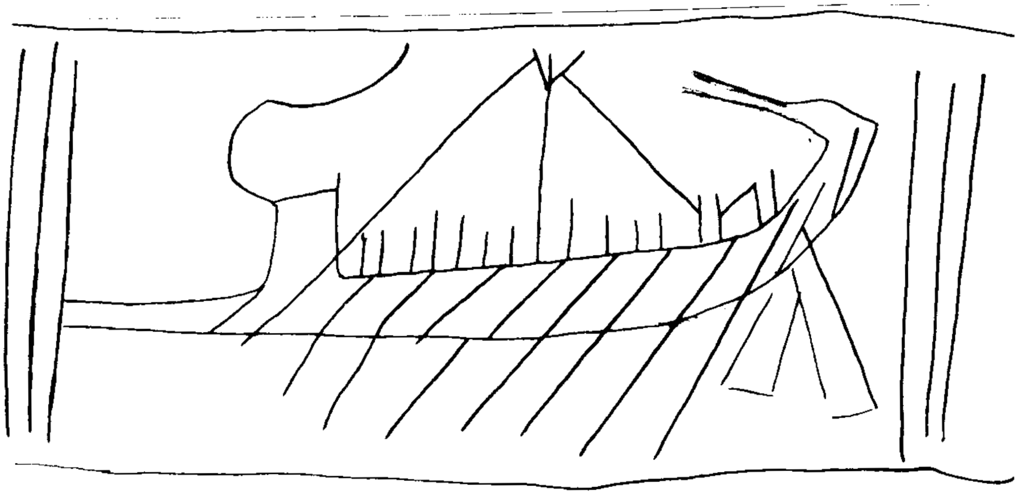

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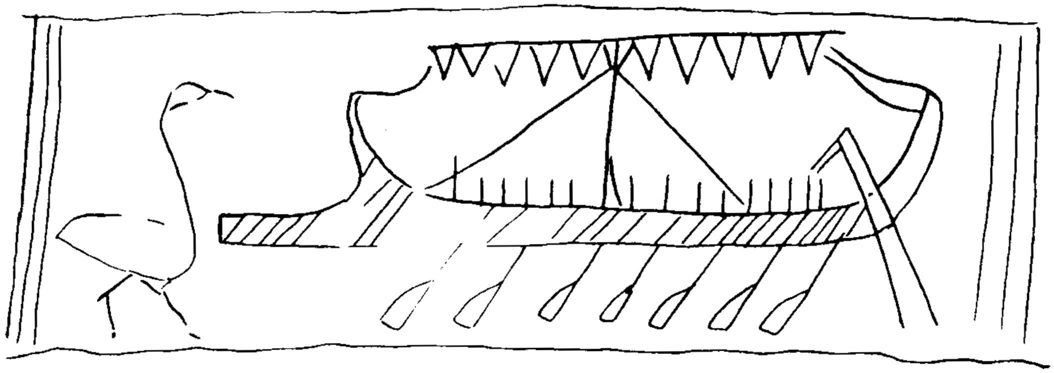
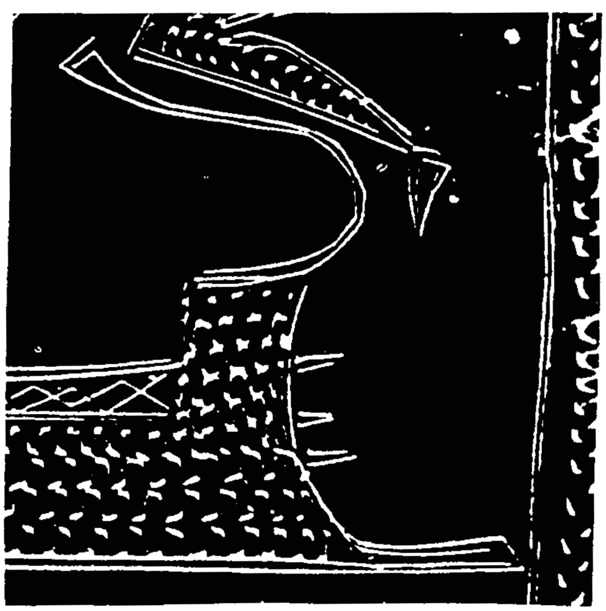


Fig. 10



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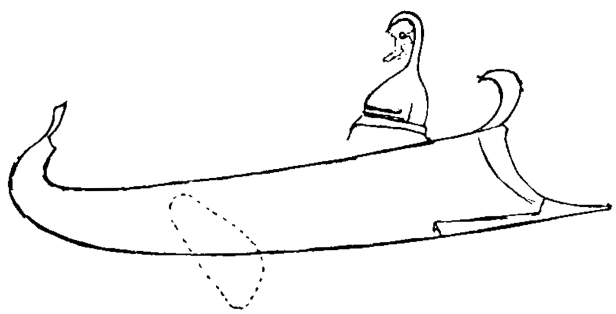
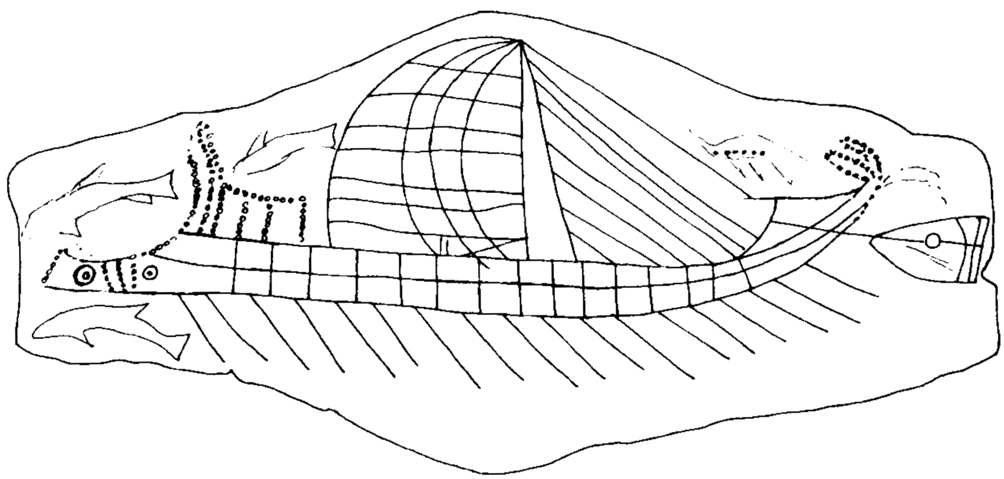


Fig. 12

Fig. 13



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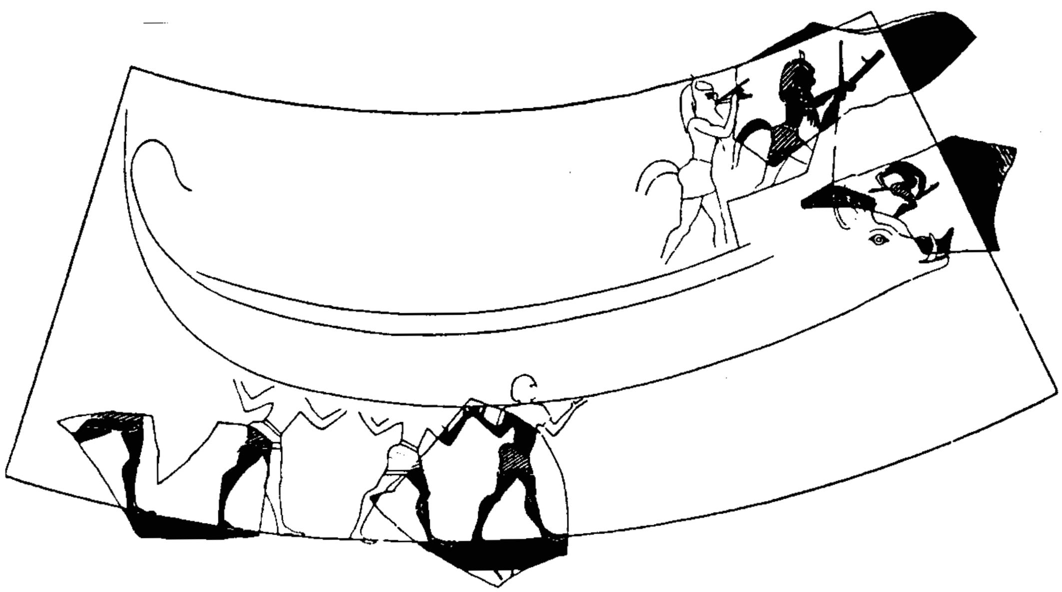


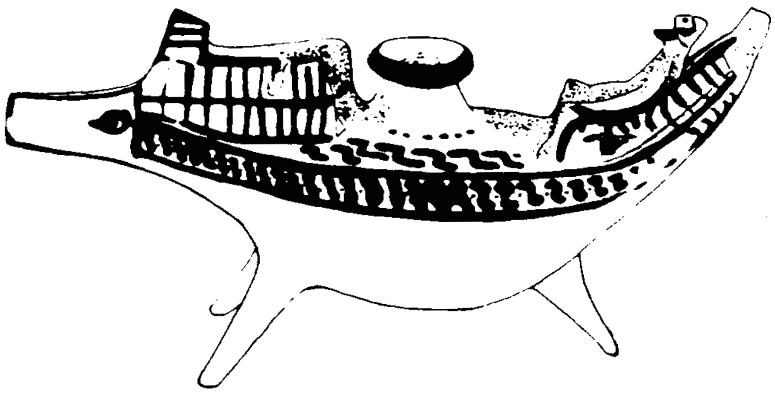
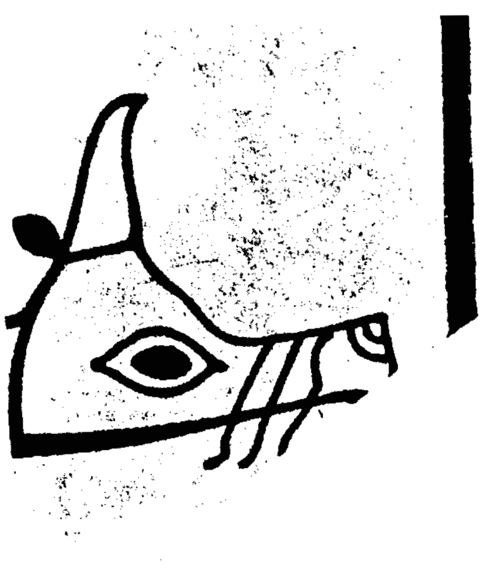


Fig. 15

Fig. 16



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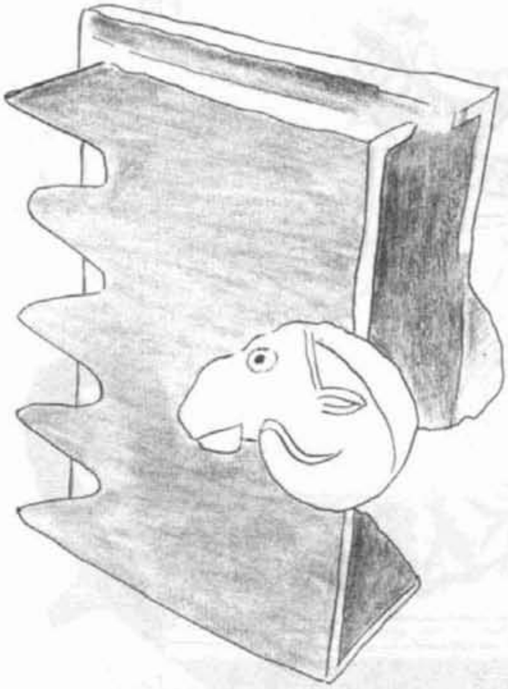

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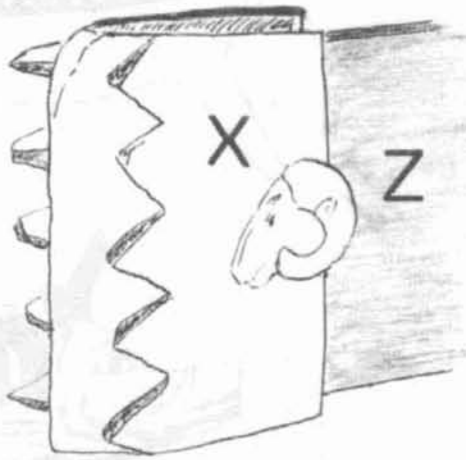
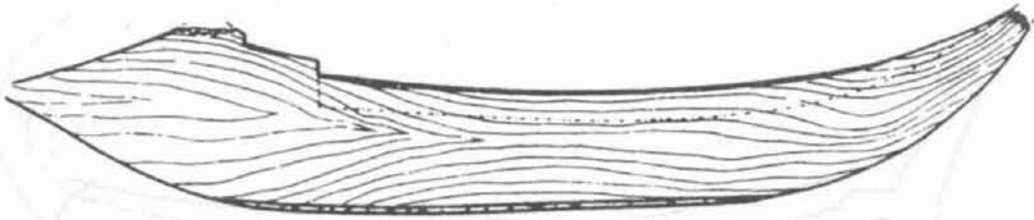


Fig. 19b

Fig. 20a

Fig. 20b



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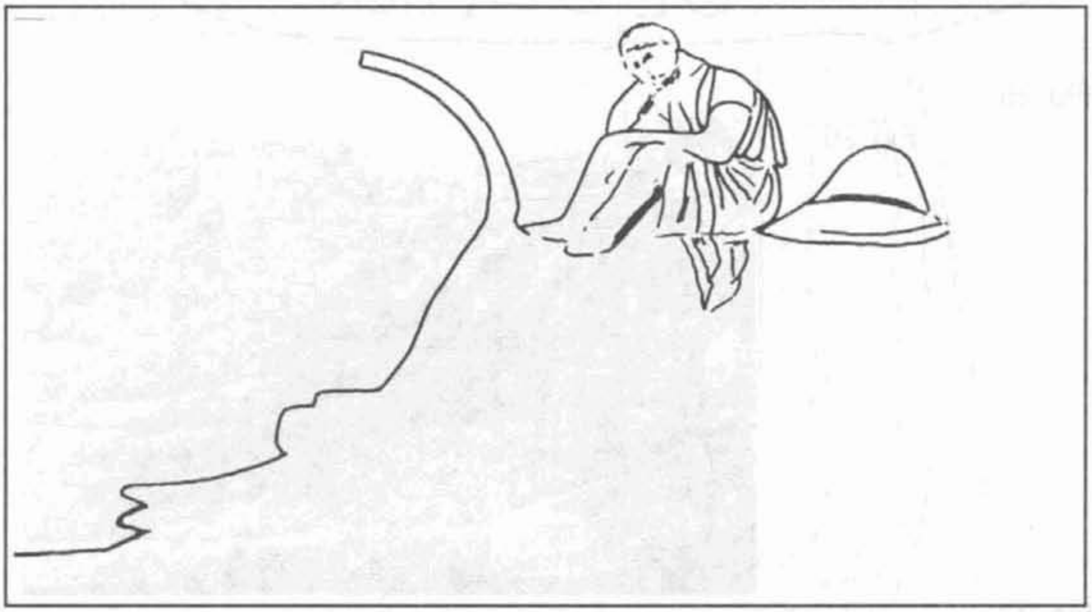

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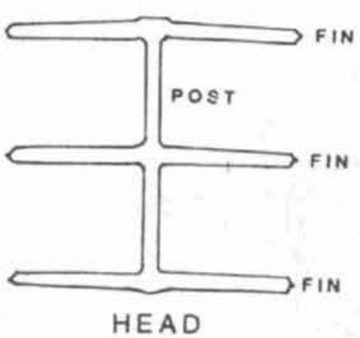


Fig. 23

Fig. 24

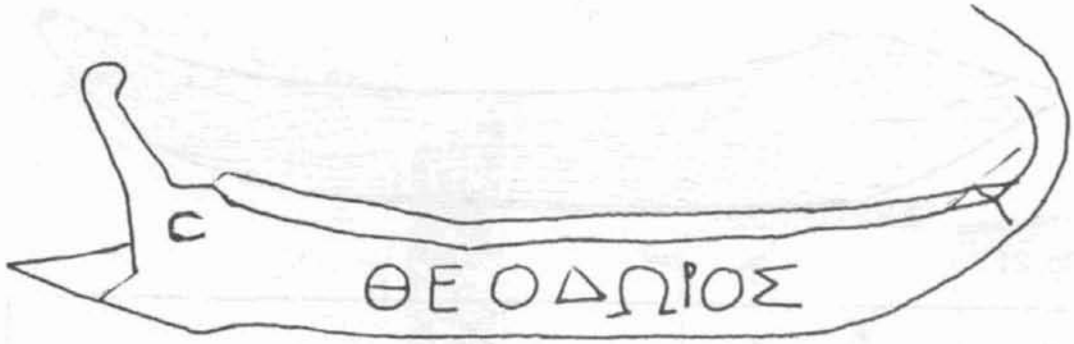
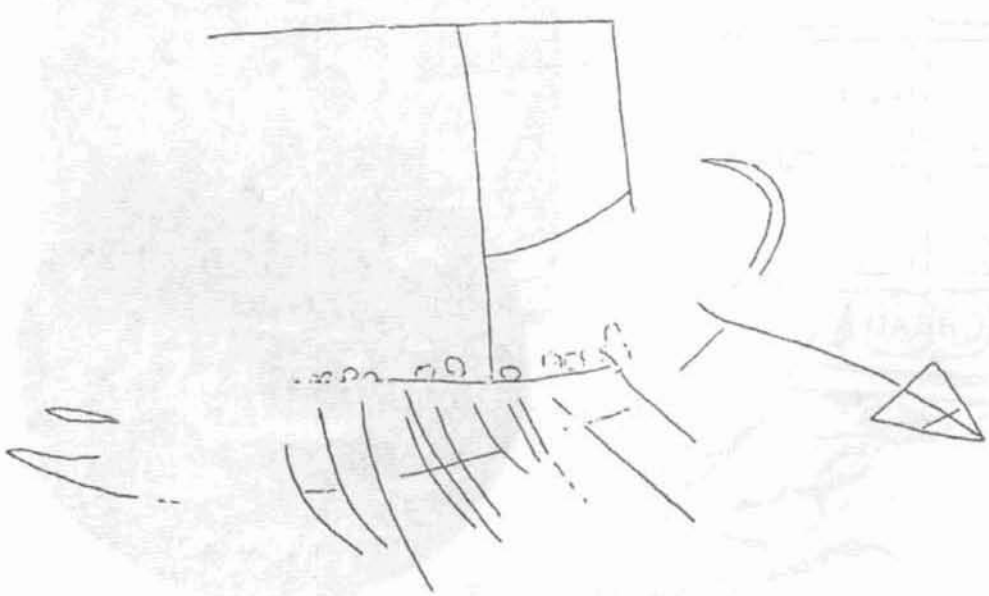
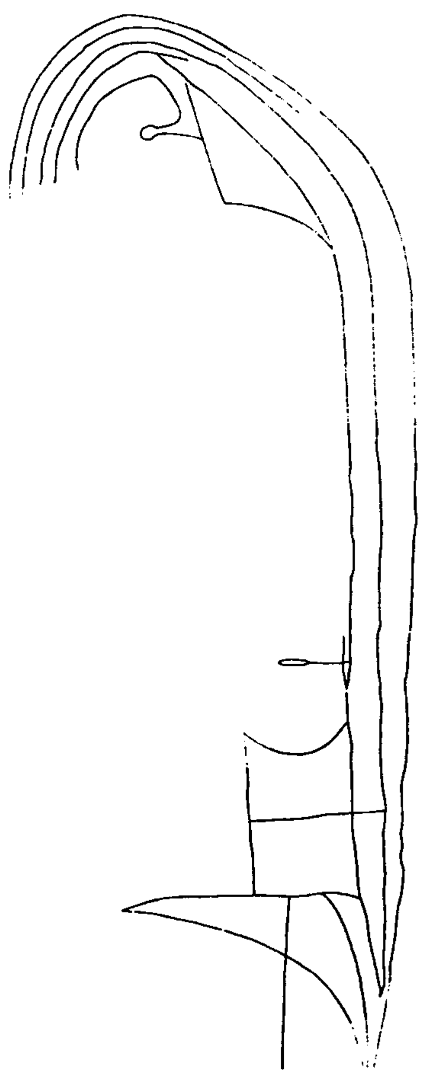


Fig. 25

Fig. 26

Fig. 27





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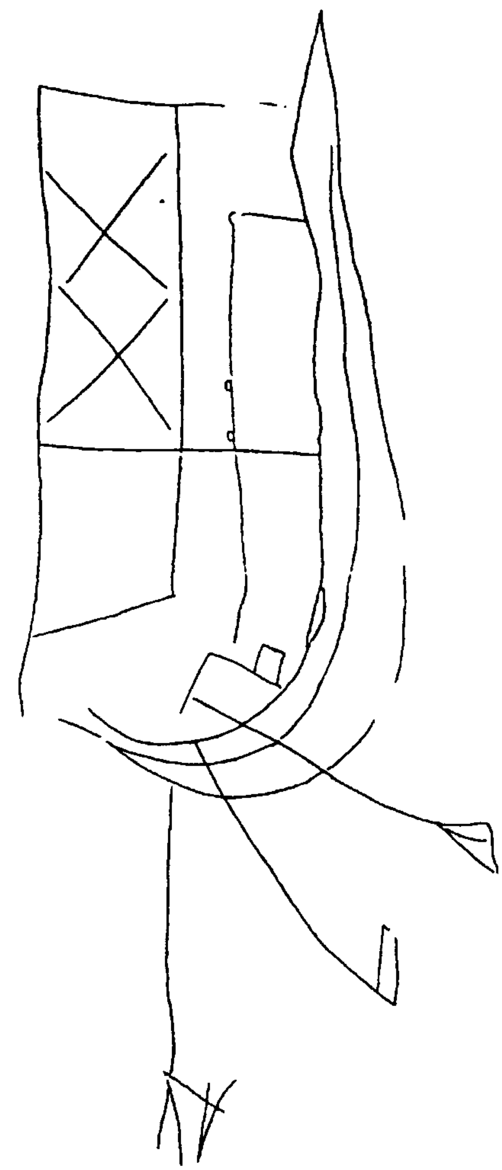
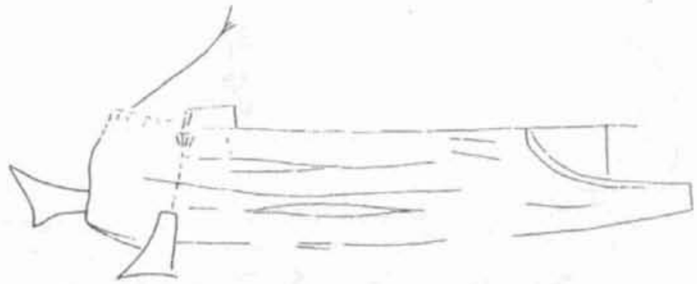


Fig. 29

Fig. 30a



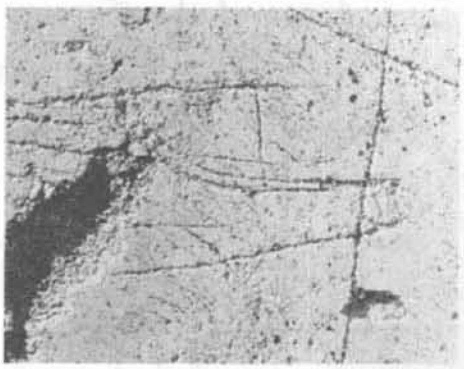
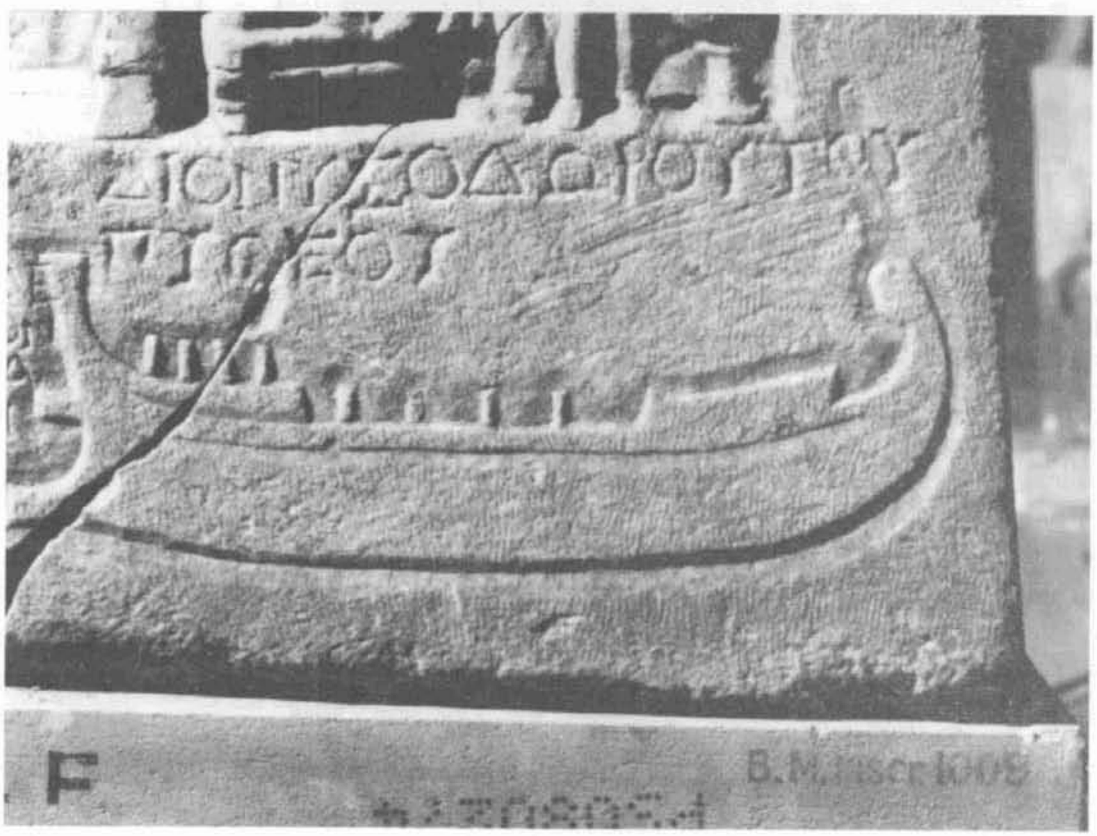
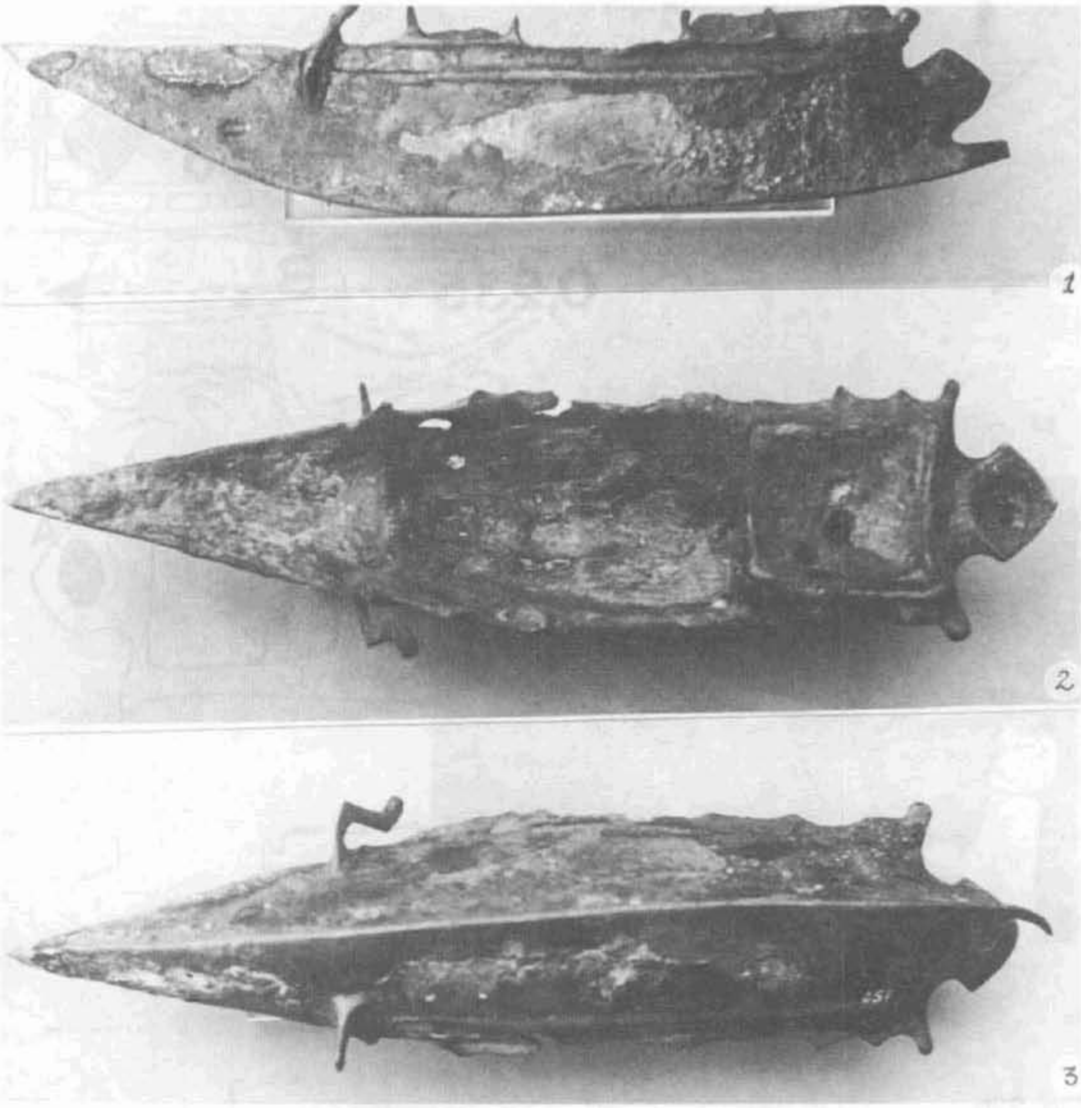


Fig. 30b

Fig. 31





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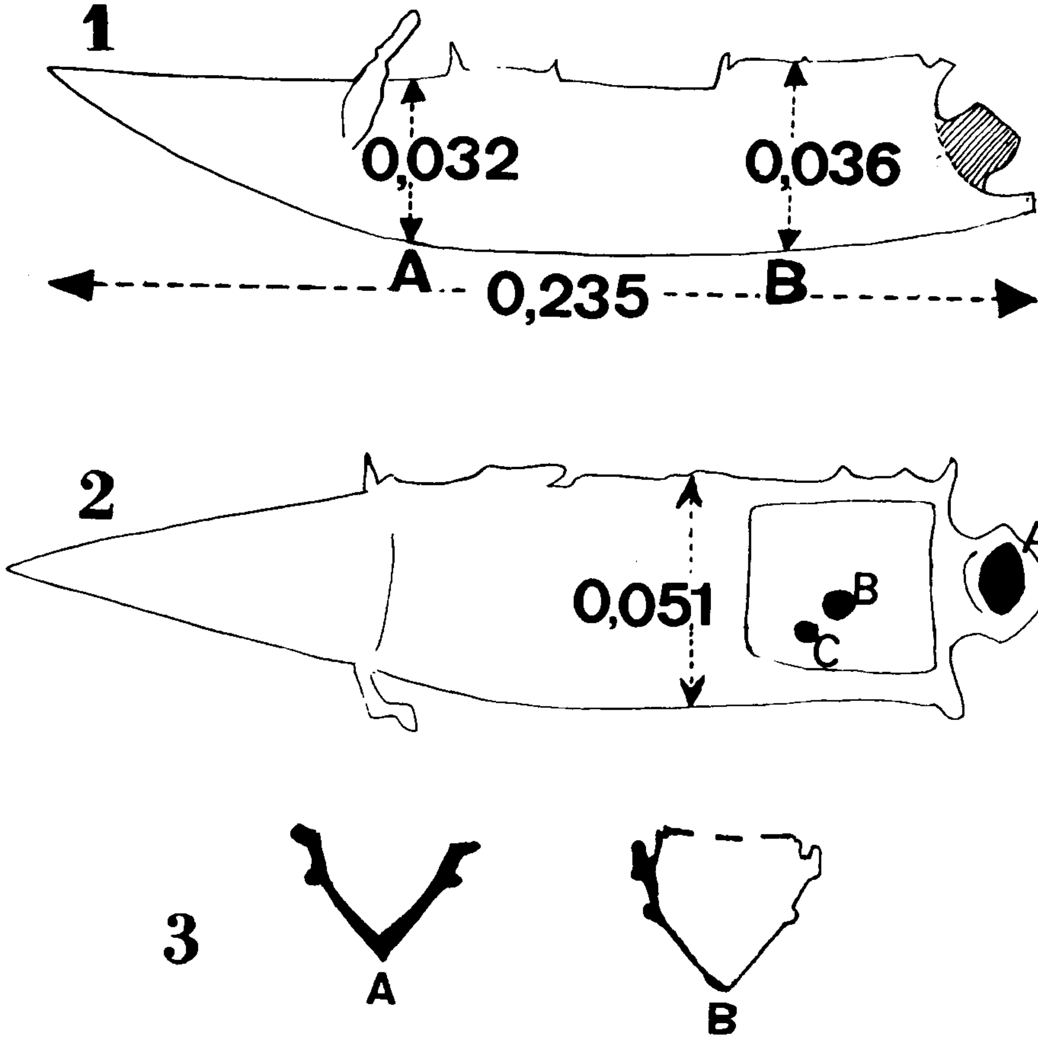

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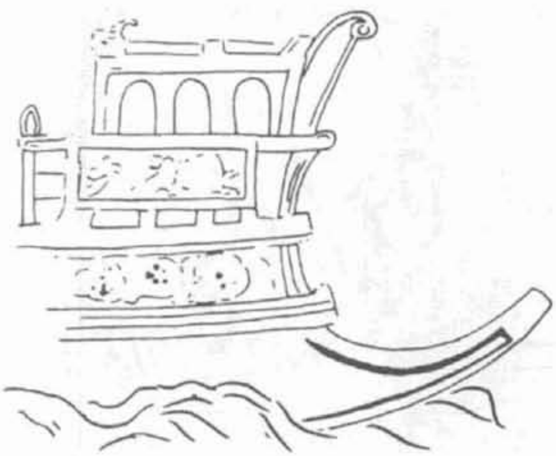

Fig. 33

Fig. 34

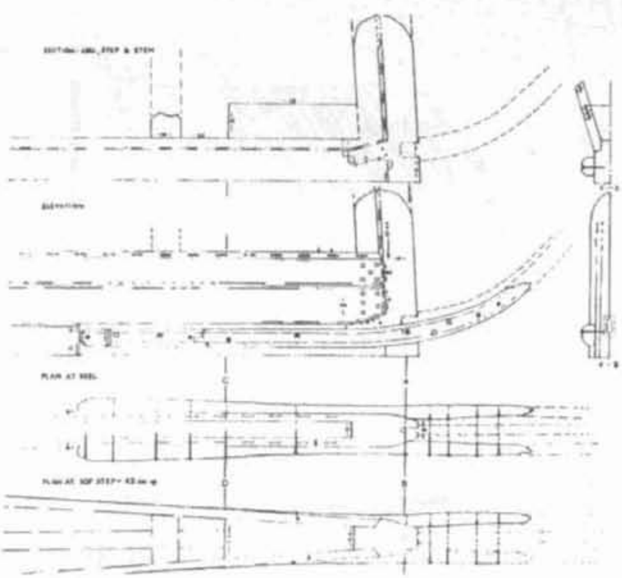

Fig. 35

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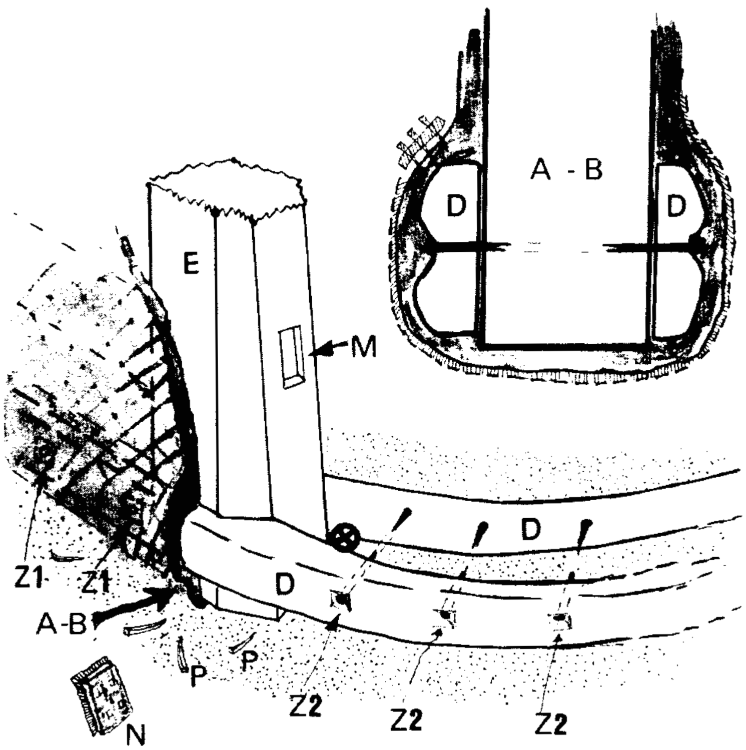

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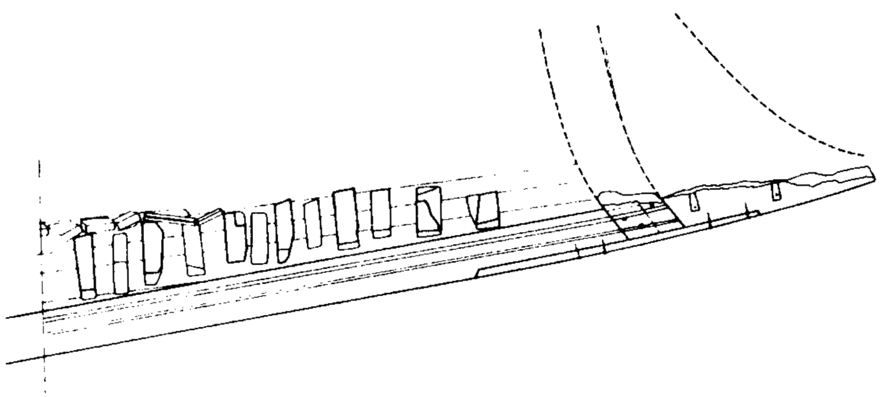

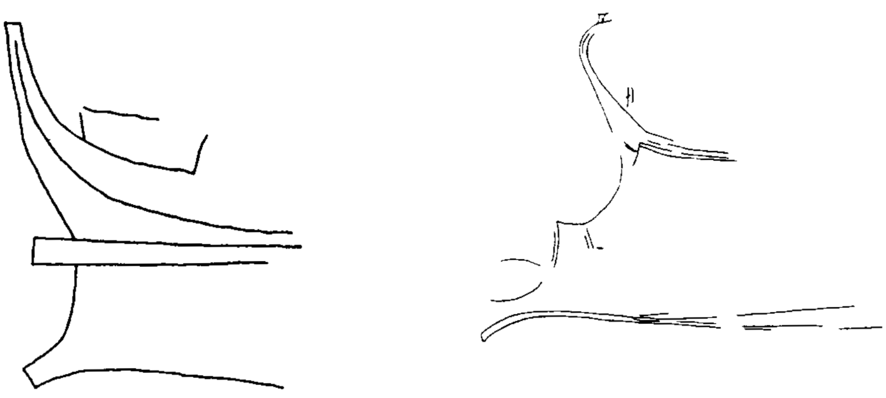

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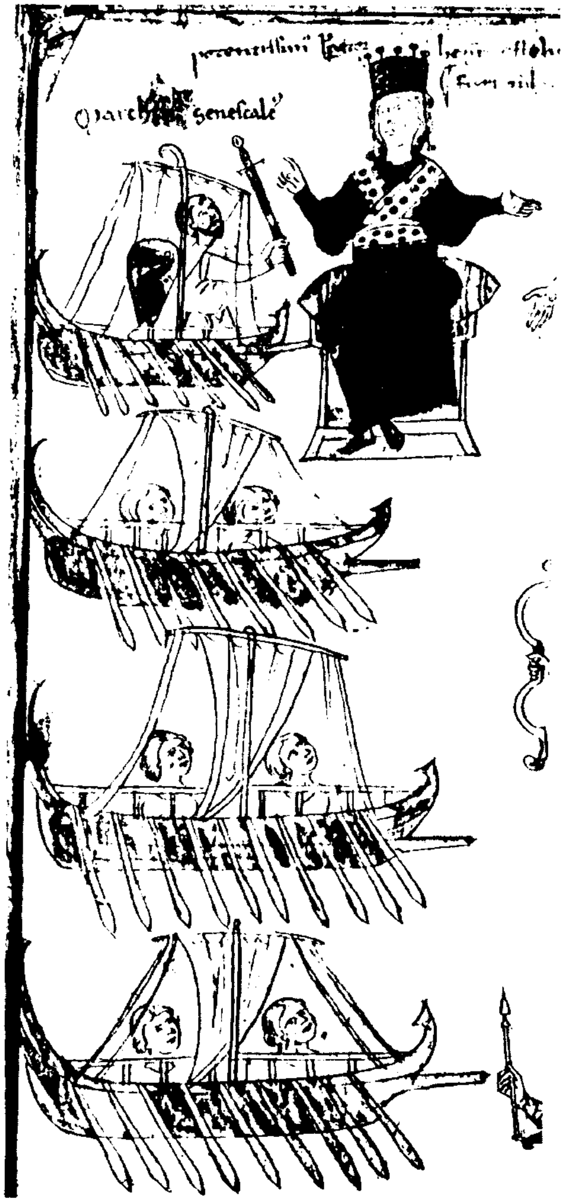

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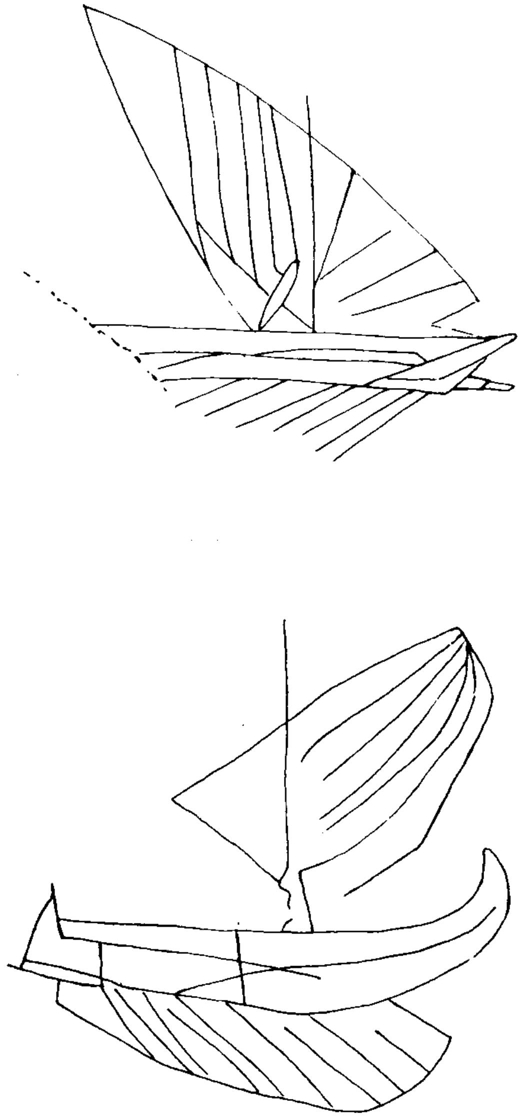

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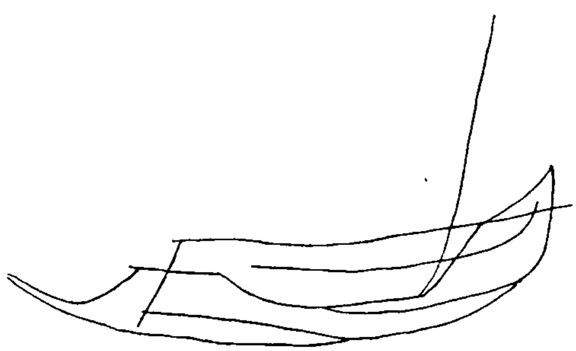

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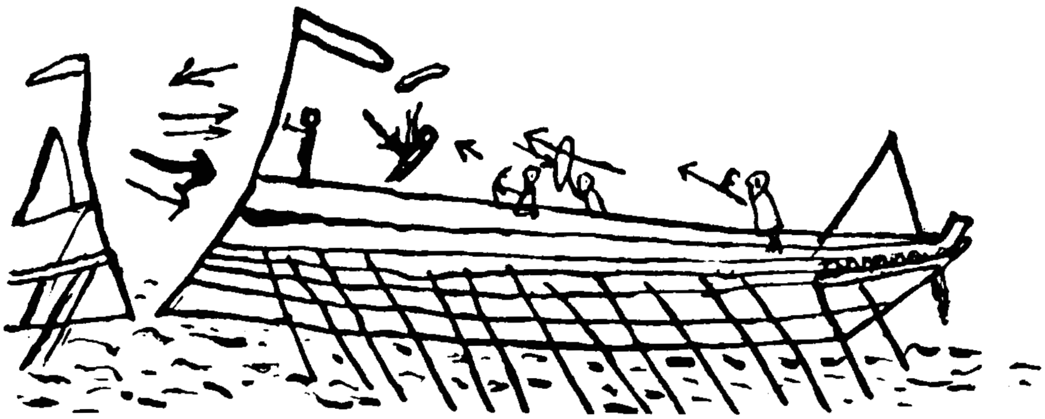

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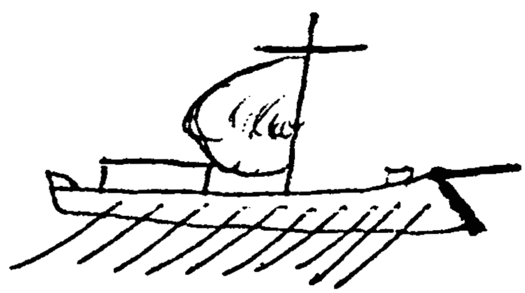

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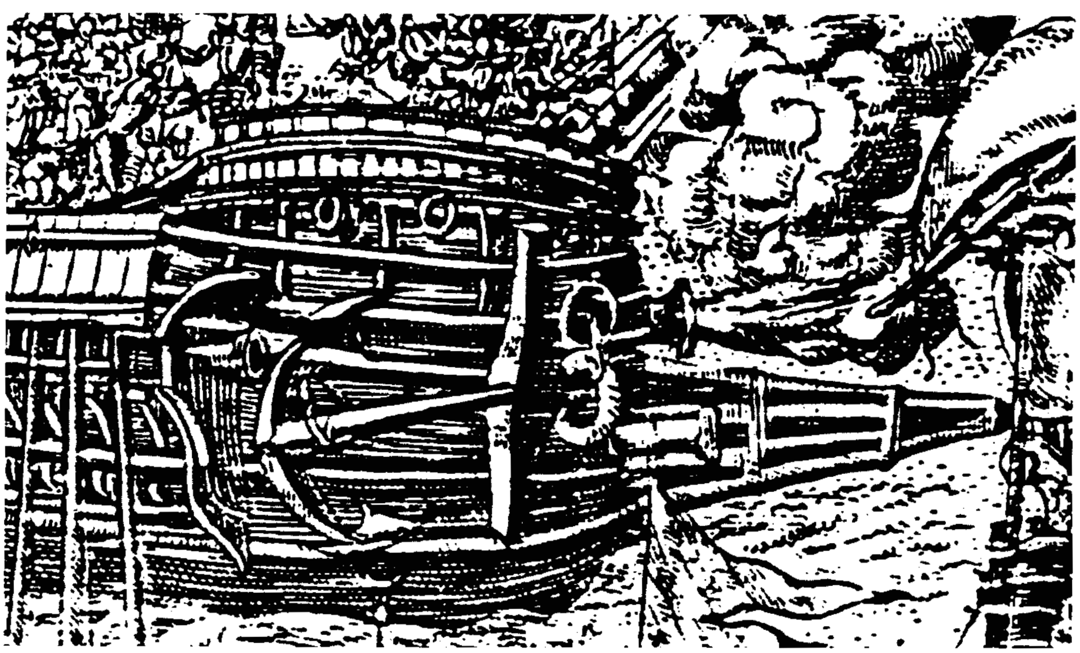
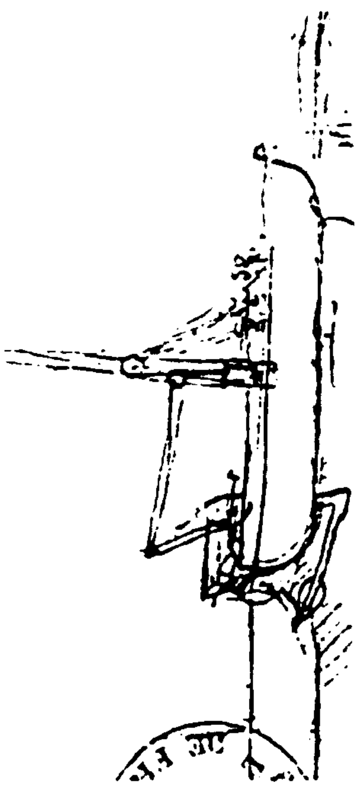
Fig. 44





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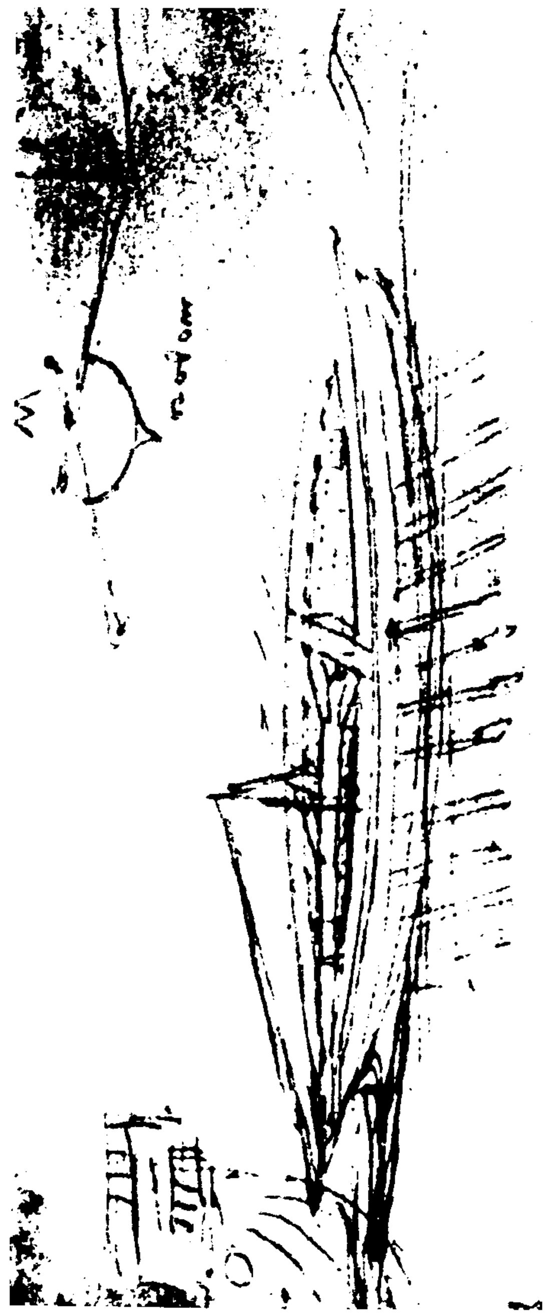
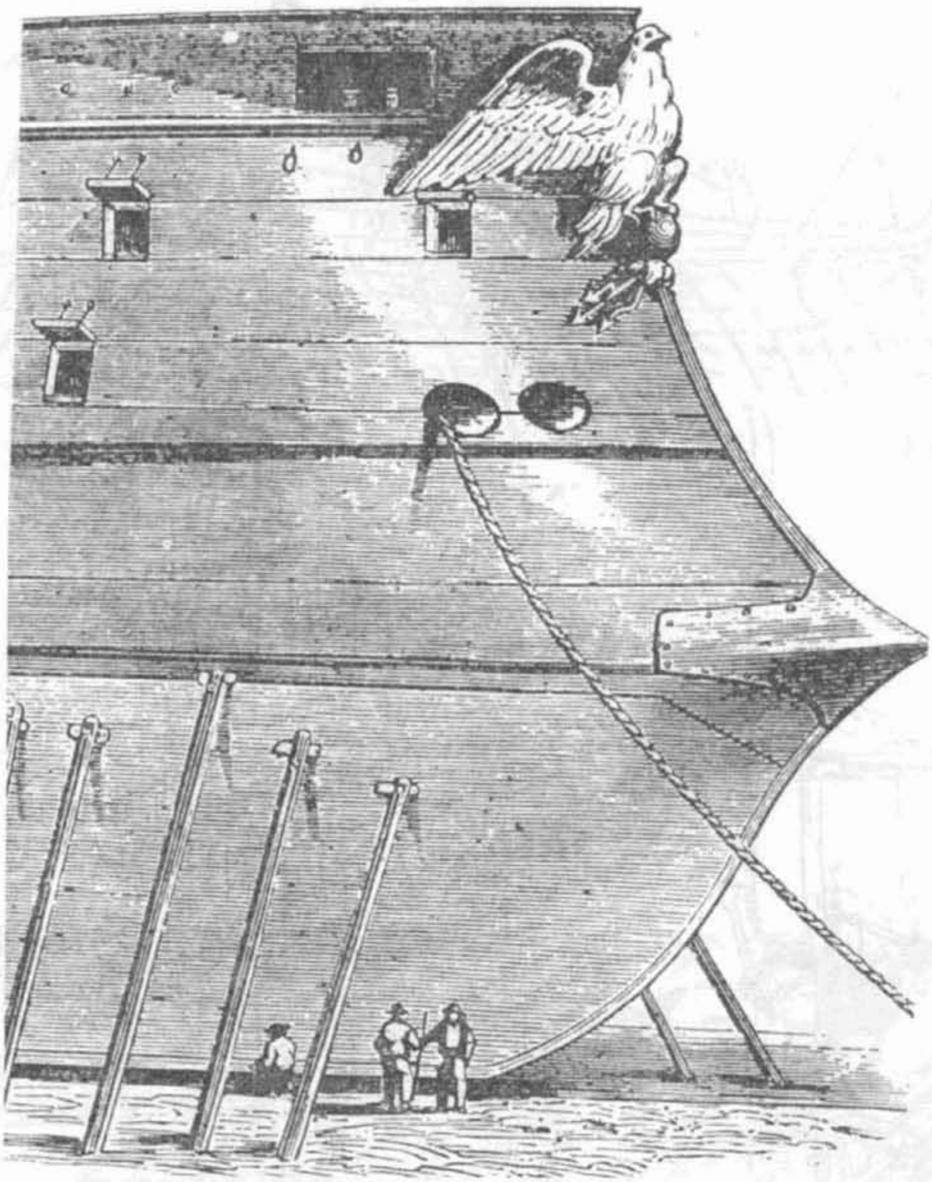


Fig. 46

Fig. 47



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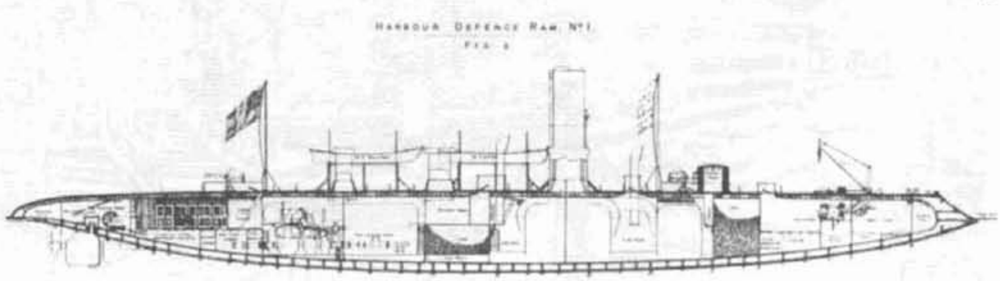

APPENDIX
Some remarks concerning the Punic ram

Introduction

The following remarks of a technical nature on the remains of the ram of a Punic ship (the so-called "Sister Ship") found on the seabed off Marsala (ancient Lilybaeum) by Honor Frost in 1974, are aimed at supplementing the report of the find (Frost, 1975, 1976, 1981) and the typological study by Basch (1975). It is written as a companion paper to the one written by Basch (1992). As will appear below, this approach results in a new variation on the earlier interpretation.

The following points will receive particular attention here: the original construction of the ram, as far as it can be established from its remains, which now consist only of its curious tusks (side timbers) and a scrap of bronze sheathing, the way it was lost from between the tusks, the exact purpose of the oddly "two-dimensional" construction, as deduced from the mechanics of ramming, the nature of the ship which was equipped with this type of ram, and finally, the reconstructional drawing of the ram. These points are interrelated and cannot be discussed entirely separately, so the discussion begins at the point which least relies on the other ones, viz. the purpose of this particular ram construction.

Constructional principle of the ram

The starting point here is that of the transverse forces acting on the ram during and immediately after the impact of ramming. When one ship rams another, it is generally the result of her having previously followed a ramming course, during which the bearing of the attacked ship did not change much. The same is true as seen from the victim: during some time before the collision the attacking ship approached at a bearing and with a relative velocity which were both reasonably constant. Upon impact, unless the attacking ship cuts through the victim or drives her under —both exceptional occasions— the velocity of the attacking ship is in general suddenly reduced to zero.

As the ramming attack was nearly always aimed from one of the sides, the impetus of the attacked ship was not spent as quickly as that of the attacking ship, and at some very short time after impact the attacked ship would start to move sideways relative to the attacker. That situation could be dangerous to the attacking ship, because it might cause the ram to be wrenched off, the consequences of which could be fatal. For example, during the battle of Chios (201 BC) that was the cause of the loss of a ship, as described in some detail by Polybius (XVI.4.15).

The danger could be minimised either by appropriate tactics, e.g. by attacking from a position aft if the attacker's ship was faster than that of his enemy, or by having the ram constructed in such a way that the consequences of its suddenly being pushed from the side with great force were not harmful, or only moderately so. There were two obvious ways of attaining that goal: either the prow of the ship, including the ram, was constructed so strongly that the sideways forces could be withstood, or the attachment of the ram to the stem was made such that it would give way or snap off harmlessly if the transverse force exceeded a certain limit. It appears that the remains of the ram discussed here can be interpreted as belonging to a construction of the latter type. It seems certain, on the other hand, that the rams of the majority of ramming ships used in Antiquity were designed to stand up to the transverse forces generated during a normal ramming attack.

The discover of the Marsala ram was fully aware of the extraordinary nature of her find, and recovered one of the tusks. On examination it was observed that although the grain of the wood ran with the aftermost portion of the tusk, it remained parallel to that direction in the upcurving portion; compass timber had not been used. As a result, the more the tusk curved upwards, the more it ran across the grain of the wood. Apparently, it had been designed with the intention that it could break off easily. It was concluded that the weakness must have been intentional because "it would be better to sacrifice the tip of a replacable ram, rather than to remain either involuntarily attached to the enemy by too solid a ram, or to damage the structure of one's own ship by the unbroken force of collision". (Frost, 1975).

Although the action of a horizontal transverse force does not seem to have been considered earlier, it now appears that the primary purpose of the deliberate constructional weakness of the tusks must have been to limit the magnitude of that force in order to prevent structural damage to the hull itself. If no large transverse forces acted on the ram, i.e. if the impact was largely longitudinal, it was not necessary that it should break off, so it was made in such a way that this could not happen. The ship would therefore not lose automatically her sting, like a wasp, with every offensive action. If the latter had been true, any engagement at sea between ships of this type would have been decided simply by numerical superiority, which seems highly unlikely. It would have been entirely possible to design the ram so that it was solid enough to withstand a purely frontal ramming impact, even if it would break off by the application of a relatively small transverse force.

Normally, the woodwork inside the bronze covering of the ram consisted of the solid apex of a slender pyramid of which the vertices consisted of heavy timbers (Steffy in Casson and Steffy 1991), much like the wooden frame of a church steeple turned to a horizontal position. Most probably, the exceptional type of ram which was strong in the alongships direction only was constructed as a two-dimensional triangle of strongly interconnected wooden beams. In principle, the lower bean would have been the principal part of the ram between the tusks. In the Sister Ship it was in addition only attached to the stem by a weak mortise and tenon joint, which could give way when the ram was powerfully pushed sideways. It seems probable that the vertical side of the triangular construction did not consist of the stem timber itself, but of a false stem to which the lower and upper beams forming the ram were firmly joined, as indicated in the accompanying schematic reconstructional diagram (Fig. 1). It is similar in function to the "baton" postulated in the reconstruction by the shipbuilder Vito Bonanno (Frost, 1981). The false stem may have continued parallel to the stem itself well above the ram, to a point near the gunwale where it was attached to it.

Bronze covering of the ram

Torr (1894, p. 63) concluded from inscriptions on the price of rams of Athenian three-banked ships that these rams weighed on the average some three talents, i.e. ca. 80 kilograms, "so the metal could only have formed a sheathing round a core of timber". If the word "sheathing" is taken in its customary sense, that would imply that the cover was composed of sheets of bronze which had been beaten into shape around the timber core of the ram. Taken in this sense, it was entirely logical to interpret the find of a small sheet of bronze in the gap between the stempost and starboard tusk as follows: "evidently it had been part of the bronze sheeting that covered the ram." (Frost, 1976, p. 269).

However, recently Murray and Petsas (1989) suggested that the rams in the inscription to which Torr refers were damaged rams "collected in fragments to be sold off as scrap". These rams may be compared to the Bremerhaven ram, which weighs 53 kilograms. Assuming a similar shape for the Athenian rams, the outer surface of such a ram may be estimated at no more than ca. 1 square metre. Consequently, the average thickness of the bronze covering would have been of the order of one centimetre, which points to a casting rather than a sheathing consisting of bronze plating.

One may add that if the core of the ram consisted of a pyramid or a triangle of wooden timbers joined together, the strength of a cast bronze shell would have been needed to hold the wooden assembly together upon impact of the ram of its victim. And, of course, since the discovery of the Punic ram, the rams of Athlit and Bremerhaven have come to light, both castings of bronze, as is the "ram" (probably a proembolion) in the Fitzwilliam Museum in Cambridge. Taken together, this evidence renders it most improbable that the ram was covered by bronze sheeting rather than by a cast bronze shell. As we shall see, the small sheet of bronze found on the seabed may have formed part of one of the covers of the tusks.

Loss of the ram

If we accept the interpretation that the partially cross-grained tusks were made weak intentioanally to prevent damage to the hull, the question must be answered how it was possible that the ram was lost while the tusks remained in place. The find of "an ancient ship with its two tusks and a hole like that of a lost tooth" (Frost, 1975, 1976) poses a mechanical problem, because originally the tusks were fastened to the ram and to each other by at least four iron bolts going from one side to the other (Frost, 1976 and priv. comm., 1991). If the ram had somehow been wrenched out by ramming, it is most improbable that the tusks would have remained in place. The hypothetical wrenching-out would have involved breaking at least four iron bolts at two points each, without breaking the cross-grained ends of the tusks, which is clearly impossible. It follows that when the ship sank off Lilybaeum, very probably the ram was still attached between the tusks.

How was the ram lost from between the tusks when the wreck was lying on the seabed? Was the valuable bronze ram perhaps robbed from the ship in the shallow waters in which the wreck was located? It is in itself not inconceivable that that could have happened, but if so, the tusks would have been lost too. In principle, the tusks originally may have been attached either inside or outside the bronze shell protecting the ram. In either case, there is no good reason why the robbing divers would have carefully removed the bronze shell and left the tusks *in situ* instead of hacking them off. The find of the tusks without the ram implies that robbery may be excluded as a cause of the loss of the ram.

We now consider an alternative explanation, first for the configuration in which the tusks were bolted over the bronze shell of the ram on the outside. In that case, the iron bolts passed through the bronze sheath, and at those points a galvanic circuit would have been set up in the seawater, which caused them to corrode away locally at a comparatively rapid rate. When the corrosion had reached the stage that the ram was no longer attached to the tusks by the bolts, a gale over the shallow waters in which the wreck was lying would have been sufficient to detach it altogether. The iron bolts would have formed the anode in the galvanic circuit, tha cathode was the bronze shell.

The bronze would have been protected from corrosion by the galvanic process.

If the iron bolts did not pass through the bronze shell of the ram, corrosion of a different type could have occurred: "crevice" corrosion, which is known commonly to take place in seawater. If the latter is stagnant, as in a crevice, its oxygen concentration goes down in the course of time. The variation in the composition of the electrolyte instead of the metal, causes the metal adjoining the crevice to behave as an anode, thereby corroding preferentially. However, the corrosion in the crevices formed between the tusks and the keel was so slow that the iron nails fastening the tusks had not been corroded through yet, so it would require a special explanation how the ram could have been lost by this process.

If the bronze shell had covered both the ram and the tusks, crevice corrosion might have taken place too. But if so, there arises an additional problem implied by this geometry, viz. how to explain the mechanism by which the shell could possibly have been removed while the unbroken tusks remained *in situ*. In addition, in that case the reverse process of mounting the cast bronze shell over the ram and the tusks would appear to have been geometrically impossible. The absence of any convincing explanation accounting from the possible geometry and mechanics of these hypothetical modes of mounting and removal of the protective covering of the ram leaves us the alternative assumption that the shell of the ram was located between the tusks as the only possible explanation. This arrangement would fulfill the functional requirements, and it would explain how the sheathing of the ram was mounted and could have been subsequently lost without losing the tusks.

Type of ship

First, the question must be considered whether the projecting timber was indeed a ram or perhaps a cutwater. The latter is a device for increasing the lateral resistence of the hull; it is most usefully applied to sailing ships with bluff bows under the waterline. Judging by the extant remains of the Sister Ship (Frost 1976,

Fig. 168) the hull appears to be extraordinary slender; a cutwater added to a hull of this shape would have been rather superfluous.

In favour of the interpretation as a ram is the observation by Bonanno (Frost, 1981) that the "trait de Jupiter" joint or scarf between stem and keel would make sense only if the ship had been built for ramming. The joint had been reinforced by a block of timber rather than a stem-knee. Basch (1983) suggested that it is a special strenghtening member for the purpose of absorbing the ramming impact, analogous to the longer "ramming timber" which supports the Athlit ram (Casson and Steffy, 1991). But if this evidence points to a ram rather than a cutwater, it must be repeated that the transverse weakness of the Marsala ram is a-typical, as is clear both from the iconography of ancient warships and the remains of the Athlit ram (Basch, 1982). If the ram was a later addition to the hull this weakness would be readily understood as one of the consequences of it.

Most probably, the ship had been built without the massive wales which distributed the reaction forces or ramming over the hull (Basch, 1982, Steffy, 1983) in a true ship of war. Consequently, there were no structural parts available to receive the transverse components of these forces.

The apparent contradiction between a hull built for ramming and a ram added on later is resolved if it is assumed that the ship had been built as the equivalent of a potential "auxiliary cruiser". This type of merchant ship of our own recent past was strengthened when she was built in order that in an emergency she could be quickly fitted with guns. The ancient ship was given a straight stem timber, with a strong joint to the keel, to which a false stem with a ram could be fitted easily. This type of ram was necessarily a planar construction, strong in the plane, but weak in the athwartships direction. Thus, the ram might have been a later addition to a hull which had been designed so that that could be done in an emergency in order to convert the merchant galley into a warship. Not having been built with a fixed ram she could have been damaged easily by transverse ramming forces, so the ram was designed to break off if such forces arose. The choice of iron instead of bronze for the bolts fastening the tusks to the ram lends support, perhaps, to the idea of an emergency conversion, because shipbuilders of the time must have known from experience that this combination of materials was to be avoided in normal practice.

Reconstruction

A few points concerning the reconstruction of the ram as presented in the diagram may be briefly elucidated, in particular where it differs from previous efforts. These have the ram continuing to the waterline (Frost, 1981). As a result, the lateral surface of the ram is large, of the order of 1 ½ square metres, which could have generated large sideways forces in a seaway, causing the ram to break off. For the same reason, the ram should be submerged, to prevent surface waves from beating against it. In addition, in a ship of which the prow appartently had been reinforced only near the joint of the stem to the keel for absorbing the longitudinal force component of the ramming impact, it would have been desirable to have the ram located as close as possible to the line of the keel. In the reconstruction proposed here, the lateral surface of the ram is less than half of the earlier proposals, and the tip of the ram is approximately 0.3 metre above the keel, and less than 1 metre below the waterline. The forward extension of the ram is about the same as that in the earlier proposals, and as in these, the shape of the ram accords with one of those attested by the typological study by Basch (1975).

The lowest point of the keel is the most vulnerable; it seems improbable that the angular joint between keel and stem would have been there. Accordingly, in the reconstruction (Fig. 1) it has been assumed that near the prow the keel was tilted upwards over a few degrees. The reconstructional sketch is based, in addition, on the drawing of the structure of the ram, which has been extended slightly on the basis of an analysis of the composite photograph in the final report (Frost 1976, Fig. 168 and Fig. 151). As in the photograph, going down on the stem the forefoot rakes forward somewhat relative to the part above it. Assuming the latter to be vertical, the upward tilt of the keel is approximately 4 degrees.

The question of the sheathing on the prow could only be resolved partially. Remains of woven fabric, which would have supported the sheathing, were found to cling to the prow, which was described as follows in the final report (Frost, 1976): "Thick layers of some woven fabric, liberally smeared with resin... swaddled the entire ram and extended beyond it over the tusks where these were nailed onto the sides of the keel, and even onto the garboards above. This material, the remains of which can be seen above the starboard tusk... was so thick that I had to scrape it off in order to see the tusk itself. The substance which had the consistence of chewing gum, is whitish in colour and retained its elasticity even after drying out in the air... The boundary of this thick layer on the prow is indicated in Fig. 1;

it was taken over from a sketch which was provided by Miss Frost (priv. comm. 11-I-1992, see Fig. 36 in the companion paper by Basch). The small sheet of bronze which was found between the tusks was covered on one side with the same material. It may be noted that the "ram" in the quotation above appears to include the region of the prow adjacent to the ram proper.

Where the tips of the tusks projected forward of the stem, the layer of remains of resinous cloth was present too, although it was much thinner than on the prow (priv. comm. H. Frost 9-II-1992). The fact indicates that the tusks too, had been protected by metal covering. The small sheet of bronze with resin adhering to it on one side probably formed part of a sheathing of one of the tusks. Here the metal protection had to be thin enough that it would not interfere with the tusks snapping off when the ram was subjected to a large transverse force.

Regarding the sheathing of the prow itself, it must be kept in mind that if the hulls of ships of that period were sheathed, they were sheathed in lead. The following quotation from the excavation report (Frost, 1976) is relevant: "The extent of this [bronze] sheathing on the Sister Ship is, of course, implied by the extent of the resin remains which it must have covered. On the hull itself there is no sign of lead sheathing taking over from the ram's bronze sheathing, nor is there any sign of lead elsewhere on the site. The presence of lead is usually apparent even on the surface level of a wreck, so though the Sister Ship has not been excavated, it is probable that her hull had never been sheathed".

A difficulty in this explanation, if applied to the present case, is in the position of the boundary where the lead sheathing, if there had been such, would have taken over from the bronze sheathing. From the technical point of view it is obvious that on a ram which was so designed that it could be wrenched off, the boundary of the bronze sheathing of the ram would have to correspond closely to the boundary between the dispensable part of the ram and the remainder, i.e. the front face of the stem. This implies that the remains of resin-impregnated woven fabric extending aft over a considerable distance did not, in fact, support bronze sheathing, but once must have been covered by lead sheathing, in spite of the absence of traces of that metal at present. Perhaps the lead metal corroded away at an exceptionally rapid rate because of the proximity of the bronze of the shell of the ram and the sheats of the tusks. If the bronze shell extended only a little way aft, it might have provided bronze flaps covering the joint between stempost and ram, as indicated in the diagram. Finally, it may be mentioned that together with the strip of bronze some bronze brads (headless tacks) were recovered from the wreck. Presumably, with these the thin bronze sheathing of the tusks had been fastened to the stem.

Conclusions

The foregoing leads to the conclusions which are enumerated below:

1. The tusks, and the flat timber construction which they once held between them, were solidly bolted together and once formed a ram which was strong enough in the alongships direction to receive the ramming impact.
2. If the ramming impact had a large lateral component, or if large lateral forces would subsequently act on the ram, the partially cross-grained tusks would allow the ram to break off before damage was done to the hull.
3. When the Sister Ship sank, the ram was still attached between the tusks. Corrosion of the iron bolts where they passed from the tusks to the ram through its bronze covering, eventually allowed the ram to be detached from the prow by wave action.
4. The Sister Ship was perhaps built as a merchant galley which could serve as an auxiliary warship. It was designed to be equipped with a ram when war was imminent.
5. Of the possible interpretations, the one that the ram was covered by a shell cast in bronze and that the tusks, bolted over it on the outside, were covered by separate thin bronze sheaths, seems the most probable.

ACKNOWLEDGEMENTS

The author is much indebted to Miss Honor Frost, who generously provided new data and useful commentary, and to M. Lucien Basch, with whom a constant exchange of information and ideas took place when trying to place details of the find of the Sister Ship in a meaningful technological context. A long discussion with Mr. Brian H. Dolley helped considerably to provide coherence to the various findings and observations.

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ILLUSTRATIONS

1. Schematic reconstructional diagram of the Punic ram. The "boundary of remains of resin and fabric" indicated in the diagram refers to the thick layer of remains covering the prow. The tusks were covered by a much thinner layer of such remains; originally it may have supported thin bronze plating.

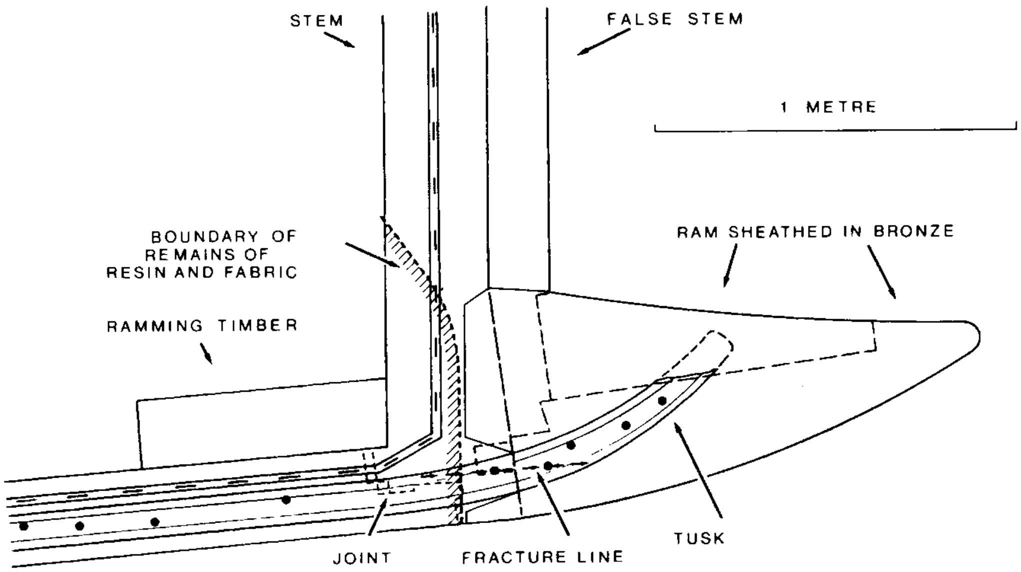
STEM
FALSE STEM
1 METRE
BOUNDARY OF
REMAINS OF
RESIN AND FABRIC
RAM SHEATHED IN BRONZE
RAMMING TIMBER
JOINT
FRACTURE LINE
TUSK

Fig. 1

WERE HAVE ALL THE SAILS GONE?

This paper will deal with the following question: Why, in spite of the numerous wrecks that have been found in the Mediterranean, as far as I know, no sails or remnants of sails have ever been found at sea?

This is particularly surprising since we have found hulls, parts of rigging, ropes, anchors, jars and their contents, and remains of foodstuffs.

I will confine myself in this paper to the Mediterranean as a single entity and the wrecks of ships from ancient times through the classical period.

Figures 1 and 2 show the Mediterranean Sea with an indication of the number of wrecks from the ancient to the classical period that have been located. The squares indicate, with their respective numbers, the amount of wrecks that have been found in that specific area and, the dots, individual sites. It becomes immediately clear that there are a great number of wrecks throughout the Mediterranean where the climate, salinity, flora and fauna are relatively uniform.

It is for that reason that regions such as the North Sea, the Baltic, the greater oceans, etc., or more modern periods than the ancient and classical don't come into consideration within the context of this paper.

To return to the question, why sails or remnants of sails have never been found in the sea, one must first consider the materials from which sails were made.

The papyrus plant was an almost universal source of material in ancient Egypt. As we know from Theophrastus, who lived in Athens from 370-288 B.C., in his book, "Enquiry into plants"[1], " ... from the inner part of the papyrus they weave sails and also ropes". Herodotus, 484-424? B.C., mentions sails made of papyrus in a list of boat gear preserved on a document from that period[2]. And Pliny the Elder, A.D. 23-79, in his book, "Natural History", wrote, " ... Papyrus grows in the swamps of Egypt or in the sluggish waters of the Nile ... and is plaited to make boats and the inner bark woven into sailcloth and ropes"[3]

These statements cover a time span of some 500 years. So we can be relatively certain that papyrus was used for at least this period of time. However, there is some discrepancy as to just how many Egyptian boats really did have sails of papyrus. There are some depictions of Nile boats, as in a mural painting at Kom el-Ahmar, where it is shown what seem to be separate sheets of papyrus which can be folded together, used as sails[4].

Both Theophrastus and Pliny use the term, "weave", when describing the use of papyrus in the manufacture of sails. However, that is not correct in our present-day understanding of the terms, "weave" or "woven"[5].

The following is the process by which papyrus is made into sheets. Strips were sliced from the inner part of the stalk, soaked and layed down edge to edge to make a flat, unbroken surface with a second layer placed on top of it with strips running perpendicularly across them, creating the same type of surface as the first layer. This "sheet" is then pressed or "tapped". This tapping crushes the plant cells and liberates the natural juices which cause the strips to stick together[6].

So we can see why, as writing paper, papyrus might have been quite fine and, as a sail, opened, with wind hitting it, it may have performed rather well along the Nile. But it was very brittle and, after repeated folding, would tear and would have lost its ability to stand up against the wind.

Figure 3 shows the five fibers - in addition to papyrus - available to the ancient world. They are cotton, wool, silk, flax (linen), and jute: the oldest of these being flax. Linen was made from the flax plant, starting in Egypt, and spread throughout the Mediterranean as early as the second millennium, B.C. for making shrouds and sails[7].

Linen became the fabric of choice for sails, gradually taking over from papyrus. It was sometimes painted and sometimes embroidered[7] As it was written in the book of Ezekiel about 570 B.C., when describing the construction of ships sailing from the port city of Tyre, " ... fine linen with broidered work from Egypt was that which though spreadest forth to be thy sail ..."[8]

Linen was used for sails not only in Egypt but also the Eastern Mediterranean and in the Aegean. It is a much finer fabric than matted papyrus, and depictions of sails in the Aegean, (600 - 200 B.C.) show that they were not always of one piece but made up of patches sewn together probably for added strength[7], and, of course, limited by the size of the looms. Much can be added about the decorations on sails. More may be said of the attempts that were made to make linen sails stronger, more durable, wind-proof and water-proof by the addition of various chemical treatments. But that is not the thrust of this paper.

It is true that authentic models of ancient Egyptian ships, with sails made of linen, have been found and are on display in museums all over the world (Fig. 4). But these have been preserved in the dry atmosphere of burial tombs. None have been found at sea.

It has been said that some sails were left ashore when ships went into battle[9]. If this is so, why have they not been found? Most probably, those ships that survived their battles would have retrieved their sails. If the ship did not survive the battle, the sails would have been used for other purposes such as making sacks, clothing or shrouds.

There is quite an interesting story of a most remarkable find, fairly recently reported by the late Professor Jean Rougé of the University Lumière at Lyon[10].

Of the many mummies at the Museum of Natural History in Lyon, was one found in a temple at Edfu, Egypt, that had been wrapped in a large piece on linen. This particular piece has several horizontal reinforcing strips, 5 cm. wide, to one of which is attached a part of a wooden ring suggested to be a brail ring of a Greco-Roman sail, Carbon-14 dated to 150 B.C., ±50 years (Fig. 5 and Fig.6).

Now, briefly, about the other materials.

In ancient times, wool was used for nomadic tents and clothing and never intended for sails, although Tacitus[11], in AD 70 reports that during the Batavian revolt in the estuary of the Rhine, "... they sewed their brightly coloured woollen war coats into sails". But that, and the story of the Vikings[12], who also used wool, takes us away from our original time frame and specific vicinity, making it part of another story.

As far as I know, silk was never used in the Mediterranean for sails neither in China nor Japan, and is also outside the scope of this paper. What remains is jute and cotton.

As time went on, other materials were introduced in combination with or in competition to linen such as hemp, from which canvas came, and jute[13].

Parenthetically, cotton was a most interesting addition to our world of sails. Cotton began to be used for sails together with linen sails as soon as it was readily available, from about the middle ages. This is discussed in detail by John Pryor in Mariner's Mirror, August, 1990, in his article on Crusader Transport Ships when he suggests that on some ships, "... both cotton sails and linen were used for different purposes". Cotton became very popular after the America's Cup Race in 1851, when the yacht, America, using such sails defeated British yachts using linen sails. Of course, the major problem of cotton sails is their tendency to rot, due to mildew when damp[13].

The question remains as to why sails have not been found under water. This is due to the hostile environment by which the fabric is surrounded at the bottom of the sea. Wool and silk apart, since they are proteins, all these fibers, as well as wood, are composed of two major families of molecules[14]; Celluloses, which are long chains of sugars, vulnerable to oxidation and microorganisms, and Lignins, their protective coating, tough and almost indestructible. (*Table 1, below*).

Table 1. Chemical Composition of Fibrous Plants and Trees
(Adapted from Refs. 14, 15, & 16)

	CELLULOSES AND HEMICELLULOSES (%)	*LIGNIN (%)*
Cotton	*88.4*	*0*
Papyrus	*?*	*?*
Linen (flax)	*72-80%*	*2.0-2.5*
Hemp (canabis)	*83.1*	*3.3*
Sisal	*77.8*	*9.9*
Jute	*76.4*	*11.8*
Hardwoods (oak, etc.)	*~80.0*	*~20.0*
Softwoods (pine, etc.)	*~70.0*	*~30.0*

Note: No figures on the chemical composition of papyrus are known. However the composition of various straws have been given (16) as celluloses and hemicelluloses about 80%, lignins 9-13%. Raw flax contains up to 5% lignin but the amount is reduced on "retting".

Wood contains 20-30% lignin and has, therefore, survived at the sea's bottom, almost intact when protected by, or buried in sand or mud. Jute and sisal, from which ropes were made, also have a high lignin content. As such, they have been found in situ, under the sea's bottom, attached to anchors, etc.

Linen, however, was another story[16]. The flax stalks were treated, or retted, before being woven. Retting is a process of hitting, or beating, the stalk in order to break down the tough, outer fibers of lignin and the inner pulp causing the protective coating and pulp to be stripped away.

All that is left is the exposed, pure cellulose fiber, completely vulnerable and at the mercy of the elements underwater (Fig. 7 & Fig. 8). This is the factor that destroys any possibility of finding sails or remnants of sails, *in situ*, in the sea.

The question still unanswered and still the subject of much searching is - what could be the possibility of finding a piece of sail impacted within the anaerobic environment of mud beneath the surface of the sea-bottom? Could modern-day techniques such as mud-penetrating sonar enable us to discover wrecks with their masts and sails somewhere aboard or, at least alongside? I would hope the answer is yes.

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14. A.J. Turner, *"The Structure of Textile Fibers"*, A.R. Urquhart & F.O. Howitt, eds. (Manchester, 1953) Vol VII (Flax) Vol VIII (Long Vegetable Fibers).
15. F.E. Brauns & D.A. Brauns, *"The Chemistry of Lignin"* (Supplement Volume, 1949-58) London (1960).
16. M. Schuler, *"Utilization and Recycling of Agricultural Wastes and Residues"*, (CRC Press, 1980).

ILLUSTRATIONS

1, 2. Maps of the Mediterranean showing submerged sites throughout the classical period. (From Anthony Parker in *Archaeology Under Water, an Atlas of the World's Submerged sites*; ed. Muckelroy, McGraw-Hill, 1980; 50-1).

3. Characteristic appearance of various fibers under the microscope. (From W. Scott-Taggart, "Cotton Spinning", Vol I, 9th Edition, McMillan & Co. 1935. Frontispiece.)

4. Model of a ship with linen sail from an Egyptian tomb (postcard from Ashmolean Museum, Oxford.)

5. Reconstruction of fabric with portion of brail ring. (From Rougé, Ref. 10b, Fig. 1.)

6. Enlargement of portion of brail ring. (From Rougé, Ref. 10b, Fig. 2.)

7. Cross-section of flax stem with outer lignin and inner pulp intact. (From Turner, Ref. 14, p. 92, Fig. 2.)

8. Enlargement of segment of cross section of flax stem showing the flax fiber bundles. (From Turner, Ref. 14, p. 95, Fig. 3.)

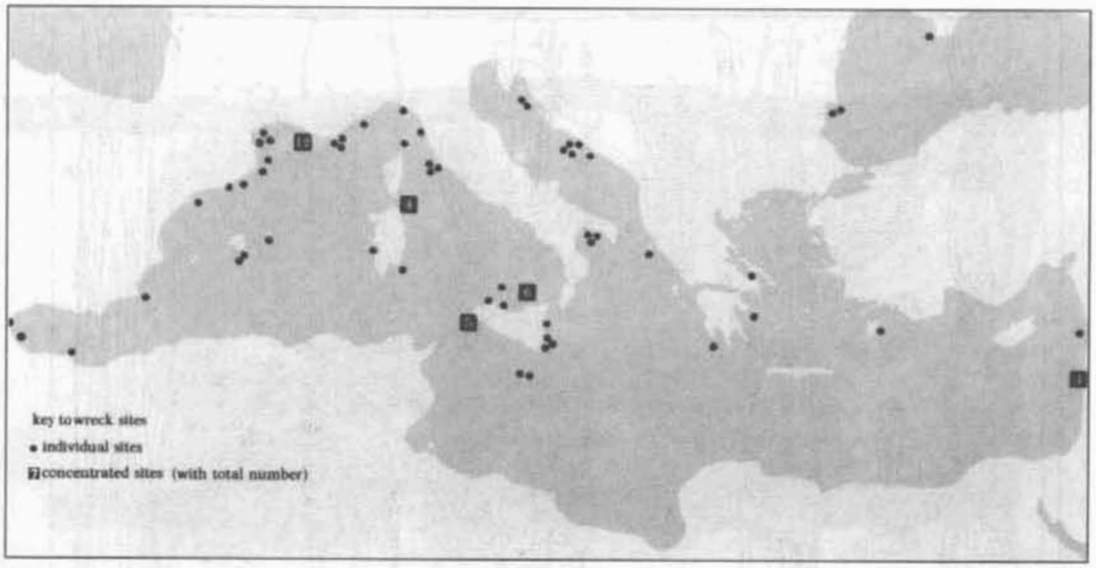
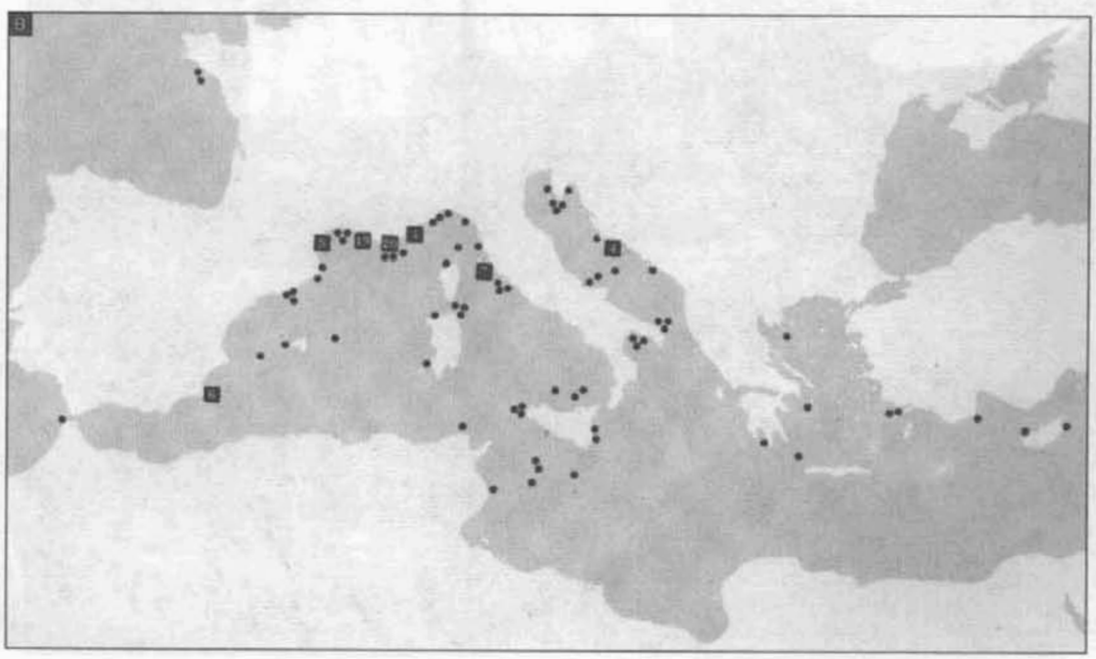

key to wreck sites
• individual sites
7 concentrated sites (with total number)

Fig. 1

Fig. 2



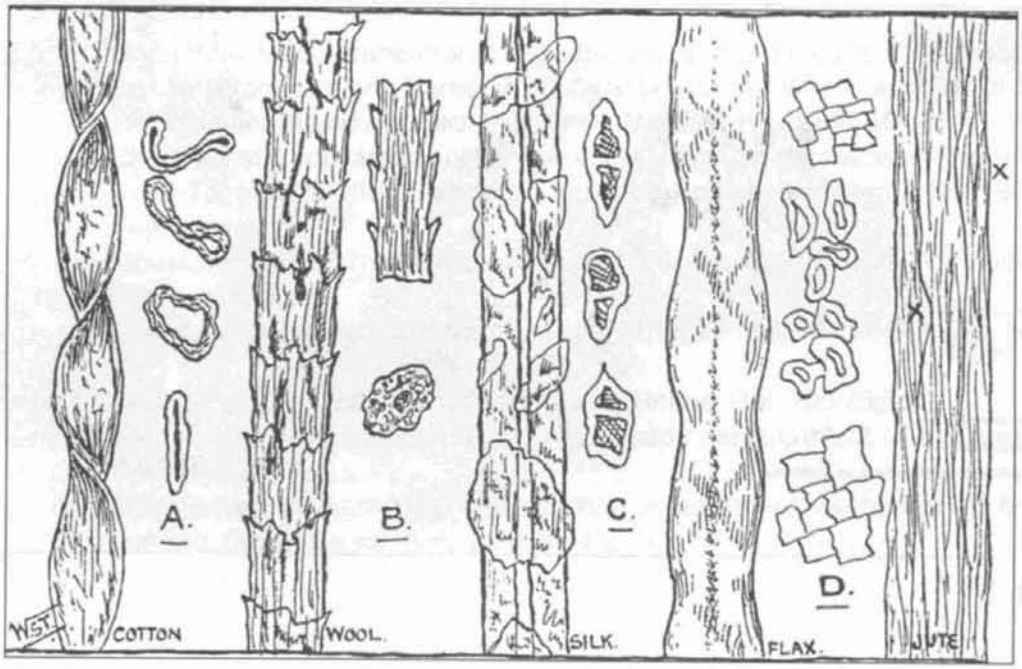


Fig. 3

Fig. 4

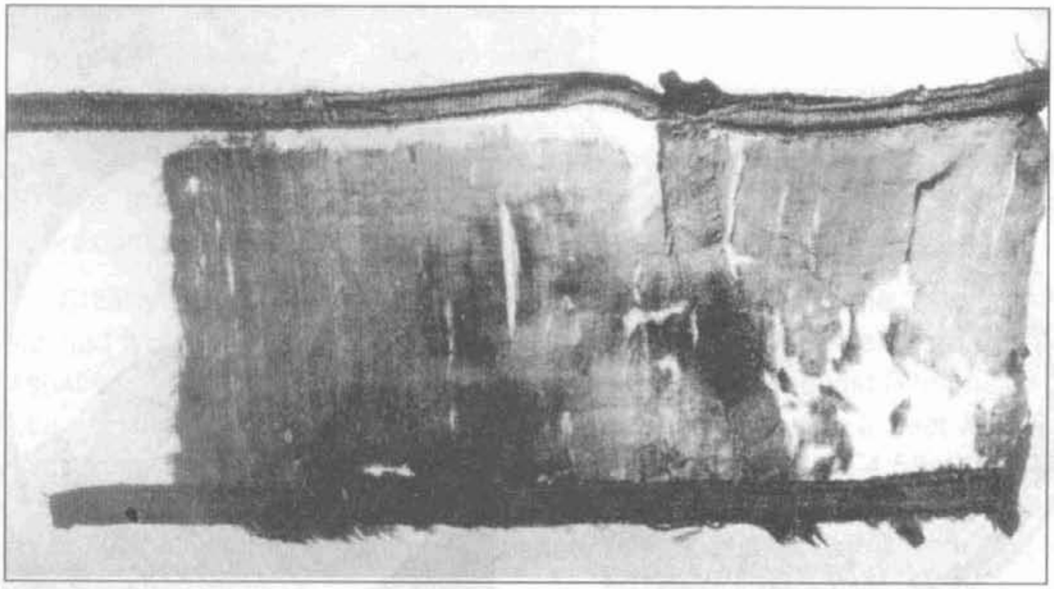


Fig. 5

Fig. 6

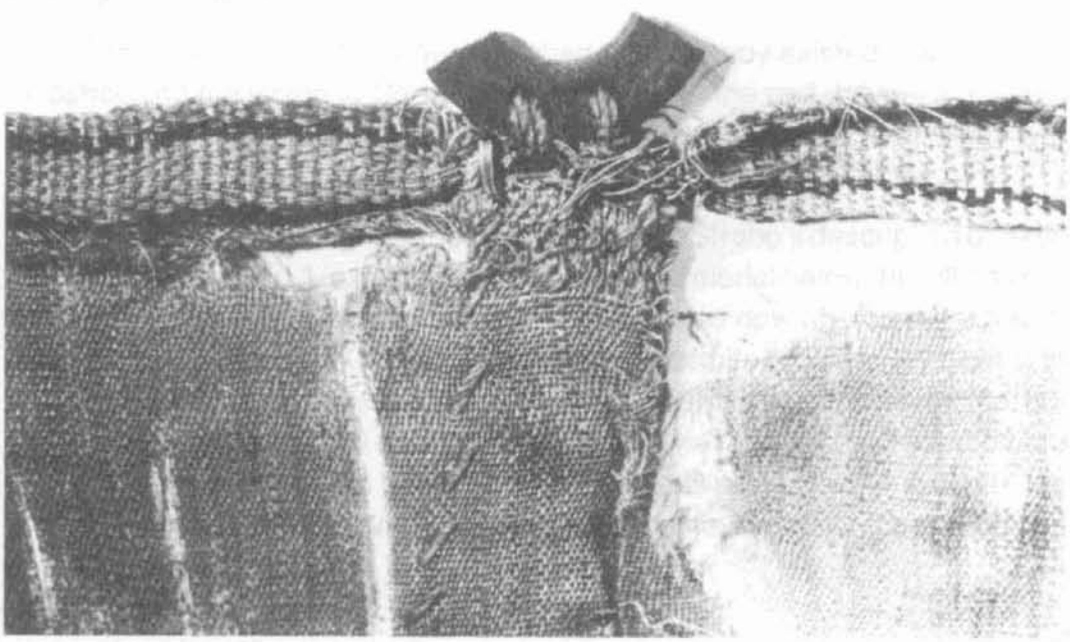


Fig. 7

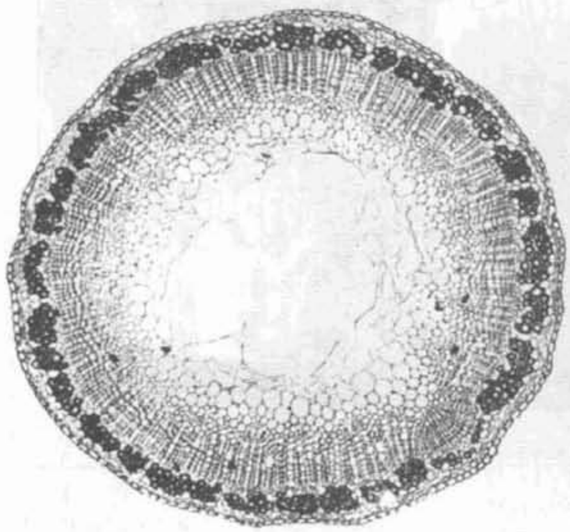
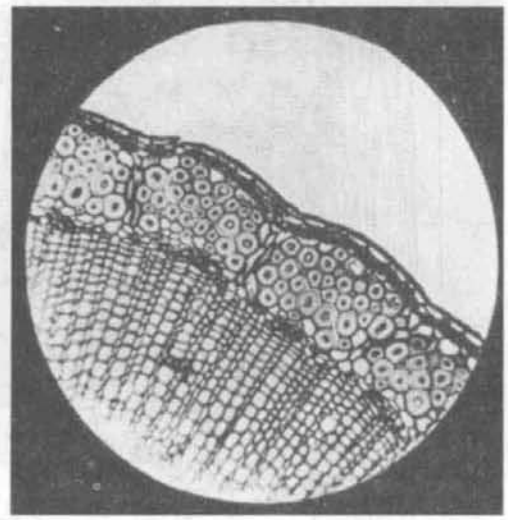


Fig. 8



NEW EVIDENCE FOR ANCIENT SHIP DIMENSIONS

The width of shipsheds provides crucial evidence for the beam of ancient warships. In recent years it has become clear that the question of shipshed types is more complicated than I (and others) imagined in the 1960s.

Clearly we can still associate with the classical trireme the "traditional" shipshed type, with a clear width of about 6m, as found on the eastern side of Pashalimani/Zea harbour in Piraeus, or at Oeniadae. At the last Symposium I discussed the new evidence for a narrower shipshed type, with a clear width of just over 4m: for example, in Rhodes (4.20-4.40m) and Dor (3.80-4.50m). These would have been for smaller warships such as *hemioliae* or possibly *trihemioliae*. In Rhodes they are found adjoining shipsheds whose width is at the wider limit of the "traditional" type[1].

Two years ago I said that we must assume that tetrereis and pentereis were housed in shipsheds of the "traditional" type, 'since there is no clear evidence of alternative provision for them, e.g. at Piraeus'. I now feel, however, that we have enough evidence to indicate a third, *wider* shipshed type, though it is not yet fully defined. I hope therefore that we can soon make a modest further contribution to establishing the size of the large ships of the fourth century BC onwards, inspired by the excellent study of the Aktion Monument and the wealth of new information which it has provided[2].

Some indications of a wider shipshed type already existed. Two of the 30 shipsheds on the island at Carthage are wider than the rest, having a minimum clear width of 7.1m at the upper end and of 8.0m at the lower end. They were about 48m long, like those on either side[3].

Furthermore, the significance of a passage in Strabo's description of Aktion had been overlooked. He describes a shipshed memorial below the hill on which the temple of Apollo Aktios stood, which had burned down before he wrote his account: '*neoria* in which Caesar dedicated as first fruits of his victory a set of ten ships, from a "one" *(monokrotos)* to a "ten" *(dekeres)*; it is said, however, that both the shipsheds *(neosoikoi)* and the boats *(ploia)* have been destroyed by fire'. There is a clear implication here that the shipsheds were of varying widths, but no proof; and the remains were destroyed within a few years of the construction of the memorial[4].

With this in mind we should at least look again at the evidence from Athens. Most of the shipsheds found at Piraeus, and all of the remains properly studied and published, were of the "traditional" type, for triremes. Could they have also held the *tetrereis* and *pentereis* introduced at Athens in the later fourth century? Lehmann-Hartleben, who accepted that these were larger ships, did not know the answer to this question. We cannot be sure that the shipshed builders will always have built the shipsheds large enough to take the largest ships in commission, as Vitruvius later demanded (5.12), but it is a sensible principle if space allows. There clearly was new shipshed construction in the last years of Athens' heyday, under Lycurgus (338-326); this is normally explained as reflecting the increased size of the Athenian fleet, but it could also reflect the increased size of some of the new ships[5].

One thing we can assume, I believe: that if the dimensions of a ship type were fairly standard (whether trireme, *tetreres* or *penteres*), then so too would have been the dimensions of the shipshed type intended to house them, in whatever harbour. If one captured a warship from an enemy one would want to be able to slip it in an appropriate shipshed.

Should we therefore give any credence to the measurements published by Graser in 1872[6]? He claimed to have seen in Zea and Munychia shipsheds of different width groups, to fit ships of different beam: including penteconters (10.37-13.81 feet), 12 "normal" triremes (16-17.73 feet), 15 *tetrereis* (17.96-19.62 feet) and 7 *pentereis* (19.88-23.11 feet). In 1968 I was very hesitant on this: 'we only have his verbal descriptions, and the evidence is not conclusive'. It is certainly unfortunate that we have only his descriptions, which can no longer be checked; but perhaps we do need to look at his article again, in the light of the new evidence.

Some striking new evidence has now been discovered on a small island off the west coast of Rhodes - Alimnia. Lying about 6 miles off the coast of Rhodes, due west of Skala Kameirou, the island has now no good source of fresh water, but only brackish water and some water in cisterns after rain, and has been uninhabited since the 1960s. Animals are now left on the island all the year round, but the human inhabitants have withdrawn, mostly to Chalki which still has a permanent population of about 300; occasional visitors to Alimnia include holiday-makers on day trips from Chalki.

During a surface survey of ancient remains on the island in 1980, carried out while he was excavating a Neolithic settlement on the Kastro, Adamantios Sampson of the Ephorate of Prehistoric and Classical Antiquities of the Dodecanese found remains on the south-eastern shore of the main enclosed bay of the island, Agios Georgios, and on the southern shore of an inlet on the east coast of the island, Emporio. A short account of this discovery appeared in 1988. In late August 1991 I was able to pay a short visit to the island, and to confirm the importance of the discovery[7].

At Emporio Sampson found remains of 11 shipsheds, and 3 more badly destroyed; so far I am only sure of the eleven. The ships are cut in the bedrock which is now very weathered; they continue into the water but it is difficult to say precisely how far. I checked those in the deeper water at the eastern end, and found that no.XI, for example, continues for a further c.5m, down to a depth of 0.65m, and then more abruptly to a depth of 1.20-1.30, where it breaks off.

We can be sure only that the slips continued into the water for some 5m, to add to the present dry length of 16m (no. XI) to 21m (no. VI). The short length is indeed a problem, particularly when combined with the considerable widths (mainly 8.50-8.70m or 9.50-9.80m). The slips are not spaced at completely regular intervals but take account of the very rough bedrock, of hard limestone. As Sampson noted, nos III and IV intercommunicate.

Sampson published the plan which I reproduce (Fig. 1); he discusses the widths and says that the length could be established in only a few cases, but does not mention the gradients. Determining the gradient is not easy where the rock is so weathered and there is an earth fill at the top of the slips. However, on the east side of slip no. II a fairly secure measurement was possible: a drop of 1.34m over 9.2m; if we allow a little for the earth fill, we arrive at a gradient of 1 in 7[8].

At the back of the inlet there are remains of walls which seem to be of good Hellenistic date, close to the shore; Sampson describes these and also considerable remains of houses and a kiln on the slope of the low ridge on the south side of the inlet, dating from the Hellenistic to Byzantine periods; also an Early Christian basilica near the shore and an early Roman burial, which indicates that the harbour structures were by then no longer in use as such.

A similar discovery was made on the south-eastern shore of the inner bay of the natural harbour of Agios Georgios. The harbour is well protected from the prevailing winds (N, SE, SW), and currents which set from the open sea to the south-west; it was used by the Italians in the Second World War as a naval station for small ships and flying boats: remains of their living quarters still stand on the shore close to the chapel of Agios Minas, which is built over the foundations of earlier structures, now just submerged, on a short headland projecting into the bay. These structures have not yet been studied, but could belong to a simple ancient jetty.

Just inside (north-east of) this headland at least 10 shipsheds were constructed along the shore (Figs. 6-11). They give the impression of greater depth, since except at the south-west end the slips were cut into a steep hillside, part of which clearly proved too steep to be used (on either side of no. VI). Much work remains to be done in studying these slips, particularly at both ends of the row and in the water[9]. The commonest width here is 9.60-9.90m. Again the slips are very short, surviving to c.14 to 20m (no. VI). Sampson notes that the length of none can now be established. He believes that they must belong to the same date as the shipsheds at Emporio - very probable but not yet proved. He reports that the pottery finds from this area are mainly Hellenistic.

No evidence has yet been found in either group of shipsheds for (1) roofing; (2) external or internal walling; (3) installations such as capstans.

The most striking feature of both groups is the width of the slips, even if one allows for possible working space on either side of the ship. Most fall into one of two groups: 8.50-8.70m (E); or 9.50-9.80m (E) / 9.60-9.90m (AG). Of the wider ones, one (E I) must be a "double" or even a "treble" shipshed, and AG I and VI could well be "doubles". I am not sure that there is any significance in the greater width of the first shipshed in each of the two rows.

TABLE OF WIDTHS

8.50-8.70m	9.50-9.80m (E) 9.60-9.90m (AG)	10.80-11m	13m	18.20m
E II-VI	*E VII, VIII, X, XI* *AG III, IV, VII, IX, X*	*E IX* *AG II, V*	*AG I* *AG VI (13.20m)*	*E I*

As for the two main groups, it is very tempting to conclude that we have here wide shipsheds for the big ships of the Hellenistic period; the main problem is that they seem to be so awkwardly short. When investigated in more detail they may prove to be "doubles" of the narrow shipshed type which I have defined (see note 1, above), in which case the length problem disappears. In any case this new evidence will have to be studied further, and taken into account by those seeking to establish the dimensions of the Hellenistic "polyremes"[10].

What of the historical context? Who built a small naval station off the west coast of Rhodes, apparently in the Hellenistic period (although this is not yet absolutely certain)? Sampson concludes that Emporio, close to the coast of Rhodes, was developed as a naval station in the Hellenistic period, when Rhodian naval power was at its height; he dates the remains at Agios Georgios to the same period. He clearly believes that the naval station could only have been developed by the Rhodians. This is the obvious explanation: south of the city of Rhodes itself, the west coast of the island of Rhodes certainly lacks any other good harbour. The only problem which arises concerns the "wide shipshed" interpretation: on the evidence we have had hitherto the Rhodians specialised in smaller warships; the standard heavy units were *tetrereis*, and the largest warships attested were *pentereis*, but they also developed smaller types such as *trihemioliae*. The latter were used by the Rhodians as guard-ships (which would be particularly appropriate at Alimnia), but so also were *tetrereis*. The "double narrow" shipshed interpretation would fit *trihemiolia*, but nothing larger; while single wide shipsheds would be unnecessarily wide for *tetrereis*.

If the "wide shipshed" interpretation is correct, we should look for other possible explanations: for example, could we have here a small naval base developed by one of the other Hellenistic powers? If so, it is more likely to have been a power friendly to Rhodes, since the Rhodians would hardly have allowed an enemy or potential enemy to operate from an island so close to the island of Rhodes itself[11]. But none of the Hellenistic powers were long-term friends of the Rhodians, not even the Romans. One is therefore forced back to the conclusion that the Rhodians themselves probably developed this naval station, in a strategic position close to the south-eastern approaches to the Aegean; and that if the shipsheds were wide, then the Rhodians had some larger ships than we had thought hitherto. Further work at the site is highly desirable, and could cause these preliminary conclusions to be revised.

This discovery is a salutary reminder of how much remains to be discovered or studied in the more remote corners of the Aegean[12].

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NOTES

1. D.J. Blackman, "Some Problems of Ship Operation in Harbour", *Tropis III* (1995) 73-81. The final report on the Rhodes shipsheds has been submitted to the Deutsches Archaeologisches Institut for publication; preliminary reports: Blackman, *Deltion* 27 (1972, published 1977) 686-7; Blackman and P. Knoblauch, *Akten des XIII. Internationalen Kongresses fuer klassische Archaeologie, Berlin 1988* (1990) 499 and pl. 75.1-2; cf. Blackman, *Tropis II* (1990) 42f. Possibly the wider type at Rhodes was a development of the trireme shipshed specifically to fit the *tetreres* which had become the standard unit in the Rhodian navy.
2. W. M. Murray and Ph. M. Petsas, *Octavian's Campsite Memorial for the Actian War, TAPS 79.4* (1989); Murray, *Tropis IV* (1996), pp. 333-348.
3. I am grateful to Henry Hurst for this detailed information, not yet published. It is already clear on published plans that two ramps (nos 25-6) are wider than the rest: e.g. Hurst, *AntJ,* 57.2 (1977) Fig. 4.
4. Quoted in Murray and Petsas, *op. cit.* 5-6 and n. 29; cf. 99, 125. I prefer to translate *dekanaia* as "set of ten" rather than "squadron of ten". One wonders whether any of the substructure might have survived.
5. K. Lehmann-Hartleben, *Die antiken Hafenanlagen des Mittelmeeres, Klio* Beiheft 14 (1923, reprinted 1963) 113. Lycurgus: Diodorus, 16.87-8; Plutarch, Vit.X or. 7.853. *Tetrereis* appear in the Naval Lists for the first time in the list of 330/29, but may have been introduced some years before: eight are recorded in the *neoria* and ten at sea (*IG* II^{2}1627.22). By 325/4 there were more *tetrereis* (43 in the *neoria* and 7 at sea), and *pentereis* had been introduced (7 in the *neoria*): *IG* II^{2}1629.808.
6. B. Graser, 'Meine Messungen in den alt-athenischen Kriegshaefen', *Philologus* 31 (1872) 1-65, with table opposite p.62; D.J. Blackman, in J.S. Morrison and R.T. Williams, *Greek Oared Ships, 900-322 BC,* 183n.; I expressed similar caution in *IJNA* 11.3 (1982) 206: 'there is no clear evidence that the latter (sc. quadriremes and quinqueremes) required new or remodelled shipsheds'. Wachsmuth, however, to whom I referred in 1968 *(loc. cit.),* was prepared to follow Graser and believe in shipsheds for wider and narrower ship types than triremes: *Die Stadt Athen im Alterthum,* II.I (1890) 72-3. Remains of shipsheds found on the east side of Zea in 1973/74 may be of a *narrower* type, which would give some credence to Graser's claim; a ramp 4.7m wide is reported, but it is not certain whether that was the total clear width: O. Alexandri, *Deltion* 29 (1973/74, published 1979) *Chron.* 151 & Figs 34-5 (indicating a clear width just over 5m).
7. A Sampson, *Deltion 35* (1980, published 1988) Chron. 561-3, with plans (Fig. 11, p. 562) and plates 354-6; this was not seen by me until after the 1989 Symposium. I am most grateful to the Ephor, Mr. Ioannis Papachristodoulou, for permission to study the remains and to discuss them at the Symposium. I visited Alimnia on 25 August, immediately before the Symposium. I am grateful also to Mr. Sampson, who has generously agreed to my working further on this discovery. The results of his survey of prehistoric sites in the Dodecanese have now been published: *Η νεολιθική περίοδος στα Δωδεκάνησα* (Athens 1987); his excavation of structures of a very late Neolithic phase on the Kastro at Alimnia are described there (79-86) and in *Deltion* 35, 558-9. There was a settlement on the Kastro in the Hellenistic and Roman periods also. Sampson lists other prehistoric finds on the island: from Pontikovounaro, a hill between the bays of Emporio and Agios Georgios; from the south shore of Emporio; and from near the Agios Minas promontory (*op. cit.* 106-7 & Fig. 96).
8. My visit was brief and only a limited number of measurements was possible. Sampson's plan is a good basis for further work, which must include a detailed survey and if possible the controlled clearance of the earth fill and clearance of undergrowth, to check for evidence of interior walling or roofing, or fixtures for installations such as capstans, etc.
9. Sampson mentions ashlar walls in the sea to the east of AG IX-X, 'which must have been

connected with the ancient harbour'.

10. One can argue that the slips were originally longer, and that a relative rise in sea level has increased the marine erosion of their lower ends (sic R. Prescott in the discussion at the Symposium). However, I wonder whether, even assuming that, one reaches a plausible length for "polyremes". Furthermore, the ancient remains on the promontory in the harbour of Agios Georgios have foundations which are now just submerged; if they are roughly contemporary with the shipsheds (not proved, but plausible), and if they are harbour installations, then the relative rise cannot have been very great. Perhaps, as Casson has suggested to me, some at least of the Hellenistic warships had a much broader beam with relation to length than we are expecting, over influenced by what we know of the classical trireme.
    If we accept the "double narrow shipshed" explanation, then the apparent length is much more appropriate - for small warships; but on first inspection of the two sites I could see no evidence for double construction.
11. L. Th. Lehmann suggested in the discussion that the base might have been established by Demetrios Poliorketes when he was preparing his attack on the city of Rhodes in 305. But it seems too small and too distant to have been of much use in that massive attack: Demetrios had 200 warships of varying sizes, plus more than 170 auxiliary vessels as troop-transports.
12. The ancient name of Alimnia was almost certainly Eulimna: see G. Susini, 'Eulimna', *La Parola del Passato* 89 (1963) 129-31; and with fuller topographical description: *idem*, *Annuario* N.S.25/26 (1963/64, published 1965) 260f.; cf. *RE* Suppl.XII (1970) 364-5 s.v. 'Eulimna'. For an earlier description see G. Gerola, 'Carchi e Limonia', *Annuario 2* (1916) 6-12, esp. 11f. Island visited by L. Ross in 1844, who reported that it was previously inhabited and had a fine harbour, calling it Limonia: *Reisen auf den griechischen Inseln III* (1845) 114. Wrongly identified with ancient Teutlussa by Hiller von Gaertringen, *IG* XII.3 (1898) p.5; correction by him and D. Chiavaras: *Öst. Jahreshefte 7* (1904) 90-92.
    The island must have been part of the chora of ancient Chalke, on which see: L. Ross, *op. cit.* 14-20; *IG* XII.1 (1895) pp. 158-61 (Hiller von Gaertringen); *RE* III (1899) 2066 s.v. 'Chalke 2' (Bürchner) - inadequate; H. van Gelder, *Geschichte der alten Rhodier* (1900) 181-3; Gerola, *loc. cit.*; ATL I 436-7, 561; II 83; III (see IV, Index); P.M. Fraser & G.E. Bean, *The Rhodian Peraea and Islands* (1954) 144-5, 153-4; G. Klaffenbach, *Festschr. C. Weickert* (1955) 94-96; Susini, *op. cit.* 247-60; RE Suppl. XII (1970) 148 s.v. 'Chalke 2' (E. Meyer); Sampson, *op. cit.* (1987) 113-15 & Fig. 153a.
    For a geographical description of the islands see A. Philippson - E. Kirsten, *Die griechischen Landschaften* IV (1959) 307f.

ILLUSTRATIONS

1. A. Sampson's plan of the shipsheds at Alimnia (reproduced with his permission from *Deltion* 35, Fig. 11).
2. Emporio Bay from the west; in the distance, the mainland of Rhodes.
3. Emporio: shipsheds XI (left) to VIII (right), viewed from the bay.
4. Emporio: shipshed IX from the west; beyond are visible shipsheds X-XI.
5. Emporio: shipshed VIII from the east; beyond, shipshed VII.
6. Agios Georgios: shipsheds X-VII (left distance), VI (centre) and V (right), viewed from the bay.
7. Agios Georgios: shipsheds V (left) to II (right), viewed from the bay.

8-9. Agios Georgios: shipshed VI, looking south-west.

10-11. Agios Georgios: shipshed IV, looking south-west.

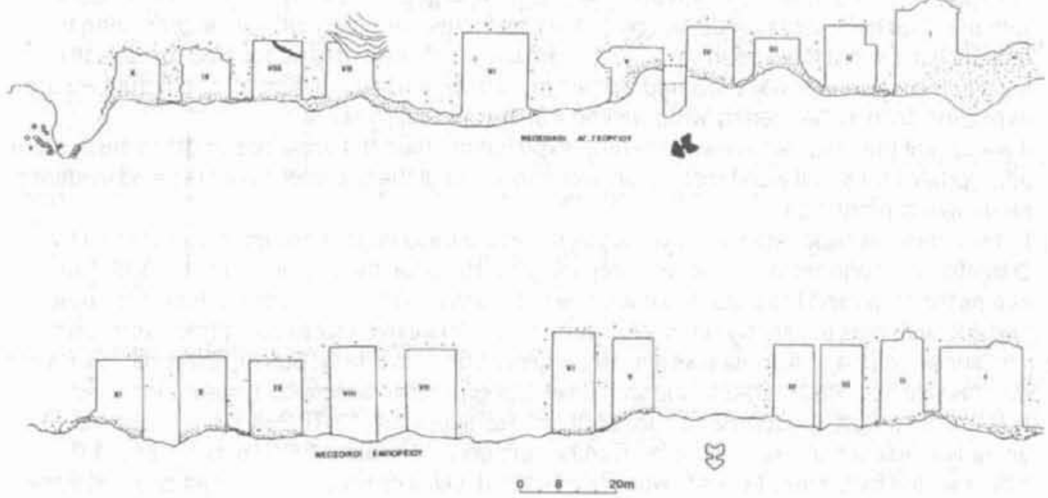

Fig. 1

Fig. 2

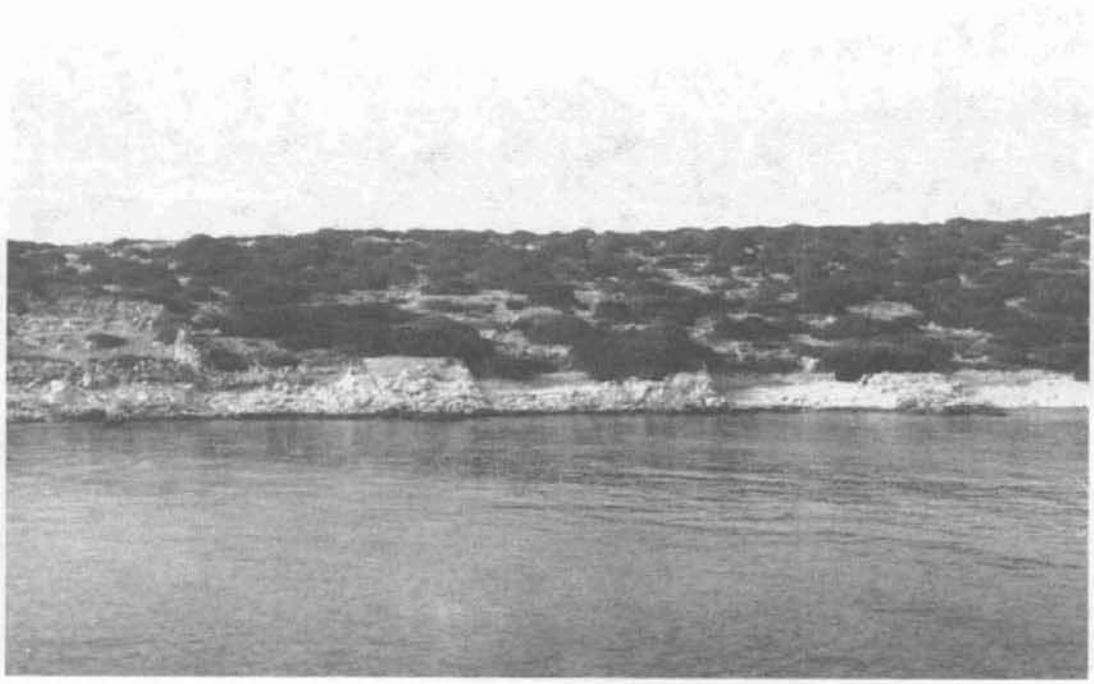

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

THE BLACK WARE CARGOES. A 4TH CENTURY BC WRECK AT DATILLO, NEAR THE ISLAND OF PANAREA IN THE AEOLIAN ARCHIPELAGO

Around 1980, a wreck was found off the rock of Dattilo, in front of the island of Panarea in the Aeolian Archipelago. The wreck is important because it dates to the late Classical Period and is our first example of a single product cargo. The material raised consisted almost entirely, of black-painted fine wares (cups, plates, bowls, jugs, lamps etc) of apparent Sicilian manufacture, but in immitation of forms that were of Greek origin. The wreck is unusual in that it fetched up within the crater of a submerged volcano; this presented the excavators from Oxford University MARE with a set of difficulties never before faced by underwater archaeologists.

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Oxford University

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EDITOR'S NOTE

Since making his presentation at the 4th Symposium on Ship Construction in Antiquity, in Athens, Dr. Bound wrote several articles on the "Datilo wreck" which are given above, together with a brief abstract of this communication.

ΧΑΛΚΙΝΟ ΕΜΒΟΛΟ ΠΛΟΙΟΥ

Τα τελευταία χρόνια έχει δοθεί ιδιαίτερη ώθηση στην μελέτη των θεμάτων της αρχαίας ναυπηγικής και της ναυσιπλοΐας στην περιοχή της Μεσογείου - το κέντρο του αρχαίου κόσμου.

Απόδειξη το παρόν 4ο, ήδη, διεθνές συμπόσιο με θέμα την "Ναυπηγική στην Αρχαιότητα", που οργάνωσε και πάλι το δραστήριο "Ελληνικό Ινστιτούτο Προστασίας Ναυτικής Παράδοσης" με ψυχή και νούν τον ακάματο καλό φίλο κ. Χάρη Τζάλα, τον οποίο και ευχαριστώ για την ευγενική του πρόσκληση συμμετοχής.

Για να προχωρήσει όμως θετικά η μελέτη των θεμάτων αυτών και να πλησιάσουμε στην κατανόηση των λεπτομερειών και στην γνώση των διαδικασιών, που επέτρεψαν στον άνθρωπο των χιλιετιών που πέρασαν να διακινηθεί (είτε ειρηνικά, είτε πολεμικά) στον θαλάσσιο χώρο της ανατολικής Μεσογείου, πρέπει πρώτα να συλλέξουμε και να καταγράψουμε όλες τις δυνατές πληροφορίες και γνώσεις από τις αρχαίες φιλολογικές πηγές, καθώς και τα αρχαιολογικά ευρήματα, που είναι στη διάθεσή μας. Η στην συνέχεια συνθετική επεξεργασία των στοιχείων αυτών είναι εκείνη που θα καταστήσει δυνατό τον σχηματισμό μιάς καλλίτερης και σαφέστερης συνολικής εικόνας του θέματος.

Μέσα σε αυτό το πνεύμα βρίσκεται η παρουσίαση σήμερα ενός χάλκινου αρχαίου, που φυλάσσεται και εκτίθεται στο εποπτευόμενο από την Α' Εφορεία Αρχαιοτήτων (Ακροπόλεως), "Μουσείο Παύλου και Αλεξάνδρας Κανελλοπούλου", στην Πλάκα. Το αρχαίο αυτό μαζί με πολλές άλλες αξιόλογες αρχαιότητες καθώς και μνημεία της μεσαιωνικής μας και νεώτερης τέχνης, ανήκε στην σημαντική ιδιωτική συλλογή του Παύλου και της Αλεξάνδρας Κανελλοπούλου, που δωρήθηκε το 1972 στο Κράτος και στεγάζεται σήμερα στο κομψό νεοκλασικό σπίτι της οδού Θεωρίας και Πανός στην Πλάκα, στα ριζά της Ακρόπολης[1].

Το χάλκινο αυτό αρχαίο (αρ. ευρ. Μουσείου 138) είναι μέχρι τώρα αδημοσίευτο και παραμένει άγνωστο, αν και αναφέρεται στον κατατοπιστικό κατάλογο της έκθεσης του Μουσείου, που συνέταξε και εξέδωσε το 1985 η αρχαιολόγος κα Μαρία Μπρούσκαρη[2].

Πρόκειται για μία χάλκινη τριγωνική θήκη, που έχει την μορφή ρύγχους θαλασσινού ζώου, με πτυχωτό δέρμα και σειρές δοντιών κάτω. Η θήκη είναι ακέραιη (πλην μιας μικρής απόκρουσης στην άνω απόληξη), μήκους 0,35μ., κοίλη εσωτερικά και χυτευμένη ενιαία με την μέθοδο του "χαμένου κεριού". Το μέταλλο της θήκης είναι σχετικά παχύ (παχ. 0,04μ.) και οι πτυχώσεις χυτευμένες, ενώ οι σειρές των δοντιών είναι εγχάρακτες "εν ψυχρώ", δηλ. μετά την χύτευση του αντικειμένου. Οι δύο ελλειψοειδείς οφθαλμοί του κήτους (0,025 X 02) είναι κενοί, ίσως άλλοτε πληρούμενοι από άλλη ύλη, όπως κενά είναι επίσης και τα ρουθούνια.

Το ρύγχος του ζώου είναι μακρουλό και θα κάλυπτε το άκρο ενός ξύλινου εμβόλου, στο οποίο στερεωνόταν με μεγάλα χάλκινα καρφιά (μήκους 0,065μ. το καθένα). Κρίνοντας από τις σωζόμενες τρύπες υπήρχαν τρία καρφιά στην περιφέρεια του ανοίγματος της θήκης (σώζονται 2) και δύο στην κάτω επίπεδη επιφάνεια, που δεν σώζονται όμως σήμερα. Σήμερα επίσης δεν διατηρούνται στο εσωτερικό ίχνη της απόληξης του ξύλινου εμβόλου, που θα ήταν, κρίνοντας από την μορφή της θήκης, ορθογώνιας διατομής, πλάτους περίπου 0,065μ.

Σύμφωνα με πληροφορίες του συλλογέα, βρέθηκε στον Κορινθιακό κόλπο, γεγονός που εάν ανταποκρίνεται στην πραγματικότητα, σημαίνει ότι το αρχαίο θα έκειτο στην ιλύ του πυθμένα της θάλασσας, αφού δεν παρουσιάζει φθορές από την παραμονή του στην θάλασσα, ούτε έχουν επικαθίσει σε αυτό ιζήματα, ούτε έχει προσβληθεί από μικροοργανισμούς, όπως συμβαίνει σε ανάλογες περιπτώσεις (πρβλ. χάλκινα ναυαγίου Αντικυθήρων, κ.άλ.)

Η σχετικά φυσιοκρατική απόδοση των χαρακτηριστικών του θαλασσινού ζώου με το πεπλατυσμένο ρύγχος, το πτυχωτό δέρμα και την ποικιλία των δοντιών, επιτρέπει την αναζήτηση του είδους, στον πραγματικό κόσμο των ζώων της θάλασσας.

Για την ταύτιση απευθύνθηκα στο διεθνώς γνωστό "Μουσείο Γουλανδρή Φυσικής Ιστορίας" στην Κηφισιά, και ευχαριστώ ιδιαίτερα την ψυχή του Μουσείου κα Νίκη Γουλανδρή για την βοήθεια της, καθώς και τον επιστημονικό συνεργάτη του Μουσείου ζωολόγο κο Αχιλλέα Δημητρόπουλο για τις πληροφορίες του.

Το χάλκινο του Μουσείου Κανελλοπούλου ταυτίστηκε αμέσως από τον κο Δημητρόπουλο ως αποδίδον κεφαλή καρχαρία/σκυλόψαρου επιβεβαιώνοντας έτσι τις πρώτες σκέψεις. Η αρχική όμως σύλληψη του αρχαίου καλλιτέχνη, να αποδώσει δηλαδή ένα από τα πάνω από 20 είδη καρχαρία που επιχωρίαζαν στην Μεσόγειο, ξεστράτισε, αφού τελικά κατέληξε να κατασκευάσει ένα φανταστικό ζώο με την προσθήκη χαρακτηριστικών θηλαστικών ζώων της στεριάς.

Ο λοβός του ρουθουνιού, η θέση του ματιού στο μέσο του κεφαλιού, η θέση του στόματος στο κάτω μέρος του κεφαλιού και τα μυτερά μεσαία δόντια είναι όλα χαρακτηριστικά του καρχαρία που είναι ψάρι, όχι θηλαστικό. Αντίθετα ο σχηματισμός των ρουθουνιών, η μικρή γλώσσα που εξέχει, τα ακραία πλακοειδή δόντια είναι χαρακτηριστικά χερσαίων θηλαστικών, όπως το άλογο ή ο σκύλος, δηλαδή ζώα φυτοφάγα ή παμφάγα. Η πτύχωση του δέρματος και η ανύψωση του ρύγχους, που δεν απαντούν στον πραγματικό καρχαρία, μπορεί κατά τον κο Δημητρακόπουλο, να αποδοθούν στο γεγονός ότι ο αρχαίος καλλιτέχνης θα μελέτησε τον καρχαρία από αποξηραμένο ή χημικά διατηρημένο, νεκρό πια παράδειγμα.

Τα είδη του καρχαρία κυμαίνονται στο μήκος τους από 1-8μ. αλλά τα περισσότερα είναι 3-5μ. και υπήρξαν πάντοτε επικίνδυνα, το φόβητρο των ναυτικών και των ψαράδων της Μεσογείου όλων των εποχών.

Η περιγραφή του χάλκινου αντικειμένου του Μουσείου Κανελλοπούλου έκανε σαφή, πιστεύω, την χρήση του: πρόκειται για την μεταλλική ενισχυτική απόληψη του ξύλινου εμβόλου ενός πολεμικού πλοίου. Το έμβολο γενικά, τοποθετημένο στο ύψος της ισάλου γραμμής, υπήρξε πολεμικό εξάρτημα των αρχαίων ελληνικών πλοίων καθ' όλη την αρχαιότητα, όπως απέδειξαν οι σχετικές μελέτες, ιδιαίτερα του Cecil Torr, του J. Morrison και του καθηγητή L. Casson[3].

Ίσως εφεύρεση των φοινικικών ναυτικών πόλεων της ανατολικής Μεσογείου, το έμβολο και η χρήση του φαίνεται ότι εισάγονται στον ελληνικό χώρο κατά τον 9ο αι. π.Χ., πιθανότατα αρχικά στις ευβοϊκές πόλεις, όπως το Λευκαντί[4]. Η κατασκευαστική αυτή λεπτομέρεια, δηλαδή η ύπαρξη κεντρικού επιθετικού εμβόλου, προϋποθέτει τώρα και βασικές νέες τροποποιήσεις στην τεχνική της κατασκευής των πλοίων, ώστε να ενισχυθεί το σκαρί του πλοίου, για να μπορεί αυτό να εμβολίσει, αλλά και για να ανθέξει στον κλυδωνισμό και στην πίεση του εμβολισμού. Αλλά επίσης και νέα εξάσκηση του έμψυχου υλικού (των ναυτικών) προϋποτίθεται, για την εκτέλεση των κατάλληλων ελιγμών που απαιτεί ο εμβολισμός του εχθρικού πλοίου και την διεξαγωγή της μάχης που ακολουθούσε.

Το έμβολο υπήρξε ιδιαίτερο χαρακτηριστικό των ελληνικών πολεμικών πλοίων κατά τους γεωμετρικούς, αρχαϊκούς, κλασικούς και ελληνιστικούς χρόνους και χρησιμοποιήθηκε επίσης από την ρωμαϊκή ναυτική, πολεμική μηχανή.

Ήδη από νωρίς το ξύλινο έμβολο απέκτησε μεταλλική ενίσχυση (χάλκινη ή σιδερένια), ώστε και το πλήγμα που θα επέφερε στο αντίπαλο πλοίο να είναι καίριο και αποτελεσματικό. Η πιο συνηθισμένη μορφή που έλαβε η μεταλλική αυτή επένδυση, ήταν της κεφαλής του κερασφόρου κριού, απ' όπου έλαβε και το όνομα του γενικά το έμβολο: "κριός" (Ram στα αγγλικά). Σε αυτό ακολουθούσε προφανώς την παρόμοια χρήση της κεφαλής του κριού στο ομώνυμο πολιορκητικό στεριανό μηχάνημα των αρχαϊκών και κλασικών χρόνων[5]. Η δύναμη ώθησης που χαρακτηρίζει το ζώο κριός και που αποτελεί κυριότατο γνώρισμα ανδρείας και υπεροχής στην μάχη, έγινε προφανώς η αιτία της χρησιμοποίησης μεταφορικά του ονόματος, καθώς και της ίδιας της μορφής της κεφαλής του ζώου, και στα έμβολα των πολεμικών πλοίων των Ελλήνων.

Όμως εκτός από τον κριό χρησιμοποιήθηκε για την επένδυση του εμβόλου και η μορφή της κεφαλής του κάπρου, κυρίως στα πολεμικά πλοία των Σαμίων[6]. Τα υπόλοιπα, ολίγιστα μεταλλικά έμβολα που έχουν διασωθεί μέχρι σήμερα, ή που απεικονίζονται σε αρχαία έργα τέχνης, είναι οδοντωτά και δεν φέρουν συγκεκριμένη μορφή ζώου, εκτός από το έμβολο του Μουσείου Κανελλοπούλου, που παρέμεινε όμως άγνωστο στην σχετική βιβλιογραφία.

Το χάλκινο έμβολο του Μουσείου Κανελλοπούλου με την μορφή του θαλασσινού ζώου είναι μικρού μεγέθους (μηκ. 0,35μ.) και μικρού βάρους (4,165 gr.) και εξ αυτών προϋποθέτει μικρό πολεμικό πλοίο. Εάν αποκλεισθεί η πιθανότητα ο χάλκινος "κριός" Κανελλοπούλου να ανήκε σε αναθηματικό, μικρογραφικό πλοίο, τότε πρέπει κανείς να στραφεί σε πραγματικό πολεμικό πλοίο, μικρών όμως διαστάσεων.

Από τις φιλολογικές πηγές και τους αρχαίους ιστορικούς γνωρίζουμε ότι κατά την μέση ελληνιστική εποχή παρατηρείται μια γενική στροφή προς τα μικρά και ευέλικτα πλοία, σαν αντίρροπη προφανώς τάση προς την παρατηρούμενη σύγχρονη υπερβολική αύξηση του όγκου των πλοίων ορισμένων πλούσιων ναυτικών δυνάμεων.

Παράλληλα, κατά τον 3ο και 2ο αι. π.Χ. παρατηρείται μια σημαντική αύξηση του φαινομένου της πειρατείας, ιδιαίτερα στις ανατολικές ακτές της Αδριατικής και στο Ιόνιο. Κυριώτερος πειρατικός λαός ήταν την εποχή αυτή οι Ιλλυριοί, γνωστοί και ως Λιβυρνοί[7]. Αυτοί, φαίνεται, ότι εισήγαγαν τον τύπο του μικρού και ευέλικτου πλοιαρίου, που έγινε γνωστό με το όνομα "λέμβος".

Είναι ενδιαφέρον ότι ο νέος αυτός τύπος ελαφρού πλοίου, αφού δοκιμάστηκε με επιτυχία από τους πειρατές —με οδυνηρές συνέπειες για όλες τις παράλιες ελληνικές πόλεις— έγινε αποδεκτός και από ορισμένες οργανωμένες ελληνικές ναυτικές δυνάμεις, όπως η Σπάρτη και η Μακεδονία. Στην συνέχεια με την ονομασία "Λιβυρνίς" έγινε ο βασικός τύπος πλοίου στο ναυτικό της αυτοκρατορικής Ρώμης[8].

Η λέμβος φαίνεται ότι διακρινόταν σε διάφορους τύπους, ανάλογα με τις διαφορετικές χρήσεις της. Όταν χρησιμοποιείτο ως μάχιμη μονάδα, διατηρώντας πάντοτε το επίμηκες και ευέλικτο αρχικό της σχήμα, μπορούσε να φέρει μέχρι και 50 κωπηλάτες, να έχει διώροφη θέση γι' αυτούς, καθώς επίσης οξεία πρώρα και ίσως και έμβολο. Την ύπαρξη πάντως εμβόλου στις λέμβους αμφισβητούν οι περισσότεροι νεότεροι μελετητές των ναυτικών θεμάτων[9].

Άλλος, παρόμοιος τύπος ελαφρού πλοίου εμφανίζεται τους χρόνους αυτούς, - πάντοτε σε σχέση με τις λέμβους - και φέρει το όνομα "πρίστις", ακριβώς από το ομώνυμο θαλασσινό κήτος[10]. Το κήτος πρίστις είναι γνωστό από την αρχαία γραμματολογία, ήδη από τον 5ο αι. π.Χ. και αναφέρεται από τον κωμικό Επίχαρμο, τον Αριστοτέλη, τον ιστορικό Πολύχαρμο και τους μεταγενέστερους Οππιανό και Αιλιανό[11]. Το κήτος αυτό (γνωστό στην ζωολογία σήμερα ως PRISTIS ANTIQUORUM) έχει σώμα μεγάλο, επίμηκες και χαμηλό, ισχυρότατη ουρά και ιδιαίτερα μακριά σιαγόνα με δύο σειρές ισχυρότατων, πριονωτών δοντιών. Τα χαρακτηριστικά αυτά του κήτους προφανώς μιμείται ο τύπος του πλοίου που φέρει και το όνομά του, για να σκορπίζει στον εχθρό τον φόβο, ακόμη και με την θέα του.

Πιθανότατα όμως και άλλα θαλασσινά ζώα, όπως το επίφοβο σκυλόψαρο, έδωσαν τη μορφή τους για την κατασκευή εμβόλων πλοιαρίων του τύπου αυτού, όπως το έμβολο του Μουσείου Κανελλοπούλου . Στην έμπνευση αυτή ίσως έπαιξε κάποιο ρόλο και η ιδιαίτερα αγαπητή στην ελληνιστική περίοδο παράσταση της μυθικής, φοβερής, θαλασσινής Σκύλλας, με τις τρεις απολήξεις σε μορφή κυνοκεφάλων, όπως μας περιγράφεται ήδη από το ομηρικό έπος (Οδύσσεια, μ' 85 κ.επ.) και γνωρίζουμε από έργα του 4ου αι. π.Χ.[12]

Πάντως, πιστεύω, ότι η μη ανταποκρινόμενη στην πραγματικότητα πτύχωση του δέρματος της κεφαλής του καρχαρία που παρατηρείται στο έμβολο του Μουσείου Κανελλοπούλου, μπορεί να εκπληρούσε και λειτουργική ανάγκη αφού το πτυχωτό μέταλλο θα αντιστεκόταν καλλίτερα στις πιέσεις ενός εμβολισμού.

Εάν υπάρχει αμφιβολία από τους νεωτέρους μελετητές για την ύπαρξη εμβόλου στις λέμβους, μια αναφορά του Τίτου Λίβιου καθιστά βέβαιη, πάντως, την ύπαρξη εμβόλου στις πρίστεις. Ο Ρωμαίος ιστορικός σε μια περίπτωση μεταφράζει την αντίστοιχη αναγραφή του Πολύβιου, που αναφέρει "πρίστιν", σε "NAVE ROSTRATA", δηλαδή πλοίο με έμβολο (rostrum). Ο Πολύβιος συγκεκριμένα αναφέρει (18.1.1) ότι το 197 π.Χ. ο Φίλιππος ο Ε' της Μακεδονίας απέπλευσε "πέντε λέμβους έχων και μίαν πρίστιν", και ο Τίτος Λίβιος, όταν αναφέρεται στο ίδιο γεγονός, σημειώνει μεταφράζοντας τον Πολύβιο, ότι ο Φίλιππος απέπλευσε "CUM QUINQUE LEMBIS ET UNA NAVE ROSTRATA" (32,32,9).

Η απόδοση αυτή του Τίτου Λίβιου, δεν πρέπει να οφείλεται σε σύγχυση και άγνοια του ιστορικού, όπως υπέθεσαν ορισμένοι μελετητές[13], αλλά σημαίνει ακριβώς ότι στους μικρούς ναυτικούς σχηματισμούς του Φιλίππου και του Νάβι της Σπάρτης, οι λέμβοι αποτελούσαν το πλήθος, ενώ ολιγαριθμότερες πρίστεις ήσαν πλοία πιο ενισχυμένα και αξιόμαχα, ίσως εκτελώντας το ρόλο της ναυαρχίδας του στολίσκου.

Τούτο προφανώς γνώριζε ο ρωμαίος ιστορικός και προκύπτει έμμεσα και από την άλλη περίπτωση, όπου ο Πολύβιος αναφέροντας τα καθέκαστα της ναυμαχίας της Χίου (201 π.Χ) σημειώνει (16, 2-8), ότι ο Φίλιππος ο Ε΄ της Μακεδονίας είχε στόλο συνολικά μεν 150 μικρών πλοίων, υποδηλώνεται όμως σαφώς ότι οι πρίστεις ήσαν οι ολιγώτερες αριθμητικά: "λέμβοι δε συν ταις πρίστεσιν εκατόν και πεντήκοντα".

Ο Τ. Λίβιος αναφέρει (44.28.1) ακόμη, ότι πρίστεις είχε στο στόλο του και ο Περσέας της Μακεδονίας.

Μετά τις τελευταίες αυτές μνείες η πρίστις, ως τύπος πλοίου, δεν αναφέρεται ξανά στην αρχαία γραμματολογία, πράγμα που μαρτυρεί ότι ο τύπος έπεσε σε αχρηστία και ξεπεράστηκε από άλλους τύπους πολεμικών πλοίων. Εάν κρίνουμε από τις ιστορικές πηγές, η διάρκεια της χρήσης της πρίστης δεν υπερβαίνει συνολικά τον ένα αιώνα, δηλαδή από τα μέσα περίπου του 3ου αι. π.Χ. μέχρι τα μέσα του 2ου αι. π.Χ.

Μέσα σε αυτό το περιεχόμενο είναι δυνατόν να ερμηνεύσει κανείς και να χρονολογήσει τον χάλκινο "κριό" του Μουσείου Κανελλοπούλου: προσηλωμένο στο έμβολο ενός μικρού πλοίου, πιθανότατα τύπου πρίστης, εικονογραφούσε ακριβώς την μορφή ενός επίφοβου θαλασσινού ζώου, όπως ο καρχαρίας. Παράλληλα, από την διάρκεια γενικά της χρήσης του τύπου του πλοίου, μπορεί και ο χάλκινος σωζόμενος "κριός", να χρονολογηθεί αντίστοιχα από τα μέσα του 3ου αι. μέχρι τα μέσα του 2ου αι. π.Χ., γεγονός που συμφωνεί και με την τεχνοτροπική απόδοση των χαρακτηριστικών και λεπτομερειών του χάλκινου εμβόλου.

Ελπίζω, ότι νέα αρχαιολογικά ευρήματα στο μέλλον θα επιβεβαιώσουν την πιο πάνω σειρά των συλλογισμών και θα μας επιτρέψουν μια καλλίτερη αναγνώριση του τύπου αυτού του μικρού, αρχαίου πολεμικού πλοίου, της πρίστης, και των ιδιαίτερων κατασκευαστικών χαρακτηριστικών της, όπως το χάλκινο έμβολο.

Πέτρος Γ. Καλλιγάς

Έφορος των Αρχαιοτήτων

Διευθυντής της Ακροπόλεως

ΣΗΜΕΙΩΣΕΙΣ

1. Μ. Μπρούσκαρη, Μουσείο Παύλου και Αλεξάνδρας Κανελλοπούλου, *ΑΑΑ* ΙΧ (1976), 130-152 – Π. Γ. Καλλιγάς, *ΑΔ* 45 (1990) Χρονικά 15-16.
2. Μ. Μπρούσκαρη, Το Μουσείο Παύλου και Αλεξάνδρας Κανελλοπούλου – Οδηγός, Αθήνα 1985, 46 και διορθωμένη έκδοση του 1994). Τα σχέδια του εμβόλου, που συνοδεύουν το παρόν άρθρο, συντάχθηκαν από τον κ. Κ. Καζαμιάκη αρχιτέκτονα-τοπογράφο της Εφορείας Αρχαιοτήτων Ακροπόλεως, τον οποίο και ευχαριστώ θερμά.
3. C. Torr, Ancient Ships, Chicago 1964^2, J. S. Morrison and R. T. Williams, *Greek Oared Ships 900-322 BC*, Cambridge 1968; L. Casson, *Ships and Seamastership in the Ancient World*, Princeton 1986^2.
4. M. Popham, An Early Euboean Ship, *Oxf. Journ. of Arch.* 6 (1987), 353 ff.; P. G. Calligas, Early Euboean Ship Building, *Τρόπις* ΙΙ, Αθήνα, 1990, 77-83.
5. E. Kunze, *Rammabock, Olympia Bericht V*, Berlin 1956, 75-78; Γ. Σ. Κορρέ, *Τα μετά Κεφαλών Κριών Κράνη*, Αθήναι 1970, 252-3.
6. L. Casson (βλ. σημ. 3), σελ. 63-4, σημ. 104 και 109. Μορφές διαφόρων ζώων στα έμβολα πλοίων που εικονίζονται σε αττικά μελανόμορφα αγγεία του 6ου αι. π.Χ. βλ. L. Casson, figs. 81, 82, 85, 88, 89, 90.
7. H. Bengtson, Ιστορία της Αρχαίας Ελλάδος, (μεταφρ. Α. Γαβρίλη) Αθήνα 1979, 358. Για την πειρατεία των Αιτωλών, βλ. Γερ. Κατωπόδη, Αιτωλική Συμπολιτεία, Αθήναι 1977, 440 κ. εξ.
8. L. Casson (βλ. σημ. 3), σελ. 125-127 και 141-142.
9. Βλ. αντίθετα L. Casson (σημ. 3), 126, σημ. 107.
10. Για το πλοίον "πρίστις" βλ. L. Casson (σημ. 3), 127, όπου και παραπομπές στους ιστορικούς Πολύβιο και Τίτο Λίβιο. Μ. Μ. Σίμψα, Το *Ναυτικό στην Ιστορία των Ελλήνων*, Αθήναι 1982, 333.
11. Για το θαλασσινό κήτος "πρίστις" βλ. Αριστοτέλους, *Περί τα Ζώα Ιστορίαι*, 566, β, 3. Επιχάρμου, Αποσπ. 59. Οππιανού, *Αλιευτικά Ι*, 370. Αιλιανού *Περί Ζώων Ιδιότητος*, 9, 49.
12. Π. Θέμελης, Σκύλλα Ερετριακή, *Αρχ. Εφημ.* 1979, 118-153.
13. Το rostrum-i, στα λατινικά σημαίνει ρύγχος ζώου και έμβολο πλοίου και μεταφορικά το βήμα της Αγοράς, γιατί εκεί υπήρχαν έμβολα πλοίων από κάποια ναυμαχία.

ABRIDGED TRANSLATION OF DR. PETROS CALLIGAS PAPER, BY THE EDITOR

BRONZE RAM OF A SHIP

This bronze ram is part of the important private collection of Pavlos and Alexandra Canellopoulos, donated in 1972 to the Greek State and housed today in the "Pavlos and Alexandra Canellopoulos Museum, Plaka (Athens), supervised by the Ephorate of the Acropolis.

It is hollow, shaped in the form of a sea animal muzzel, of 0.35 m length. The thickness of the metal is 0.04 m.

The two eliptic eyes as well as the nostrils are vacant. Two of the three nails that fastened the metal to a piece of wood that penetrated the interior of the ram still exist.

From informations provided by the collector it was found on the sea-bed of the Corinthian gulf.

It is believed from informations provided by the Goulandris' Museum of Natural History, that the ancient artist was initialy aiming to represent the muzzel of a shark, although the final result is a fantastic creature.

The bronze ram at Canellopoulos Museum is small in length (0.35 m) and weights only 4.165 kgs. If we exclude the possibility of it pertaining to a small votive ship, it then may have belonged to a real war-ship, but of small dimensions.

Litterary sources enumerated by the author refer to a light war-ship called "Pristis" and a parallel is drawn between a specie of Mediterranean shark, the "Pristis Antiquorum" and such a craft.

The "Pristis" war-ship existence is recorded for a century, i.e. between the IIIrd and IInd c. B.C. and the caracteristics of this ram concord with such a dating.

H.T.

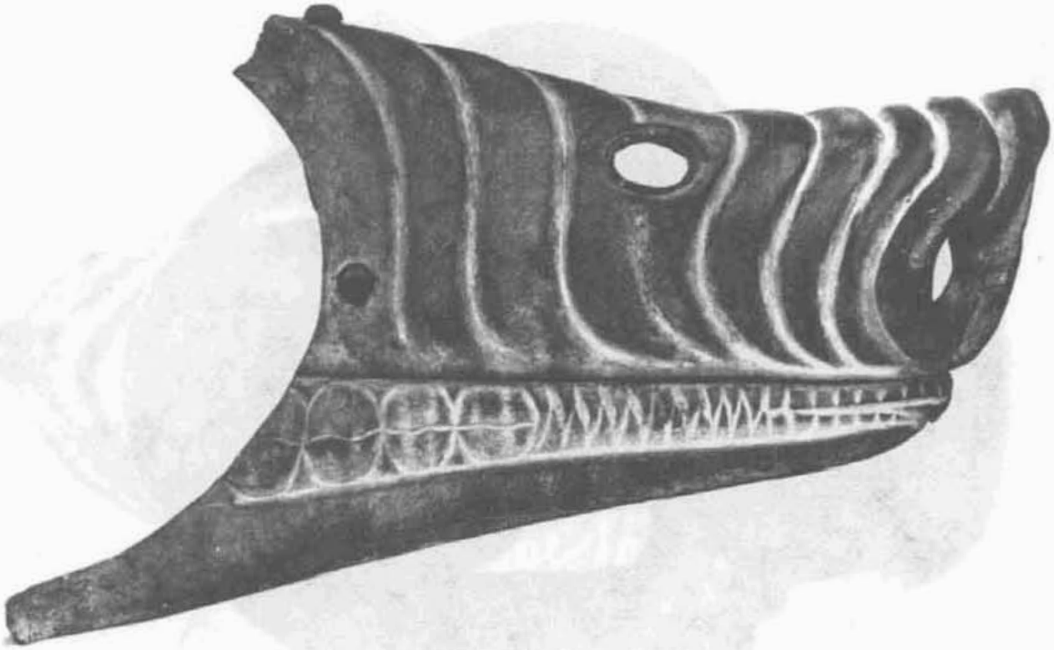
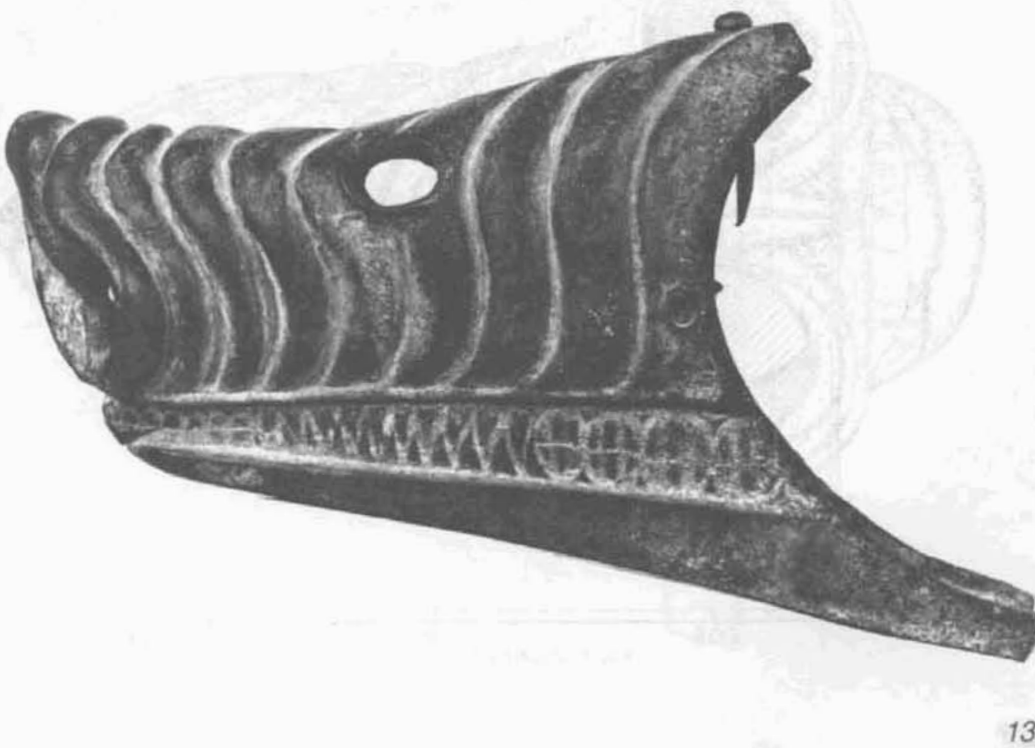


Fig. 1

Fig. 2



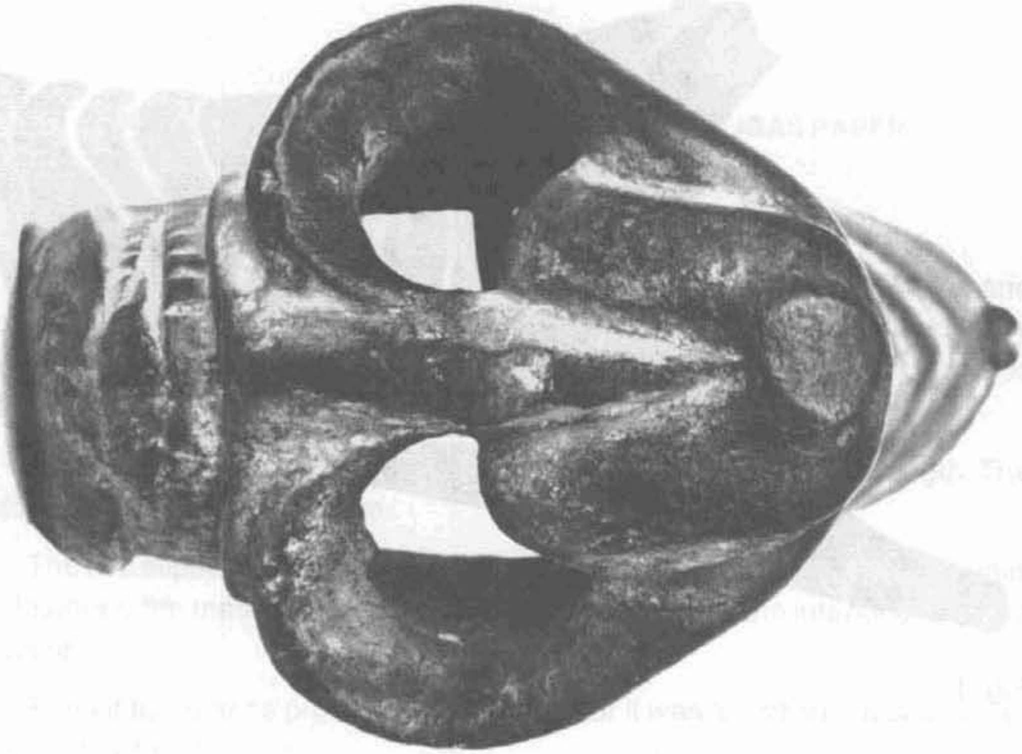
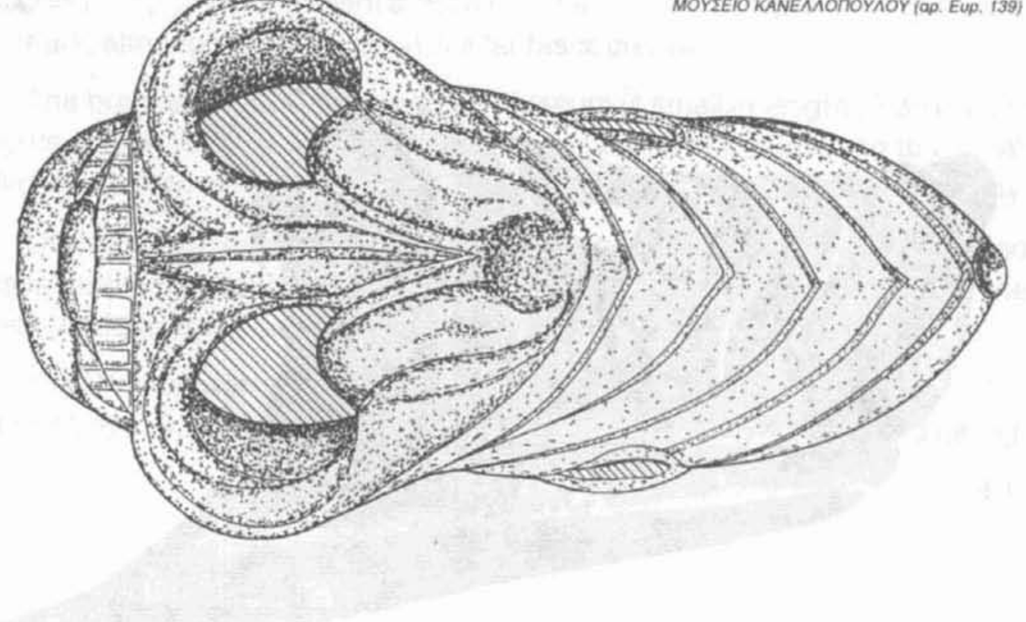
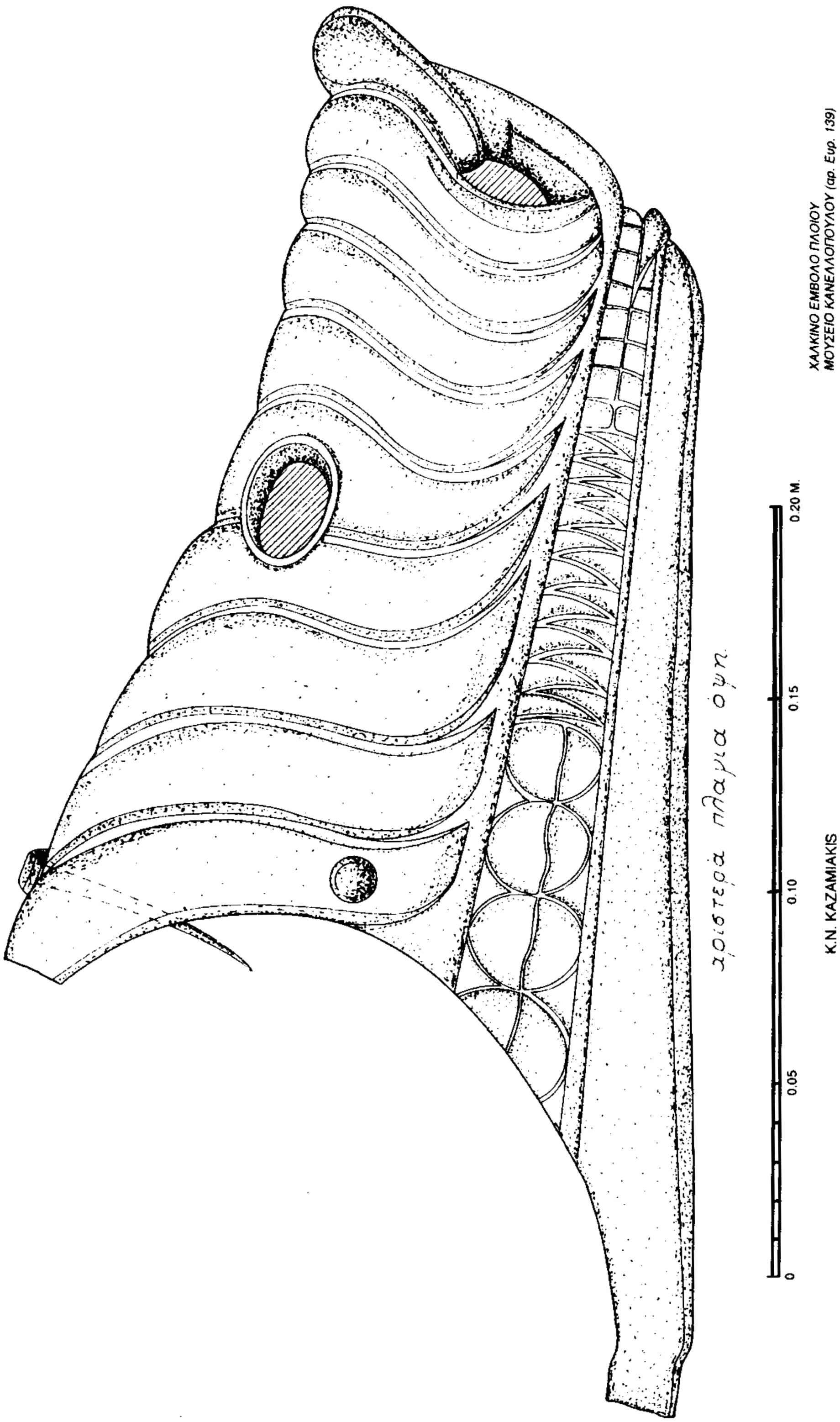


Fig. 3

Fig. 4

ΧΑΛΚΙΝΟ ΕΜΒΟΛΟ ΠΛΟΙΟΥ
ΜΟΥΣΕΙΟ ΚΑΝΕΛΛΟΠΟΥΛΟΥ (αρ. Ευρ. 139)

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0
0.05
0.10
0.15
0.20 M.
K.N. KAZAMIAKIS
αριστερά πλάγια όψη

Fig. 5

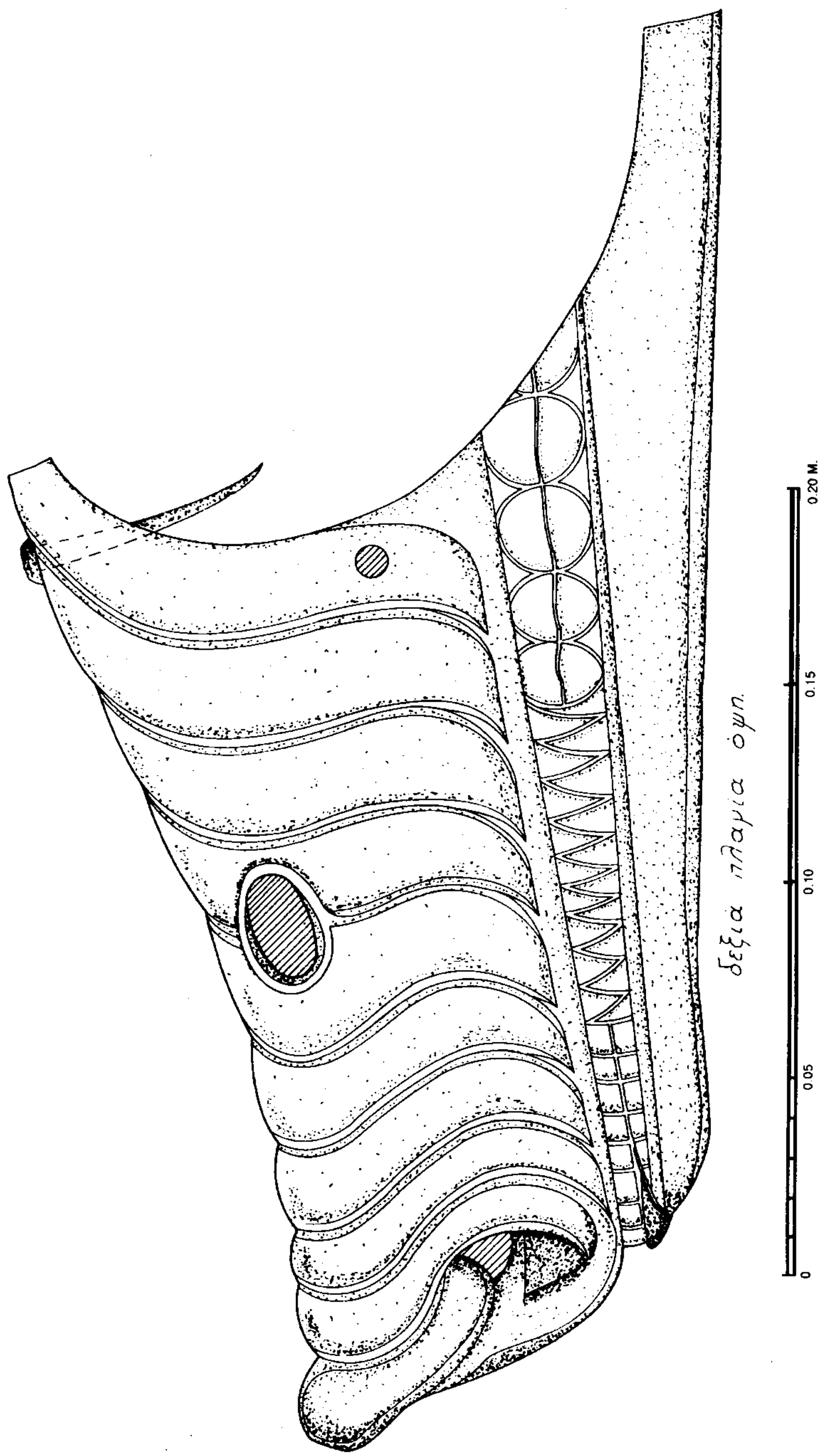

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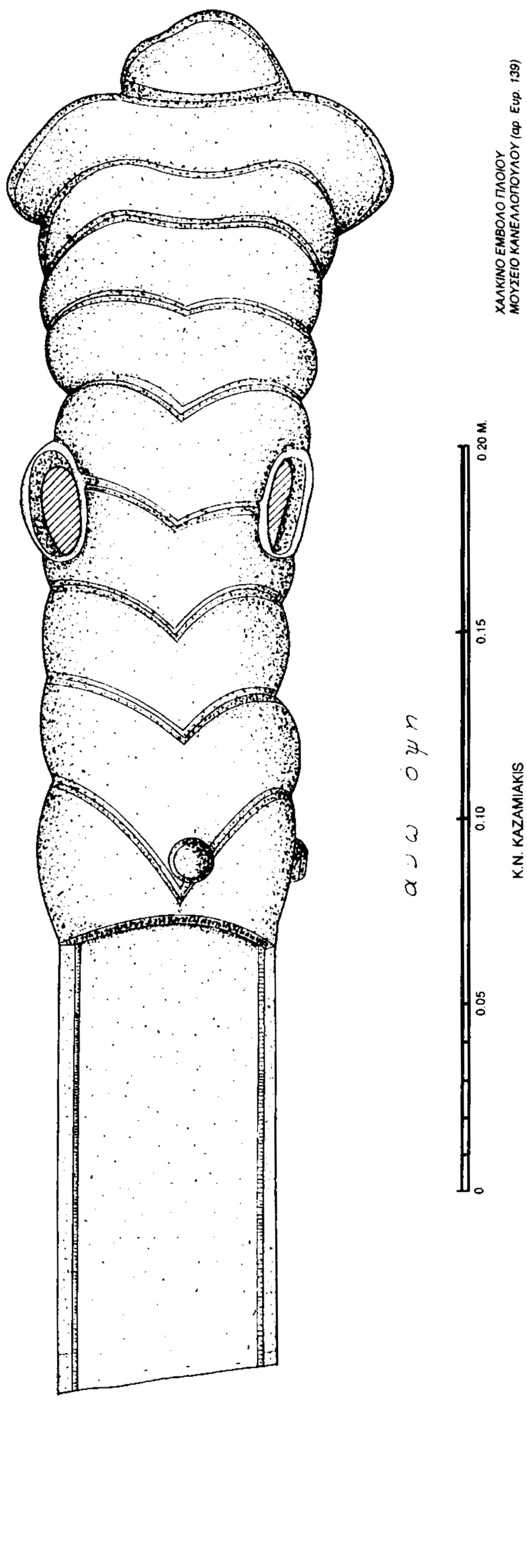
Fig. 6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ΜΟΥΣΕΙΟ ΚΑΝΕΛΛΟΠΟΥΛΟΥ (αρ. Ευρ. 139)
0
0.05
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0.15
0.20 M.
K.N. KAZAMIAKIS

Fig. 7

DOCUMENTARY EVIDENCE FOR SHELL-FIRST CONSTRUCTION

A papyrus fragment found in Egypt, obviously from a shipyard's ledger, records payments to shipwrights and sawyers working on a boat.

The sequence of payments indicates clearly that shell-first construction was being used.

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EDITOR'S NOTE

Prof. Casson made an oral presentation. The above is a brief description of his communication.

KÉLEUSTE, AULÈTE, TRIERAULÈTE, SON MUSICAL ET MANOEUVRES DES BATEAUX

Grâce à une inscription du début du 4e siècle av. J.-C. (IG II^2 1951) on a la chance de disposer de listes d'équipages de différentes trières athéniennes de cette époque. Parmi les membres de ces equipages on trouve le kéleustès et l'aulétès. Ces deux personnages se retrouvent également, toujours l'un à côté de l'autre, dans la classification des équipages des navires que propose le lexicographe Pollux dans son *Onomasticon* (προσθετέον δὲ τούτοις καὶ τριηραύλην καὶ κελευστήν). Kéleuste et aulète font aussi belle équipe dans un autre texte. Polyaenos (5.2.5) raconte la ruse dont s'est servi Dionysios pour s'approprier l'île de Naxos. Il fit envoyer au port de Naxos une pentécontore avec comme passagers des aulètes et des kéleustes dont chacun semblait ordonner une trière. Les Naxiens, alors, croyant qu'allaient arriver autant de trières qu'îls voyaient des kéleustes et des aulètes ont eu peur et se sont rendus sans résistance à Dionysios. On sait par les sources mentionnées ci-dessus aussi bien que par la Souda que le kéleuste a autorité sur les rameurs (et selon Souda sur les épibates = passagers qui ne font pas partie de l'équipage, souvent des guerriers) et qu'il reçoit ses ordres soit par le kybernète directement soit par l'intermédiaire du proreus (Fig. 1).

Dans l'époque homérique on n'a pas le grade du kéleuste; pourtant Homère emploie le verbe κελεύω (inciter, donner des ordres) pour désigner la commande des manoeuvres nautiques qu'ordonne Télémaque à ses compagnons de bateau (Od. 2.422-423).

Selon les récits mythiques, le premier kéleuste qui exerçait, en même temps, la fonction du musicien sur un bateau fut Orphée. Dans ses *Argonautiques* Apollonius de Rhodes nous dit que les Argonautes "aux sons de la lyre d'Orphée, ils frappaient de leurs rames les flots impétueux de la mer et les vagues venaient battre le navire": ὥς οἵ ὑπ' Ὀρφῆος κιθάρῃ πέπληγον ἐρετμοῖς πόντου λάβρον ὕδωρ ἐπί δέ ρόθια κλύδοντο, Ap. Rh. 1.540.

La participation d'Orphée Fig. 2 à l'expédition argonautique est mentionnée par Pindare lorsque, dans la 4e *Pythique,* le premier récit complet sur l'expédition des Argonautes, il donne les noms des héros qui ont répondu à l'appel de Jason. Des listes pareilles à celle qu'établit Jason en vue de son voyage ne sont pas, de toute façon, totalement fictives. On possède de l'époque mycénienne des listes de rameurs qui remontent au 13e siècle av. J.-C. (Fig. 3).

Dans les fragments d'*Hypsipylé* d'Euripide le rôle d'Orphée est clairement mentionné comme de celui qui rythme les gestes des rameurs et définit la rapidité de la nage: "on disait qu'au milieu, à côté du mât, la kitharis thrace d'Orphée criait un chant asianique chantant les ordres aux rameurs aux longues rames, tantôt l'ordre de la nage rapide tantôt l'ordre du repos" (fr. I, III 8-14). Bond (l'éditeur, Oxford) constate l'emploi inattendu du mot ἰήιος qui correspond plutôt à un chant triste proche du ἔλεγος (cf. D. Page, *Greek Poetry and Life*, p. 209).

Même si souvent les chants maritimes sont empreignés d'une certaine tristesse on a du mal à expliquer pourquoi cette tristesse trouverait une place dans une occasion pareille. Peut être faut-il penser que la nature du chant mentionné dans se texte d'*Hypsipylé* est dicté par le caractère du discours de l'héroine et pas par la forme qu'affecte généralement le chant destiné à donner le rythme aux rameurs sur un bateau. En réalité ce rythme était souvent modifié tout au long du trajet et il est difficile de penser que ces modifications rythmiques pouvaient être introduites par les variations rythmiques du chant lui même seulement.

Il paraît plus logique de penser que l'intervention du kéleuste et elle seule était en mésure d'imposer et de synchroniser des modifications de rythme rapides et sans danger pour la securité et l'efficacité de la nage.

Les ordres du kéleuste n'étaient pas probablement donnés pendant qu'un aulète jouait et même si ces ordres comportaient parfois en eux un élément rythmique ou musical, leur principales caracteristiques étaient la brieveté et la précision. Une fois le rythme donné, la musique de l'aulète pouvait l'entretenir. Mais l'important était que les matelots puissent entendre clairement les ordres à travers le bruit des flots, le grincement des bois et, souvent, le bruit du combat.

Thucydide nous décrit ce qui pourrait arriver dans le cas contraire. Lorsqu'au IIe livre de son histoire Thucydide parle de la défaite des Corinthiens il précise qu'au milieu du tumulte et de la confusion générale ils negligaient d'exécuter les ordres des kéleustes et ne les entendaient même pas: βοῇ τε χρώμενοι καὶ πρὸς ἀλλήλους ἀντιφυλακῇ τε καί λοιδορίᾳ, οὐδέν κατήκουον οὔτε τῶν παραγγελλομένων οὔτε τῶν κελευστῶν (3.84).

Le contact entre le kéleuste et ses hommes était d'une importance capitale non seulement au moment précis des manoeuvres mais d'une façon plus générale, puisque le kéleuste était le responsable pour l'enseble des rameurs. Arrien précise qu'il relevait de son ressort de distribuer les repas aux hommes: "Les kéleustes distribuèrent sur chaque navire aux rameurs ce qu'il leur revenait et ces derniers une fois qu'ils l'avaient reçu se sont exclamés en se lançant dans une nage accelerée: οἱ κελευσταὶ καθ' ἑκάστην ναῦν τὸ ενδόσιμον τοῖς ἐρέταις ἐνέδοσαν οἱ δὲ ἐπὶ τῇ ἐνδόσει ἀθρόοι τῷ ροθίῳ ἐπηλάλαξαν (App. *Παρθικά* 61 (Rees)= 151 J EGrH). Souda (s.v. κελευστής) propose un tableau analytique des dévoirs des kéleustes. Ceux-ci "commandent aux rameurs et aux épibates et rendent de très grands services; ils veillent à ce qu'on cuise la quantité de pain nécessaire et à ce que les rameurs aient juste leur ration; ce sont eux qui s'occupent du vin, de la viande, de l'huile et de toutes les autres denrées, afin d'avoir toujours à leur disposition ce qu'il faut distribuer chaque jour": (ἄρχει δὲ ὁ πρωρεὺς τῶν κωπηλατῶν) οἱ δὲ κελευσταὶ τούτων αὐτῶν καὶ τῶν ἐπιβατῶν. Μεγίστην δὲ παρέχονται χρείαν οἱ κελευσταὶ καὶ γὰρ ἵνα τοὺς ἄρτους δεόντως πέττωσι καὶ συντελῶσι τὸ μέτρον ἐν τῷ δειπνεῖν οἱ κωπηλάται, τούτοις ἐστὶν ἐπιμελὲς οἴνου, κρέως, ἐλαίου, πάντων τῶν τοιούτων, ἵνα ταῦτα τηροῦντες καθ' ἡμέραν τὸ ἐπιβάλλον ἔχωσι τοῦ διδομένου πρὸς τὴν χρείαν.

Ces textes rendent claire la difficulté et l'importance de la tache du kéleuste qui doit exercer ses fonctions en faisant preuve à la fois de finesse et d'autorité; car c'est à lui de maintenir la discipline si nécessaire pour la bonne issue des opérations.

Lorsque, dans les *Grenouilles* d'Aristophane, Eschyle parle de l' ordre et de la discipline qui regnaient chez les marins à l'époque où il vivait, il donne l'exemple des rameurs qui ne savaient pas autre chose que reclamer leur ration et pousser des cris qui les aidaient à ramer de façon plus efficace. Euripide, son interlocuteur et concurrent dans la même pièce, lui rappelle l'autre aspect de cette discipline; le même rameur pouvait très bien piquer la nourriture de son collègue et lorsqu'il debarquait à terre, il pouvait aussi derober les passants. Maintenant, ajoutte Euripide, le rameur contredit ses supérieures et il ne rame même pas! (Aristoph. *Gren.* 1071-1076).

Ce passage, en dépit de son caractère comique, constitue, néanmoins, un témoignage intéressant sur une réalité que les auteurs qui nous parlent de la marine athénienne n'évoquent pas souvent: le fait que les rameurs pouvaient se lancer à des actes tels que le vol ou le pillage lorsqu'ils échappaient à l'observation des officiers. Les sources nous informent que cet aspect là était aussi du ressort du kéleuste.

La bonne conduite d'un kéleuste à bord est valorisée tout simplement par les résultats. Dans son *Oeconomique* Xenophon nous fait l'inventaire (Oec. XXI.3): "Dans une trière lorsqu'une fois en mer il faut avancer pendant des jours entiers à la rame, certains kéleustes savent agir et parler de façon à enflammer leurs hommes et à leur faire accepter la fatigue de bonne grâce. D'autres, au contraire, sont assez maladroits, pour que la traversée dure deux fois plus dans le temps. Dans le premier cas, l'équipage débarque couvert de sueur, mais félicité par le kéleuste et se félicitant de lui; dans le second, les hommes arrivent sans s'être donné de mal et pourtant ils détestent leur chef et en sont detestés".

Or, on s'apperçoit qu'il y a en effet, deux registres dans l'activité du kéleuste à bord. En premier lieu il y a les ordres eux mêmes, les indications précises qui doivent être données au bon moment moyennant la nature de la manoeuvre et les performances attendues des rameurs, ainsi que la communication avec le proreus et avec les τοίχαρχοι (sous officiers qui commandaient à tous les rameurs d'un des côtés du navire).

Le deuxième régistre qui définit l'activité du kéleuste porte sur le ton sur lequel sont donnés ces ordres et l'ambiance qui est créée dans le but d'obtenir le maximum de la capacité des rameurs. C'est là qu'intervient la musique. On a vu que l'aulète est souvent cité comme un membre de l'équipage de la trière. Il convient, cependant, de préciser que le statut social d'un aulète de trière au Ve et au, IVe siècle, n'était pas, quand même, aussi élevé.

On possède sur ce point le témoignage de Démosthène qui nous revèle (*Περί τοῦ Στεφάνου* 129) le cas d'un "triéraules" dont on connait le prénom, le nom du père, le métier, la classe sociale, l'identité de son épouse et le métier de celle-ci ainsi que le nom de son fils.

Le prénom était Phormion et celà fait de lui le premier personnage historique ayant exercé le métier de "τριηραύλης" dont on connait l'identité. On sait (par Demosthène) qu'il était esclave; l'orateur mentionne -comme il se doit- le nom de son maître: Dion. On connait aussi l'identité de l'épouse de cet aulète; cette dernière travaillait dans une maison de prostitution et c'est de cette maison que Phormion l'a retirée pour l'épouser: Ἀλλ' ὡς ὁ τριηραύλης Φορμίων, ὁ Δίωνος τοῦ Φρεαρρίου δοῦλος ἀνέστησεν αὐτὴν ἀπὸ ταύτης καλῆς ἐργασίας (Demosth. 18.129). Il va de soi qu'on n'aurait jamais eu autant de renseignements sur un personnage aussi sécondaire que Phormion si la femme de celui-ci n'avait pas obtenu plus tard, par une autre alliance, un fils qui préccupait beaucoup Démosthène: le nom de ce fils était Eschine. Le scholiaste du texte de Démosthène précise, à propos de Phormion, qu'il n'était pas tout simplement aulète - car il y en avait qui étaient celèbres - mais qu'il jouait avec son aulos dans un trière un rythme depourvu de musique (ἄμουσον ρυθμόν): οὐχ ἁπλῶς αὐλητής - ἦσαν γὰρ καὶ ἐπίσημοι - ἀλλ' ἐν τριήρει αὐλῶν ἄμουσον ρυθμόν.

Si Demosthène a conservé le nom d'un aulète esclave en témoignant ainsi de l'existence de ce métier, quelques années auparavant Aristophane avait choisi une autre façon de montrer la nécessité d'une musique synchronisée à bord.

En 405 av. J.-C. le public athénien qui s'est reuni pour assister à la représentation des *Grenouilles*, s'est, probablement, retrouvé devant un spectacle assez inhabituel. Un bateau représenté sur scène se mettait en mouvement grâce aux bons soins de Dionysos qui se trouvait dedans et qui soi-disant "ramait" en synchronisant ses gestes avec le rythme dicté par la musique du choeur invisible des Grenouilles. On se rappelle que dans cette pièce, Dionysos dieu du théâtre, deçu par les poètes tragiques vivants descend aux Enfers pour ramener en vie Euripide. A la fin de la pièce c'est Eschyle et pas Euripide qu'il ramène des Enfers. Mais pour aller à Hadès il suit le chemin que sont censés de prendre les defunts, c'est à dire il s'embarque au bateau de Charon. Il y a là toute une série d'allusions comiques qu'il convient d'interroger brièvement pour prendre une idée aussi précise que possible sur le rapport entre la musique et les manoeuvres des bateaux. Tout d'abord il faut préciser que déjà l'image de Dionysos sur un bateau n'est pas une image etrangère aux Athéniens du Ve siècle (Fig. 4). Elle fait l'écho de deux evenements relatifs à Dionysos l'un mythique, l'autre cultuel. Le premier c'est l'épisode de l'épiphanie du dieu aux pirates qui l'avaient enlevé dans un bateau lorsque Dionysos a transformé les pirates en dauphins et le mât du navire en vigne. C'est cet épisode que représente probablement le fameuse coupe d'Exékias (Fig. 5).

Le deuxième événement c'est la procession qui amenait Dionysos en ville sur un bateau roulant qui est souvent représenté par les peintres des vases. Dans ces occasions Dionysos était, d'habitude, accompagné de satyres et de joueurs d'aulos (Fig. 6).

L'apparition fréquente de Dionysos dans un bateau est encore un indice favorable à la présence de l'aulos, instrument lié par excellence au culte dionysiaque, à bord des navires. On peut même se demander si la presence de l'aulète sur les bateaux athéniens ne servait aussi à placer, en quelque sorte, la nef sous la protection du dieu. Lorsque, donc, Aristophane fait Dionysos ramer dans un bateau il crée tout de suite une opposition comique par rapport aux deux images qu'on vient de citer. Mais il y a beaucoup plus.

Charon installe Dionysos près de la rame, il lui montre comment saisir les rames, comment avancer et étendre les bras et comment ramer sans bavarder. Dionysos declare être completement inexpert vv. 203-206.

- Et comment novice que je suis, point marin et point salaminien, pourrai-je pousser la rame?

- Très aisement, répond Charon, car dès que tu auras commencé tu entendras des chants merveilleux.

Ce sont les chants des grenouilles qui chantent comme des cygnes. Du coup Dionysos accepte et demande à Charon de commander la manoeuvre (κατακέλευε). Charon le fait aussitôt et commence à crier o opop, o opop[1]. Ainsi dans cette nage parodique Charon se substitue au kéleuste et le choeur des Grenouílles à l'aulète. C'est, d'ailleurs, le choeur lui même qui mentionne l'aulos dans son chant (ξύναυλον βοὰν ὕμνων). A partir de ce moment commence un dialogue entre les Grenouilles qui restent invisibles et Dionysos qui essaie de ramer sur la musique du choeur[2]. Nous ne disposons pas, bien sûr, de cette musique. Mais déjà la structure métrique suffit à montrer à peu près ce qui se passait. En réalité, chaque fois que Dionysos arrivait à suivre le rythme avec ses paroles et avec ses gestes, les Grenouilles changaient tout de suite de rythme. Ainsi, Charon donne au debut des mètres dactuliques, rythme qu'on pourrait traduire comme un rythme binaire. Les Grenouilles rompent ce rythme avec des metres iambiques et trochaiques (donc ternaire). Lorsque Dionysos adapte ses gestes à ce rythme là les Grenouilles commencent à chanter en mètres dactyliques. Dionysos poursuit en chantant des iambes contre les trochées des Grenouilles, puis en prenant les mètres trochaiques des Grenouilles contre elles-mêmes. Il continue ainsi en variant ses rythmes jusqu'à la fin où il triomphe sur elles. Pendant ce concours il est probable que le rythme devenait de plus en plus rapide et que les maladresses de Dionysos à la rame était évidentes et grottesques aux yeux d'un public constitué, dans la plupart, de rameurs extrêmement habiles. Mais la séance musicale la plus somptueuse qui a eu lieu sur un-vrai-bateau athénien à l'époque classique s'est, probablement, produite au moment du retour triomphal d'Alcibiade à Athènes en 408 av. J.-C.

Plutarque nous apprend ce qui se passait sur le bateau d'Alcibiade ce jour là. "Le joueur d'aulos chargé de rythmer les gestes des rameurs était Chrysogonos, vainqueur aux jeux pythiques, et le chef de manœuvres était l'acteur Callipidès; tous les deux portaient des tuniques droites, des robes trainantes et tous les ornements habituels des concours... le vaisseau amiral entra dans le port avec une voile de pourpre: on aurait dit qu'il conduisait, après boire, un joyeux cortège dionysiaque (Plut. *Alc.* 32). Athenée racontant le même épisode nous dit que Callipidès donnait les ordres du kéleuste (ἐκέλευε) portant l'habit qu'il portait sur la scène et que Chrysogonos, portant l'habit des concours pythiques, a joué sur l'aulos "l'air des trières" (τὸ τριηρικόν) (Ath. 12.353 c-d). Il me semble qu'on ne doit pas comprendre par τὸ τριηρικόν tout air qui était joué à l'aulos sur une trière (comme le fait p.ex. Cartault, "*La trière athénienne*" p. 166), mais un morceau de musique bien précis et officiel qu'on devait répéter souvent dans des occasions précises telles que par exemple. le départ ou l'arrivé d'une expédition maritime. La parure, le style et l'aspect somptueux de ce késleuste-acteur tragique choisi par Alcibiade nous amène au problème de la place qu'occupait traditionnellement le késleuste dans un bateau. Compte tenu des représentations des vases et du besoin d'être entendu par tout le monde - on sait déjà que le késleuste devait avoir une voix assez forte et qu'il servait parfois de héraut (cf. Diod. Sic. XX 50) - Morrison et Williams le situaient au milieu de la nef. C'est, d'ailleurs, la place qu'Euripide reserve à Orphée (μέσῳ πὰρ'ἱστῷ), "au milieu de la nef près du mât", Orphée qui, dans ces récits, exerce les fonctions à la fois du kéleuste et de l'aulète.

Pourtant, plus on regarde les quelques figures de kéleustes qui nous sont parvenues à travers les vases antiques plus on a du mal à les situer dans une place fixe. Peut-être, les kéleustes se tenaient-ils souvent au milieu de bateaux pour mieux être entendus et compris par leurs hommes. Mais déjà les peintures qu'on étudie montrent de façon très claire combien les gestes et la mobilité restent, à côté des paroles, les vertus principales qui assurent l'efficacité des manœuvresf. VII. Et c'est cette mobilité que je voudrais souligner en concluant car c'est cette mobilité qui faisait de cet officier l'agent habile qui concrétise les décisions, l'instrument rapide de l'action. Et c'est la même mobilité qui a fait qu'aujourd'hui même, après tant de siècles pendant lesquels les bateaux n'ont plus besoin de rames pour se mettre en mouvement, le kéleustès reste toujours un grade d'officier et exerce toujours ses fonctions sur les bateaux grecs.

Et qu'en est-il, alors, de l'aulète? Celui-ci, même s'il a pu, avec son jeu, maintenir le rythme des rameurs, même s'il a su parfois contribuer à des traversées rapides, à des victoires difficiles, à des retours inesperés, il n'a pas pu, on l'a vu, obtenir pour sa propre personne un statut social respectable et une dignité professionnele. Il a, donc, disparu. Peut-être, éprouvait-il à bord le même malaise qu'éprouvait Dionysos lorsqu'il ramait dans le bateau d'Aristophane, Dionysos, dont l'aulète n'était, après tout, que l'humble serviteur.

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ILLUSTRATIONS

1a. Aryballe corinthien du milieu du 6e siècle av. J.-C. Provenance: Béotie (Tanagra). Musée National Archéologique d'Athènes (n° 281):kéleuste, rameurs.

1b. Hydrie attique à f. n. (Louvre, E 735). Beazley ABV 85/2 Proreus, kéleuste, timonier.

2. Métope du monoptéros (Trésor) des Sicyoniens à Delphes (Autours du 560 av. J.-C.).
On voit le nef Argo et, au milieu, deux musiciens, Orphée et un autre (Μουσαῖος?) qui tiennent leur lyres. Il s'agit, rappelons-le, de la plus ancienne représentation d'Orphée qui nous et parvenue.

3. Tablette en argile (Helladique récent, III B2, fin du 13e s. av. J.-C.).
Elle a été trouvée dans les fouilles du Palais de Pylos (1939). Elle mentionne trente rameurs (ἐρέται) recrutés de cinq différentes régions de Pylos constituant l'équipage d'un seul bateau dont la destination était Plevron d'Etolie: "ἐρέται Πλευρώνα δε ἰόντες".

4. Amphore antique à f. n. Provenance: Tarquinia. Fin du 6e siècle av. J.-C.

5. Munich, Museum Antike Kleinkunst 2024. 540-534 av. J.-C. Oeuvre d'Exékias.

6. D'aprés un dessin représentant l'arrivée de Dionysos (souvent incarné par l'"archon basileus") accompagné d'aulètes et de satyres sur un bateau roulant, probablement le même qui était utilisé pour transporter le péplos d'Athèna Polias lors des Panathénées. La procession arrivait au sanctuaire de Dionysos à Limnai puis, de là, partait de nouveau une procession avec Dionysos et la basilinna qui aboutissait à l'archeion de l'"archon basileus" où avait lieu leur mariage secret.

7. Même que la. De l'autre côté du vase il y a une Sirène avec une double tête (tête d'homme et tête de femme). La présence de cette Sirène pourrait être un allusion au passage des Argonautes de l'île des Sirènes. Le desordre des rames aurait exprimé l'embaras produit par le contact avec le chant des Sirènes. Morrison et Williams voient 5 rames. J'en vois que quatre. Personnellement je tends à voir un rapport entre les gestes du kéleuste (le timonier gesticule aussi) et le desordre des rames. Même s'il ne s'agit pas du cycle argonautique, la Sirène pourrait insinuer le danger mortel qui serait la conséquence d'une mauvaise manoeuvre que semble corriger le kéleuste.

NOTES

1. Liste indicative des ordres les plus fréquents du kéleuste:

ὄπειδε:	(Appuie) Souda: ἐρείδειν· οὕτω φασίν οἱ Ἀττικοί ὁτιοῦν συντόνως γινόμενον... Ἡ μεταφορά ἀπό τῶν ἐρεττόντων καί ἐπερειδομένων τοῖς κώπαις
ῥόθιον-ῥοθιάζειν:	(Rage accélerée) Souda, Eusthathe 1540, 44, ῥοθιάζειν: τό ἐρέσσειν εὐτόνως
Ρυπαππαὶ	
ἄρρυ	

Ω ὀπόπ, Ω ὀπόπ	Pour donner le rhythme
Ὠόπ, παραβαλοῦ	Souda S.V. Ὠόπ: κέλευσμα τῶν ἐρεσσόντων καταπαῦον τὴν κωπηλασίαν
Παῦε	Tais-toi
Σιώπα	Silence

2. Aristhophane, "Grenouilles", 209-269

βρεκεκεκὲξ κοὰξ κοάξ,
βρεκεκεκὲξ κοὰξ, κοάξ,
λιμναῖα κρηνῶν τέκνα,
ξύναυλον ὕμνων βοὰν
φθεγξώμεθ' εὔγηρυν ἐμὰν ἀοιδάν,
κοὰξ κοάξ,
ἣν ἀμφὶ Νυσήιον
Διὸς Διόνυσον ἐν
Λίμναισιν ἰαχήσαμεν,
ἡνίχ' ὁ κραιπαλόκωμος
τοῖς ἱεροῖσι Χύτροισι
χωρεῖ κατ' ἐμὸν τέμενος λαῶν ὄχλος.
βρεκεκεκὲξ κοὰξ κοάξ.
Δι. ἐγὼ δὲ γ'ἀλγεῖν ἄρχομαι
τὸν ὄρρον ὦ κοὰξ κοάξ·
ὑμῖν δ' ἴσως οὐδὲν μέλλει.
Βα. βρεκεκεκὲξ κοὰξ κοάξ.
Δι ἀλλ' ἐξόλοισθ' αὐτῷ κοάξ·
οὐδὲν γάρ ἐστ' ἀλλ' ἢ κοάξ.
Βα. εἰκότως γ' ὦ πολλὰ πράττων.
ἐμὲ γὰρ ἔστερξαν εὔλυροί τε Μοῦσαι
καὶ κεροβάτας Πὰν ὁ καλαμόφθογγα
παίζων·
προσεπιτέρπεται δ' ο φορμικτὰς
Ἀπόλλων,
ἕνεκα δόνακος, ὃν ὑπολύριον
ἔνυδρον ἐν λίμναις τρέφω.
βρεκεκεκὲξ κοὰξ κοάξ.
Δι. ἐγὼ δὲ φλύκταινας γ' ἔχω,
χὠ πρωκτὸς ἰδίει πάλαι,
κᾆτ' αὐτίκ' ἐκκύψας ἐρεῖ—
Βα. βρεκεκεκὲξ κοὰξ κοάξ.
Δι. ἀλλ' ὦ φιλῳδὸν γένος
παύσασθε.
Βα. μᾶλλον μὲν οὖν
φθεγξόμεσθ', εἰ δὴ ποτ' εὐ-
ηλίοις ἐν ἀμέραισιν
ἡλάμεσθα διὰ κυπείρου
καὶ φλέω, χαίροντες ᾠδῆς
πολυκολύμβοισι μέλεσιν,
ἢ Διὸς φεύγοντες ὄμβρον
ἔνυδρον ἐν βυθῷ χορείαν

αἰόλαν ἐφθεγξάμεσθα
πομφολυγοπαφλάσμασιν.

Δι. βρεκεκεκὲξ κοὰξ κοάξ.
τουτὶ παρ' ὑμῶν λαμβάνω.
Βα. δεινὰ τἄρα πεισόμεσθα.
Δι. δεινότερα δ' ἔγωγ', ἐλαύνων
εἰ διαρραγήσομαι.
Βα. βρεκεκεκὲξ κοὰξ κοάξ.
Δι. οἰμώζετ'· οὐ γάρ μοι μέλει.
Βα. ἀλλὰ μὴν κεκραξόμεσθά γ'
ὁπόσον ἡ φάρυξ ἂν ἡμῶν
χανδάνῃ δι' ἡμέρας.
Δι. βρεκεκεκὲξ κοὰξ κοάξ.
τούτῳ γὰρ οὐ νικήσετε.
Βα. οὐδὲ μὴν ἡμᾶς σὺ πάντως.
Δι. οὐδὲ μὴν ὑμεῖς γ' ἐμὲ
οὐδέποτε· κεκράξομαι γὰρ
κἂν δέῃ δι' ἡμέρας
(βρεκεκεκὲξ κοὰξ κοάξ,)
ἕως ἂν ὑμῶν ἐπικρατήσω τῷ κοάξ,
βρεκεκεκὲξ κοὰξ κοάξ·
ἔμελλον ἄρα παύσειν ποθ' ὑμᾶς τοῦ κοάξ.
Χα. ὢ παῦε παῦε, παραβαλοῦ τὼ
κωπίω...

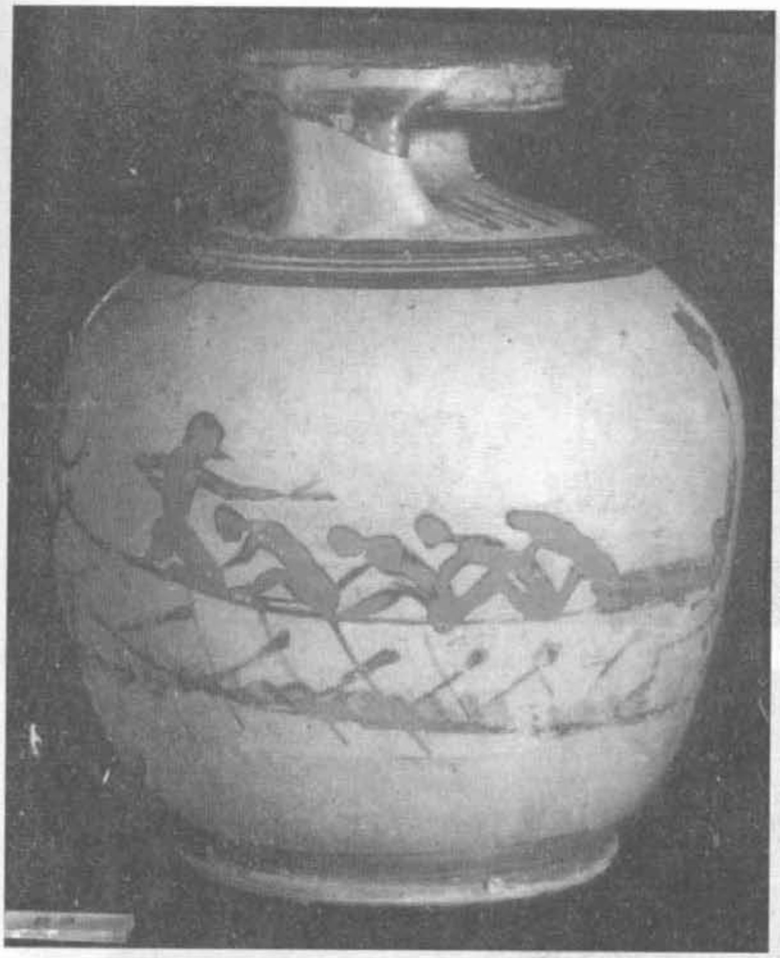

Fig. 1a

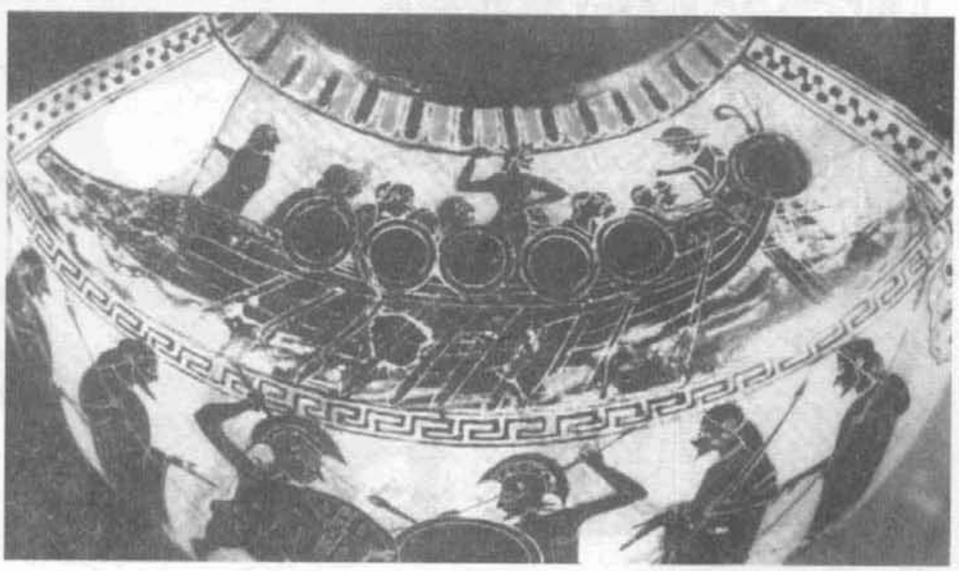

Fig. 1b

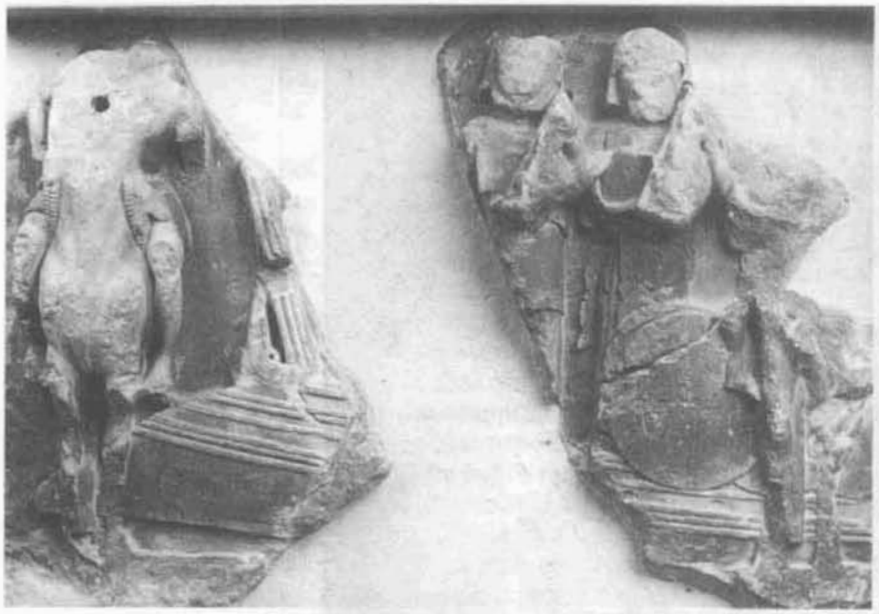

Fig. 2

Fig. 3

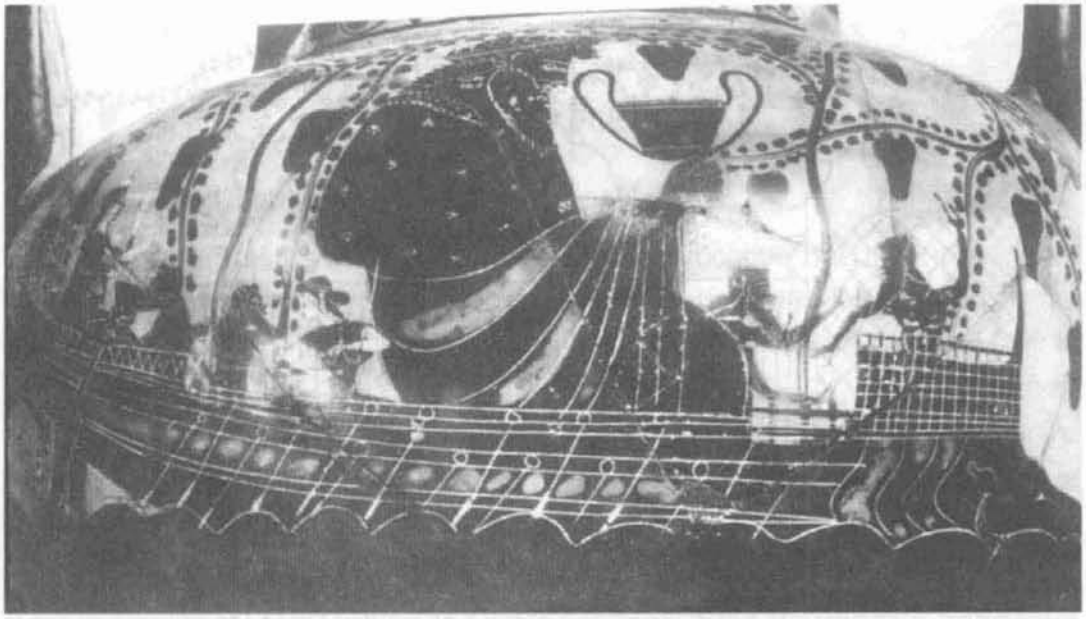

Fig. 4

Fig. 5

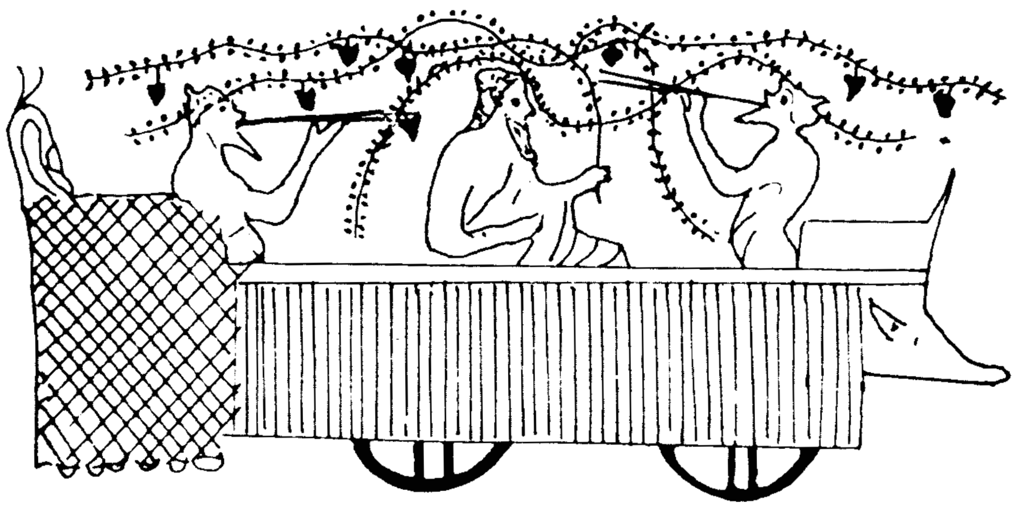

Fig. 6

Fig. 7

KYNOS .....FLEET

Ladies and Gentlemen, dear colleagues,

I am aware that the title of my paper sounds provocative, but I think it deserves it since Kynos until now has provided us with so many examples of Late Bronze Age ships as almost the whole number of the Lokrian ships, which took part at the expedition against Troy according to Homer[1].

Kynos was one of the towns of East Lokris, referred to by Homer in Iliad[2] and has been identified with a small hill by the coast near the modern village of Livanates, opposite Euboea[3].

The excavation which is being conducted there since 1985[4] has given some more examples of LH III C ships and more precisely three clay models, apart from the already known and published sherds with warships' representations[5].

All three of them, partly preserved, but tandalizing because of it, they are very didactic as far as construction and typology of LH ships are concerned.

The first of them is a clay hand-made model (Fig. 1-4, Pl. I) found together with LH III C early material. Almost half of it is missing, as well as the upper end of the prow. The ridge of the hull is mostly broken apart from some small parts which are preserved so that we have the original height of the model[6]. Dark brown painted stripes, though not very carefully applied, mark and accentuate some functional and important parts of the ship, the keel, the gunwale and the stem-post[7]. Moreover the keel on the inside is marked by an additional band of clay[8]. No other decoration, painted or plastic, is to be seen on this model except of a dot of colour outside of the hull toward the middle of its length. Whether it is intentional or accidental I cannot decide, my opinion however is that it cannot be interpreted as an eye[9]. The upright, high end of the model and the existence of a cutwater characteristics of the prows of many other Late Bronze Age ships, allow us to identify this part of the model as the stem [10].

The second model is also almost half-preserved (Fig. 5-8, Pl. II). We have to do again with a hand-made clay model of a ship of pure orange clay with a slip of diluted clay. It is found together with LH III C sherds. The pointed end is broken so that the identification of this part with stern or stem becomes difficult but not impossible. On this model again the functional parts are accentuated with the help of colour. So a red-brown stripe marks outside and inside the keel. The frames are rendered in the same way. The vertical lines seen on the out-side of the hull, framed by horizontal stripes, cannot obviously be frames or beams, since they don't reach the keel, as on other examples, such as the one from Phylakopi on which the vertical stripes are identified with frames[11] or merely decorative features[12].

So according to my opinion and the examples so far known, either from vase-painting[13] or from models[14] we have in front of us the model of an oar-propeled galley whose rowing-posts are indicated by these vertical lines, which can also render stanchions of a rail or at the same time the tholepins against which the oars were worked.

On the preserved part eleven at least such rowing posts are counted and if it is taken into consideration that the widest part of this model measures 0,044 m. so that the whole could be 0,22 m. long, it is reasonable to suggest that this model represents a ship with at least twenty-five oars on each side, that is fifty altogether, a number that fits to pentecontoros, a kind of ship known during Late Bronze Age and described by Homer[15].

Rowing-posts so close to the pointed end of the hull would be no comfortable for the rowers, but perhaps this happened due to lack of space for the artist to render the number of oars and similar rendering is not unknown to the art[16].

To my opinion whatever feature or device the artists of that time showed on paintings or models, no matter how skillfully or abstractly they are rendered, they should copy real characteristics and usually the more important or impressive ones, and if today difficulties are arosen as far as indentification of those characteristics are concerned this happens because we do not know how the world looked like at that remote period[17].

Another remarkable and difficult to explain feature of this model is the presence of two plastic bands of clay across the inner side of the hull near the end, which, beginning from the keel, should project above the gunwale. The upper part of these projections is missing, but they should not be very high according to other known parallels[18]. They cannot belong to banks[19] and they cannot be thole-pins for oars[20], as well. They could be supports for steering-oars, if this part is the stern. Double oars are not unknown during Late Bronze Age[21] and some similar devices on other models, for example the well known one of Mochlos, have been given this explanation[22].

They cannot also be cross-beams since the frames are already rendered by colour. Nor they can be ropes, as the clay strip on Argos' model is interpreted[23]. On the other hand if this part of the model is the stem these projections could be supports for the suspension of anchors[24]. This last opinion cannot be excluded although to my knowledge there don't exist any such representations from this period in the Aegean area. A fact that contributes to the stem-conclusion is the presence of a cut-water, whose junction with the bow is marked by a vertical line on both sides. A third explanation that these projections supported a superstructure, like a cabin is not trustworthy.

Comparing the above two new models from Kynos we can draw some useful conclusions. We see that although both of them obey to the angular type of craft[25] however they differ from one another basically. The first one has a curved keel and it gives the impression of a deep, roomy, heavy merchant-man[26] of the so-called kaiki-type[27], well represented in the Aegean since Early Minoan period and whose characteristics have been recognised in many other ships, painted or models, for which the same identification is given by many scholars[28]. The fact that the majority of such vessels are found at Greta and Cyrpus perhaps implies the origin of the type[29] and the character of the people, who invented and used them: merchants.

The second one has a straight keel, low, slender hull, many oars, perhaps is a pentecontoros, and gives the impression of a fast war-ship such as the already known parallels from Kynos itself[30]. Ships with similar characteristics belong mostly to the Central Aegean and the mainland of Greece[31], areas which provided us with almost all the known examples of the type, a fact that cannot be accidental to my opinion.

So the more decisive conclusion drawn from the differentiation in rendering of the above models is that during LH III C period already existed at least two different types of craft each of them with its special function. So from now on and on the base of the above examples a typology of Late Bronze Age ships of Aegean can be suggested[32].

The third example from Kynos consists of a part of a bird shaped-prow, actually the akrostolion, of the same date (Pl. III). The beak is missing and we have not found the main body of the ship which it belonged to.

The piece is decorated on both sides with an eye, at the proper place, and vertical stripes of colour, three of which have an additional hanging loop. What do these lines and loops represent is not clear. Do they suggest ropes? Or all of them are intended to render the plumage of the bird?

It is certain that this last piece does not belong to either of the models of Kynos already described. The size of it shows that it belonged to a bigger model and to my knowledge we don't have any similar ones found intact, since such high extremities, like akrostolia, are more submitted to the danger to brake. The only other example that approaches the Kynos' model is the one found in Tiryns[33], which has some characteristics that correspond not only to this akrostolion but also to the other Kynos' model, that is low, long, slender hull, vertical lines on the stem-post and which is of the same date.

The question is to which kind of model it could fit better to the merchant or to the war-ship.

I made an experiment (Pl. IV, V) and to my opinion the bird shaped akrostolion suits better to the war-ship. And this opinion is supported by many other well known examples, among them the ones from Kynos itself.

Bird-shaped akrostolia is not a novelty of Late Bronze Age ships, since this device exists on the Aegean ships since Early Minoan Period[34]. But this kind of prows - naturalistic or abstract rendered - are more often to be seen on war-ships, so that this feature tends to become a standard characteristic to them, without excluding its presence on other kind of craft, too.

War-ships should be more impressive and of more fearful outlook[35] and such devices help this purpose as the relative iconography teaches us.

The fourth ship I want to show you is already known, but only partly. It is the war-galley represented on a sherd of crater found in Kynos, which we have discussed about during the last symposium[36].

Now the good god of the archaeologist, whoever he or she is, after three years revealed us the missing other end (Fig. 9) on which the stern is pictured and the helm-man at his place working a big steering-oar with both hands, so that it is sure the ship is not pictured beached, nor sailing in open sea since mast and sail obviously have been lowered[37]. The fighting warriors on her deck not only strengthen the character of the ship but also they imply that in Late Bronze Age events, like naval battles, perhaps not in their classical meaning, took place[38].

It is certain that this last ship will arise much discussion and many controversies among the scholars but I think that beyond any doubt we all agree that it proves that the geometric war-ships we know from the relative iconography are the direct descendants of the Late Bronze Age ones[39].

Fanouria Dakoronia
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Lamia

NOTES

1. Iliad, B, 534.
2. Iliad, B, 531.
3. W. Oldfather, Kynos *R.E.*29. A. Phillipson: *Die griechische Landschaften* I, 2, 348, 360. W.K. Pritchett, East Lokris revisited, *Studies in ancient greek Topography*, V, 79 ff.
4. F. Dacoronia, Kynos, *Deltion* 40, B, 1985, 173. *Deltion* 41,B, 1986, 68. *Deltion* 42,B,1987 *Deltion* 43,B,1988 *Deltion* 44,B,1989 (under press) *Deltion* 45,B,1990 (under press). F. Dakoronia, Warships on sherds of LH III C Kraters from Kynos, *Tropis II*, 117 ff.
5. *Tropis II*, 117 ff, Fig. 1-3.
6. The model in its present condition measures 0,107 m. in longitude. Its maximum height is 0,06 m. the height of the hull is 0,045 m. and its width 0,06 m.
7. Colour, not merely for decoration. is often used on clay models for the same purpose, that is to render different parts of the ships, for example on the well known model from Phylakopi, S. Marinatos, La Marine Créto-mycénienne, *BCH* 57, 1933, Fig. 15, 26.

D. Gray, Seewesen, *Arch. Hom.I.G.* 1974, 51, Abb 14. L. Basch, *Le Musée imaginaire de la Marine Antique*, 1987, 141 Fig. 293-294.

8. Plastic rendering of different parts on clay models is not unknown, for example on the model from Argos, H. Palaiologou, Aegean ships from the second Millenium B.C. *Tropis I*, 227, Fig. I-4.
9. An eye is to be seen on the bow of the above mentioned model from Phylakopi (*loc.cit.supra* 7). It is not a usual decoration on ships of Late Bronze Age, but it becomes a characteristic of the geometric ones. About its meaning or its use Gray, *loc.cit.* (*Supra* 7) 60. L. Basch, *loc. cit.* (*supra* 7) 141. J.S. Morrison-R.T. Williams: *Greek Oared Ships*, Cambridge 1968, 37, Cecil Torr, *Ancient Ships*, 1954, 69.
10. The existence of a cutwater in front of the bow already in Late Bronze Age has been accepted by many scholars s. S. Wachsmann, The ships of the Sea Peoples, *I.J.N.A.* 1981, 10:3, 202, 209, 216. G.Kirk, Ships on Geometric Vases. *BSA* 44, 1949, 126. B. Landström, *The ship, London* 1961, 27.
11. Cl. Laviosa, La Marina Micenea, *ASAtene*, XLVII-XLVIII, (1969-1970), 24 footnote 3.
12. Morrison-Williams *loc. cit* (*Supra* 9) 11. Wachsmann, *loc. cit.* (*Supra* 10) 209.
13. For example the ship on the pyxis from Tragana, K. Kourouniotes, *AE* 1914, 107 ff. G. Korres, Representation of a Late Mycenaean ship on the Pyxis from Tragana, Pylos, *Tropis I.* 117 ff. For the vertical lines above the gunwale different interpretations have been suggested as for example that they are frames (Korres *loc. cit.* Laviosa, *loc. cit.* (*Supra* 11), decorative (Morrison-Williams *loc. cit.* (*supra* 9) 8) stanchions (Wachsmann *loc. cit* (*supra* 10) 209) thole-pins (Σ. Αλεξίου, Λάρνακες και αγγεία εκ τάφου παρά το Γάζι Ηρακλείου, AE 1973, 93). Basch *loc. cit* (*supra* 7) 142). As for the ship on the larnax from Gazi Alexiou proposes two different explanations, that is the vertical lines above the keel are frames and the one of the second zone above them are thole-pins and the open spaces between these lines are interscalmia (Alexiou *loc. cit.* 92).
14. Basch. *loc. cit.* (*supra* 7) 141, Fig. 293, 1.
15. Torr *loc. cit.* (*supra* 9) 3. Morrison-Williams *loc. cit.* (*supra* 8) 8. Alexiou *loc. cit.* (*supra* 13) 93. Σ. Αλεξίου, *Πρακτικά Γ΄ Κρητολογικού Συνεδρίου*, Ρέθυμνο 1971, A. 5. Hom. Iliad, B 719, Π 170 Hom, Odys. θ 35. L. Casson, *Ships and Seamanship in the ancient world*, 1971, 44. Basch *loc. cit.* (*supra* 7) 148.

16. For example on Pylos ship Korres, *loc. cit.* (*supra* 3) on the Gazi ship, Alexiou *loc. cit.* (*supra* 13) on the ship on a bronze fibula from Thebes, Basch *loc. cit.* (*supra* 7) 192 Fig. 406.
17. Laviosa *loc. cit.* (*supra* 11) 8.
18. For example the clay model from Mochlos Basch *loc. cit.* (*supra* 7) 133 Fig. 276. Marinatos *loc. cit.* (*supra* 7) Fig. 14, 2. Gray *loc. cit.* (*supra* 7) 15. Ph. Betancourt. *The history of Minoan Pottery*, 1985, 51 Fig. 32A.
19. As banks have been interpreted by Laviosa the plastic stripes on the bottom of the hull, which however do not reach the gunwale. Laviosa *loc. cit.* (*supra* 11) 26 Fig. 26. Palaiologou *loc. cit.* (*supra* 8) 222.
20. Such projections are often interpreted as thole-pins Basch *loc. cit.* (*supra* 7). Betancourt *loc. cit.* (*supra* 18). Κ. Δαβάρας Μινωϊκό κηριοφόρο πλοιάριο της Συλλογής Μητσοτάκη *AE* 1984, 55, 65.
21. Αλεξίου *loc. cit.* (*supra* 13) 91. Αλεξίου *loc. cit.* (*supra* 15) 3. Double steering oars are referred to by Homer, Odys. μ, 218.
22. The projections of Mochlos model are interpreted by Marinatos as supports for double steering-oars and he supposes that this kind of ship was constructed to sail to both directions Marinatos *loc. cit.* (*supra* 7) 215.
23. Palaiologou *loc. cit.* (*supra* 8) 220, 221.
24. Torr, *loc. cit.* (*supra* 9). That anchors were dropped from the stem of a ship is certain as relative representations teach. Basch, *loc. cit.* (*supra* 7) 26 Fig. 563, 261 Figs 564, 567.
25. The angular type of craft is thought that characterises the ships of the Aegean. Marinatos *loc. cit.* (*supra* 7) 212 ff. Laviosa *loc. cit.* (*supra* 11) 8. Casson *loc. cit.* (*supra* 150) 32, 39. Basch *loc. cit.* (*supra* 7) 148.
26. Casson *loc. cit.* (*supra* 15) 65.
27. Gray, *loc. cit.* (*supra* 7) 44, 56.
28. For example the ship on the "pitharaki" from Faistos (Laviosa, *loc. cit.* (*supra* 11) 11 ff. Figs. 3a, b, c) the ship on the Krater from Enkomi (Laviosa *loc. cit.* (*supra* 11) 30 ff. Fig. 35. Morrison-Williams *loc. cit.* (*supra* 9) 11) and the models from Maroni and Kazaphani from Cyprus (Gray, *loc. cit.* (*supra* 7) 46, Abb 11 a, b, c, d. Laviosa, *loc. cit.* (*supra* 11) 31). For the ships of Enkomi an identification as war-ships has also been proposed (Basch *loc. cit.* (*supra* 7) 147, Fig. 311. Wachsmann, *loc. cit.* (*supra* 10) 198 ff. Fig. 14A.
29. Laviosa, *loc. cit.* (*supra* 11) 8.33. Casson, *loc. cit.* (*supra* 15) 32.33.39. Basch *loc. cit.* (*supra* 7) 94.
30. Dakoronia, *loc. cit.* (*supra* 5).
31. Basch, *loc. cit.* (*supra* 7) 94, 148 ff.
32. That ships suitable for war existed already in Late Bronze Age has been accepted by many scholars (Wachsmann, *loc. cit.* (*supra* 10) 197 ff. Σ. Ιακωβίδης, *Ιστορία Ελληνικού Έθνους*, 1970, A. 269. Torr, *loc. cit.* (*supra* 9) 23. Casson, *loc. cit.* (*supra* 15) 32). That they also existed ships with the suitable structure to be used as merchant ships is also attested. (Torr. *loc. cit.* (*supra* 9) 23. Laviosa, *loc. cit.* (*supra* 11) 12). Laviosa recognises merchant-ships and other ships different in character from them, which she avoids to call them war-ships, because she believes that there do not exist any certain documents about sea-battles during LBA.
33. K. Kilian, Augrabungen in Tiryns 1982/83, *A.A.* 1988, 2, 140, Abb. 37, 8.
34. I. Σακελλαράκης, Ελεφάντινον πλοίον εκ Μυκηνών, *AE* 1971, 211, 216. Λ. Παρλάμα, *Η Σκύρος την εποχή του χαλκού*, 1984, 196. Wachsmann, *loc. cit.* (*supra* 10) 210.
35. Gray, *loc. cit.* (*supra* 7) 138.
36. Dakoronia, *loc. cit.* (*supra* 5) 118, Fig. 1.
37. Torr, *loc. cit.* (*supra* 9) 92.
38. Sea-battles during Late Bronze Age in Eastern Mediterranean have been recorded. Gray *loc. cit.* (*supra* 7) 122 ff. Wachsmann, *loc. cit.* (*supra* 10) 188 ff. N.K. Sanders, *The Sea Peoples*, 1978, 50, n.14.
39. Kirk, *loc. cit.* (*supra* 10) 95, 135, Morrison-Williams, *loc. cit.* (*supra* 9) 44. Basch, *loc. cit.* (*supra* 7) 148. Wachsmann, *loc. cit.* (*supra* 10) 198 ff. Casson, *loc. cit.* (*supra* 15) 32.

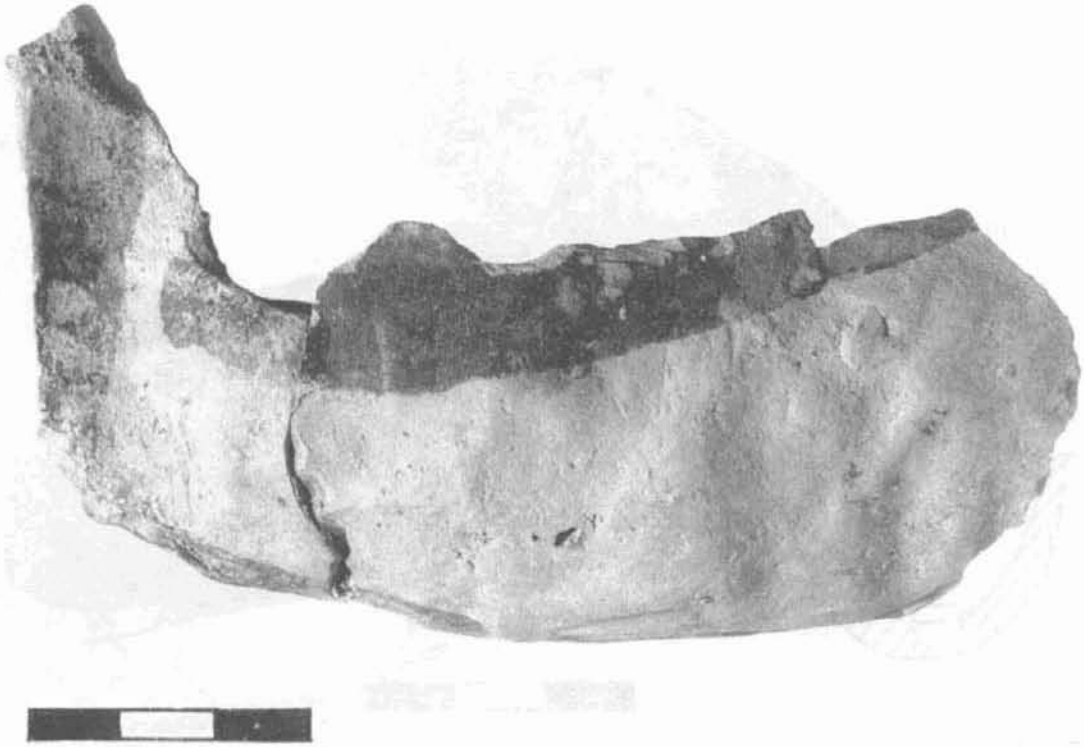


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Pl. I

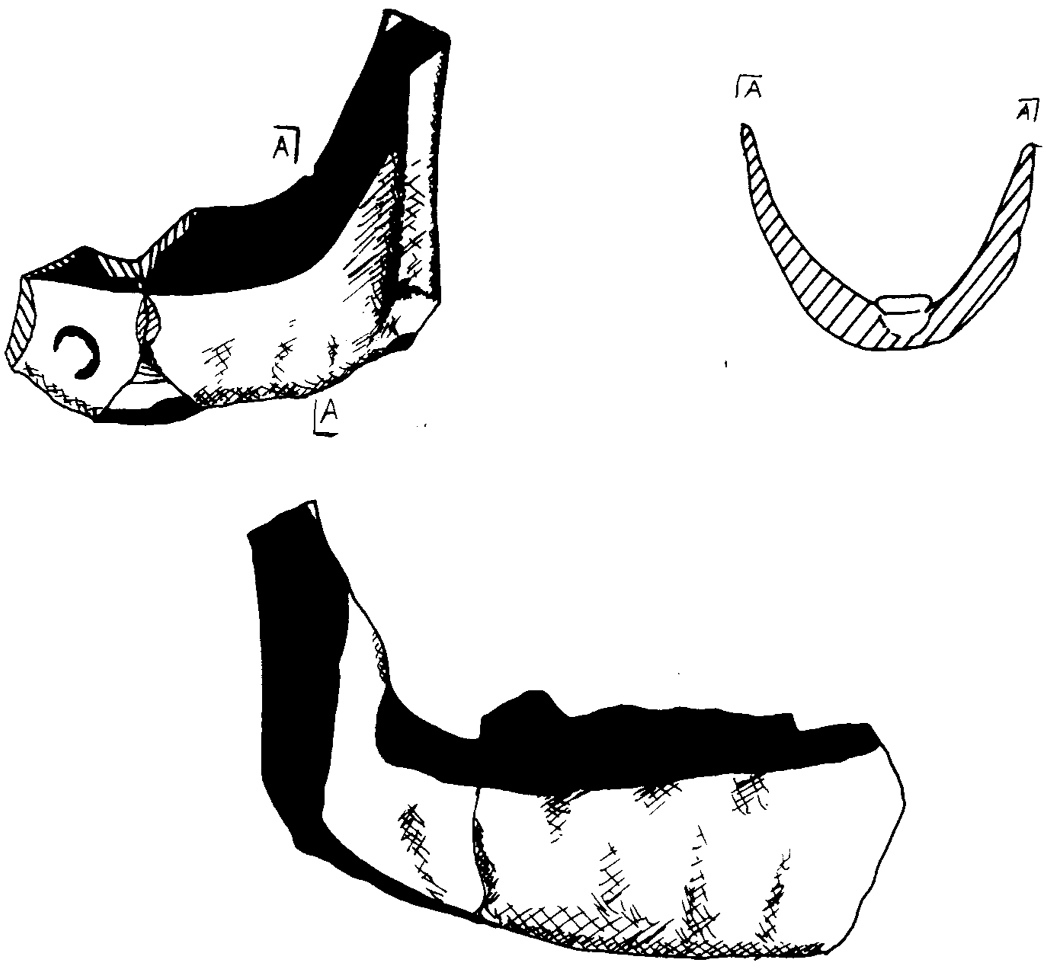
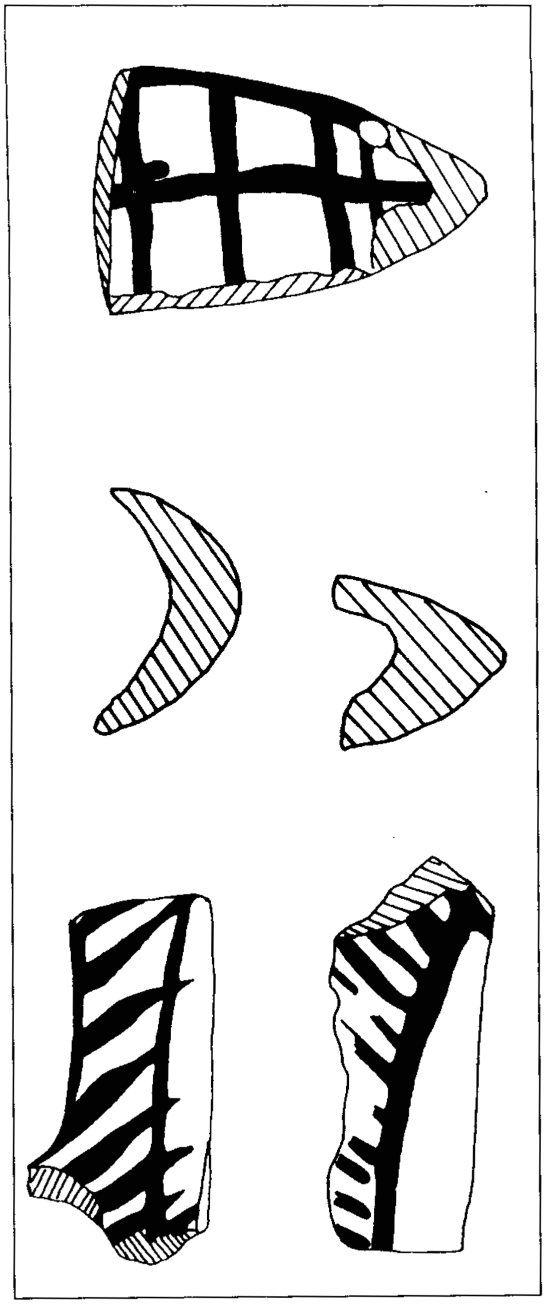


Fig. 5

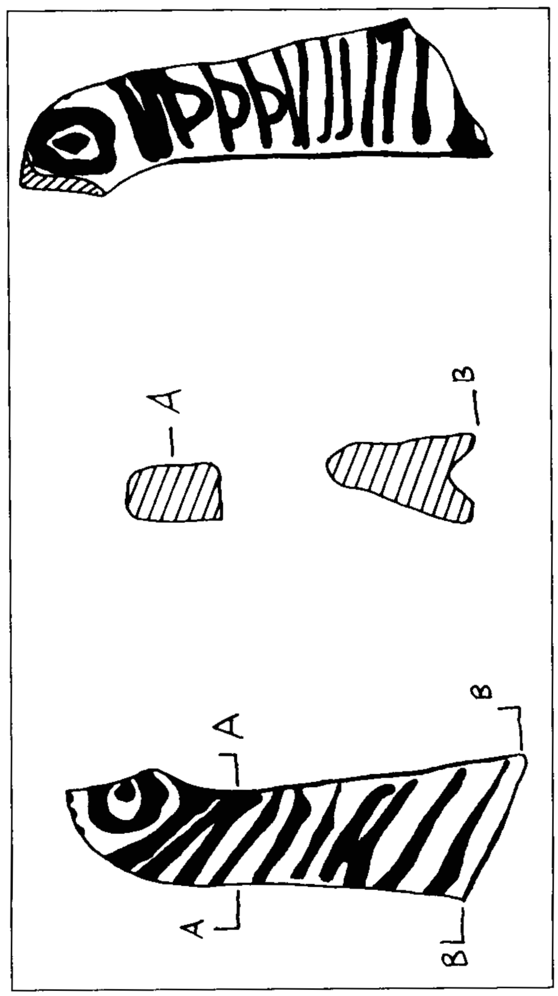
Fig. 6

Fig. 7

Fig. 8

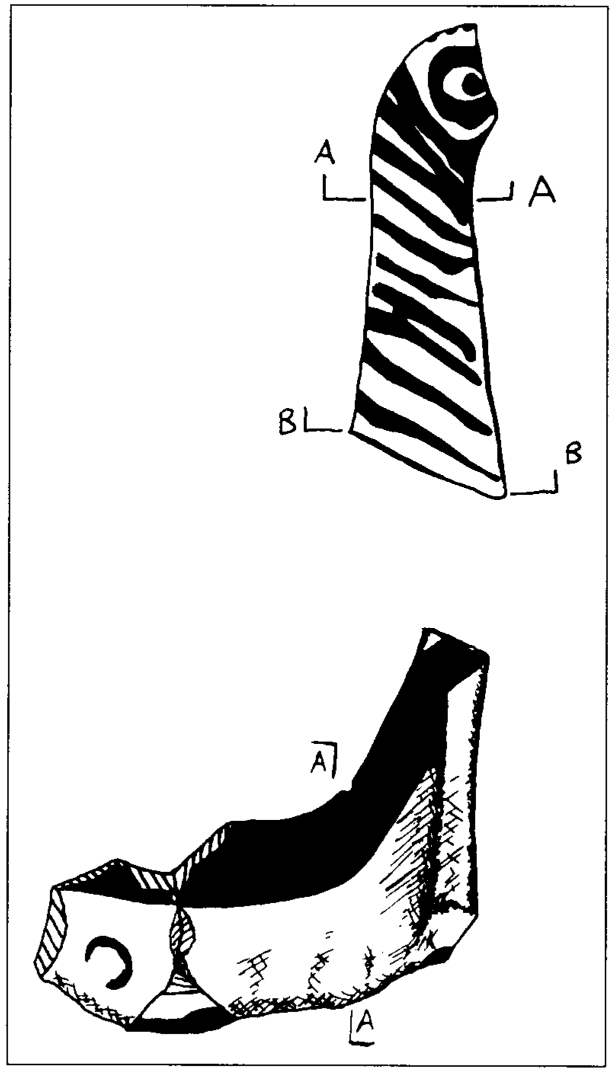


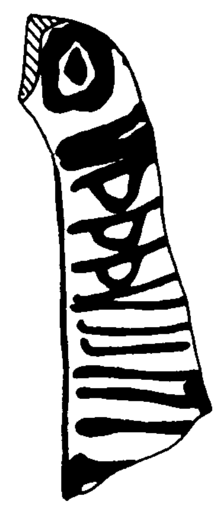
Pl. II



Pl. III

Pl. IV





Pl. V

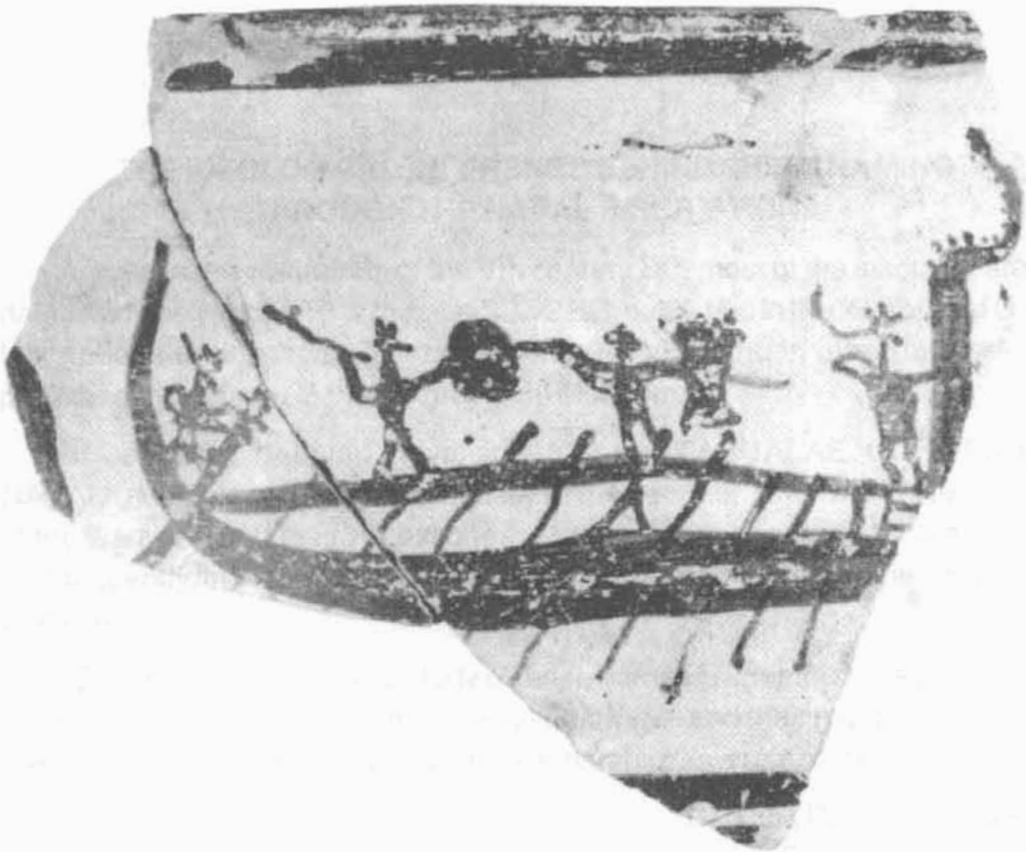


Fig. 9

THE IDEOLOGICAL INFERENCE BEHIND SHIP'S NAMING THROUGH THE NAVAL INSCRIPTIONS

Except a few fragments of the Vth century BC, most of the inscribed steles, dated from the year 377/6 to the year 323/2 BC, published in the "Corpus" of Greek Inscriptions under the numbers IG II^2, 1604-1632 and in other more recent publications, are kept in the Epigraphical Museum.

It concerns detailed naval inventories (TABUALAE CURATORUM NAVALIUM), dressed by the "epimeletai of the neoreia", referring to the situation of the warships and their accessories, as well as the necessity for their repair. Consequently, in these inventories a great number of trireme's names have been preserved.

On the present lecture, a study of these names is attempted, regarding their place on the ship's πρώρα —near the ὀφθαλμός— and their meaning, as well as the conception of the manned by citizens warship, as a real part of the city-state.

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EDITOR'S NOTE

Dr. Peppas-Delmouzou made a verbal communication and the above is only an abstract

LES GRAFFITI DE NAVIRES DES ÉGLIGES BYZANTINES ET POST BYZANTINES DE L' ÎLE D' ÉGINE

Notre étude porte sur les graffiti navals des églises byzantines et post-byzantines de l'île d'Egine.

Nous considérons comme graffiti navals toutes les représentations gravées, tirées de la vie maritime et principalement les graffiti des navires.

Il est admis que parmi les documents iconographiques le graffito naval constitue l'un des plus intéressants du point de vue documentaire, en raison de la pauvreté de l'iconographie byzantine et post-byzantine du navire qui nous servira d'exemple afin d'exposer la méthodologie appliquée a un ensemble géographique fermé. Ainsi Égine sera le cadre géographique de notre étude. Les motifs essentiels d'une telle limite géographique répondent à la volonté d'établir et d'appliquer une méthodologie concrète à un ensemble géographique preçis et clos.

L'étude d'exemples précis des graffiti navals s'impose et elle s'avère précieuse.

En effet la méthodologie essaie de repondre aux objectifs suivants:

1. Inventorier de manière exhaustive les graffiti navals des églises byzantines et post-byzantines de l'île: c'-est-à dire rélèver et classer les graffiti rassemblés en assurant au maximum la fidelité de la réproduction.
2. Replacer chaque graffito naval dans son contexte architectural.
3. Étudier le caractère iconographique de l'ensemble des graffiti recueillis en établissant une typologie.

Trois étapes organisent de la sorte notre étude.

La première étape comporte l'étude des publications precédentes et la prospection de nouveaux graffiti. Dans notre cas deux publications existent: celle de Getakos de 1958 et celle de Meinardus de 1972. Nous avons constaté qu'il s'agit des rélévés dont l'échelle n'est pas indiquée et d'une reproduction sans grande fidelité.

Pour localiser des graffiti suplemmantaires nous sommes partis du catalogue officiel des monuments byzantins et post - byzantins de l'île d'Égine fourni par le Ministère Grec de la Culture.

Les résultats: parmi les cinq églises mentionnées par Getakos et Meinardus à savoir: a) St. Georges de Paléochora, b) Prophète Elie, c) Omorphi Ecclissia, d) St. Nikolas de Mavrika, e) Stavros, seulement 3 conservent encore des représentations gravées des navires (c, d, e). Ici, il doit être noté que ces graffiti étudiés par Getakos et Meinard ne représentent en réalité qu'un tiers de graffiti existants.

Après avoir prospecté l'ensemble des églises de l'île nous avons localisé deux autres à Paleochora qui possedent des graffiti: St. Nicolas et St. Jean le Théologien.

La deuxième étape de la méthodologie consiste en une étude technique qui s'applique totalement à un système de fiches d'inventaire. Ce sont des fiches d'ordinateur qui contiennent un maximum des renseignements sur les édifices religieux et leur graffiti navals.

Il s'avère nécessaire d'apréhender concommitament l'étude des graffiti navals et celle des édifices religieux mêmes. L'église, les graffiti, tout comme les murs qui les supportent sont pour nous des entités qui forment un tout cohérent.

Cette approche nous permettra de répondre tant à des questions de formes qu'à des questions de contenu et de signification: par exemple pourqui cette fresque a-t-elle été gravée? etc.

Ce système de fiches d'ordinateur contient 3 parties:

1. La première partie se réfère à la localisation et l'emplacement de l'édifice.

   A part les églises mentionnées par Getakos et Meinardus, St. Nikolas de Paléochora et St. Jean le Théologien possèdent aussi des graffiti.

2. La deuxième partie comporte:

   A. Le cadre architectural: c'est-à-dire tous les renseignements concernant le type architectural des édifices religieux ainsi que leur mode de construction. Une telle étude contribue à la datation des graffiti.

   Nous avons rencontré deux types architecturaux:

   - le type de basilique
   - le type de cruciforme

Les matériaux utilisés pour la construction des églises sont des pièrres poreuses de production locale.

Cependant les blocs de construction d'Omorphi Ecclissia proviennent d'anciens temples de l'île.

B. Les relevés metriques en plan de l'édifice les relevés des parois:

Par exemple les relevés des assises des parois extérieurs d'Omorphi Ecclissia qui possèdent de graffiti navals demandent un travail suplemmantaire afin de pouvoir les situer dans leur contexte architectural.

C. Les relevés metriques des fresques: Il nous a paru indispensable d'effectuer les relevés métriques de fresques qui possédent des graffiti afin de pouvoir préciser leur emplacement sur le plan des parois et localiser les graffiti par rapport aux fresques.

D. Les relevés des graffiti:

Deux élements sont retenus pour mettre en évidence la situation des graffiti navals.

- La localisation des fresques sur le plan de parois et
- La répartition des graffiti sur les fresques.

Afin de relever les graffiti quatre techniques ont été employées.

1. Le relevé du dessin, technique usuel à l'échelle 1/1 sur support transparent.
2. La photo en noir et blanc et les diapositives.
3. La silicone: L'utilisation de la silicone pour effectuer des prises d'empreintes est souhaitable surtout pour les graffiti gravés sur les parois extérieurs.
   La silicone utilisée est une resine à prise rapide. Nous l'appliquons sur la surface de la parois gravée dont nous obtenons ainsi l'empreinte.
4. Le video: Avec un camescope nous filmons le graffito avant de soumettre l'image (le film) ainsi obtenu à un traitement informatique qui nous donnera le dessin graffito à l'échelle voulue.

E. L'hauteur d'exécution: La densité des gravures sur les parois est fonction de la taille du graveur et des positions qu'il adopte pour exécuter ses graffiti selon le contexte architectural.

Une comparaison avec l'échelle humaine (c'est-à-dire les principales dimension: de l'homme 1,75 cm) nous permettra de cerner les diverses positions prises.

F. L'étude des incisions: Il faut remarquer que le profil de l'incisioı traduit la forme de l'extremité de l'outil employé. Quelque soit lı nature de l'incision, plusieurs formes de profils sont présents e correspondent

- à la façon dont l'outil est tenu en main
- aux variations des pressions exercées sur l'outil
- aux passages successifs dans une même incision.

La troisieme étape: elle est une sorte de synthèse car il faut bien repondr aux questions soulevées que les étapes précedentes ont fait naître.

Notre préoccupation principale s'attache aux questions de la datation et d la typologie.

Nous nous occuperons d'abord de la typologie qui demande mainte précautions. Son intérêt est très grand car l'art byzantin n'a légué que peu d'image: de navires, de sorte que nous ne connaissons que très imparfaitement l'aspec du materiel naval qui a joué un rôle important à l'époque médiévale.

Il faut tenir compte du caractère graphique des représentations gravées qu sont souvent schématiques et aléatoires.

Les figures de navires représentent surtout les principaux éléments structurau: et les grandes lignes du contour de la coque.

Les auteurs des graffiti ne respectent pas les dimensions et les proportion: des bâtiments. Certains auteurs incisent avec précision la figuration des élément: précis comme le gouvernail et les sabords. Nous avons l'impression qu'une sort de sélection est effectuée, destinée à faire ressortir des aspects précis san: compliquer l'ensemble de la gravure.

Etant donné que la figuration des coques n'est pas élaborée et se limite à une simple schématisation des lignes essentielles, il nous semble que la voilur constitue l'aspect le plus accessible à dresser une typologie.

La structure vélique des représentations des navires ne présente pas eı effet des formes variées et évoluées, mais elle peut servir pour discerner le. principales catégories des bâtiments représentés.

Suivant les critères de la typologie basée sur la voilure nous avons discerné quatres catégories.

A. Bâtiments à un mât
   I. avec voile latine
   II. avec voile aurique
   III. avec deux voiles carrées
B. Bâtiments à deux mâts
   I. avec deux voiles latines
   II. avec deux voiles carrées
C. Bâtiments à trois mâts
   I. avec trois voiles latines
D. Bâtiments sans mât

Les exemples qui suivent sont représentatifs et indicatifs du nombre des graffiti répérés.

Dans la première catègorie AI nous distinguons le graffito (A) qui provient de l'église de St. Nikolas de Mavrika (photo 1): La voile latine est dressée sur un mât implanté au milieu de la coque qui semble traverser toute la structure. Les préceintes, l'étambot vertical et l'éperon, sont aussi bien tracés. Quatorze rames allignées et liées d'une ligne droite complètent la figure. La représentation du gouvernail manque.

La lettre B inscrite au triangle que forment le côté vertical de la voile et la corde qui se désigne du haut de la voile vers la poupe. Probablement il s'agit de l'initial du nom du graveur. Nous considérons que ce type de bâtiment fait partie de la famille des gallères.

A la même catégorie appartient le graffito (B) (photo no 2) qui provient de l'eglise de St. Jean le Théologien (Paléochora). Nous distinguons évidemment la voile triangulaire ainsi que l'étoffe de la voile représentée par des traits convergeants au milieu de la surface de la voile. La coque présente ses deux extrémités surélevées symetriquement. Dix-neuf traits traversent verticalement la coque. S'agit-il des couples? Ou faudra-t-il rechercher leur origine à une autre technique? La fresque date du dernier quart du 14éme siècle.

La seconde catégorie BI se caracterise par un graffito (C) qui provient de la fresque de St. Nicolas de l'église de St. Nicolas de Mavrika (photo no 3). Nous distinguons les rames allignées, la forme longue de la coque, la proue pointue et la poupe verticale. Il doit s'agir là d'un bâtiment de la famille des galères. La datation de ce graffito est postérieure au 16ème siècle.

Dans la dernière catégorie D un cas particulier constitue la figure incomplète de ce graffito (photo 4). Il se trouve gravé au parois ouest de l'église d'Omorphi Ecclissia. Nous considerons qu'il s'agit d'une figuration d'un navire ancien. Les élements qui déterminent un tel point de vue sont les suivants:

1. Sa position. Les graffiti d'Omorphi Ecclissia sont gravés en position horizontale. Ce graffito se trouve gravé verticalement à la surface des autres graffiti.
2. Il est connu que les assises poreuses de construction de l'église proviennent d'anciens édifices de l'île et notamment du temple d'Aphaia. Il est plus que possible que cette assise fut un bloc de réutilisation d'une construction horizontale d'un édifice ancien.
3. L'étude des caractéristiques du graffito: Nous remarquons que seulement la partie arrière est conservée. Les préceintes de la coque qui aboutissent à la poupe élevée et arrondie. Deux incisions en biais traversent la coque et évoquent une représentation possible des gouvernails lateraux et du gouverneur (?)

Une limitation de l'intérêt des graffiti résulte de l'extrême difficulté de les dater. Du point de vue stylistique les graffiti sont indatables, en s'opposant ainsi aux autres sources iconographiques.

En Occident où les points de comparaison sont nombreux et, souvent, bien datés (gravures, miniatures, peintures etc.) une datation par référence est fréquemment possible, mais en Orient et notamment en Grèce, ces critères ne peuvent être appliqués que rarement.

La datation des graffiti ne peut pas se baser sur des critères de typologie vélique. La datation exacte d'un graffito de navire est extrêmement rare. La datation du contexte architectural et des peintures murales à qui appartiennent les graffiti navals devient impérative.

Ainsi li faut tenir compte de:

1. La date de la construction de l'édifice

2. La date d'une possible restauration de l'édifice
3. La date de la création des fresques qui ne coincide pas nécessairement avec celle de l'édifice:
4. La date des inscriptions votives s'il en existent.

Le tableau qui suit tient compte des éléments déjà mentionnés

ÉGINE

ÉGLISES	*DATATION DE L'ÉGLISE*	*DATATION DES FRESQUES*	*DATATION BASSE DES GRAFFITI*
Omorphi Ecclissia	*13ème inscription 1282/1289*		*Après 13ème*
St. Nicolas de Mavrika	*12ème*	*16ème inscr. 1522*	*16ème*
Stavros	*16/17ème*	*db. 17ème*	*17ème*
St. Jean le Théologien	*14ème inscr. 1380*	*14ème*	*14ème*
St. Nicolas	*14/15ème*	*15ème inscr. 1572*	*1400-1572*

Afin de conclure il faut préciser que:

ÉGLISES	*GETAKOS 1956*	*MEINARDUS 1972*	*DELOUKA 1990*
St. Georges Paléochora	*4 graffiti*	*4 graffiti*	*ruinés*
Prophète Elie	*9 "*	*9 "*	*chaux*
Omorphi l'ecclessia	*4 "*	*4 "*	*23 graffiti 21 relevés*
St. Nicolas de Mavrika	*19 "*	*13 "*	*28 graffiti 28 relevés*
Stavros	*3 "*	*3 "*	*36 graffiti 22 relevés*
St. Nikolas Paléochora	......	......	*1 graffito 1 relevé*

St. Jean le Théologien	......	......	*3 graffiti 1 relevé*

Dans un ensemble de sept églises, quatres possèdent des graffiti de navires incisés sur leur fresques et seulement Omorphi Ecclessia sur ses assises des parois extérieures. Un certain nombre de graffiti reste indéchiffrable car les fresques, support indissociable de ceux-ci, subissent des endommagements considerables.

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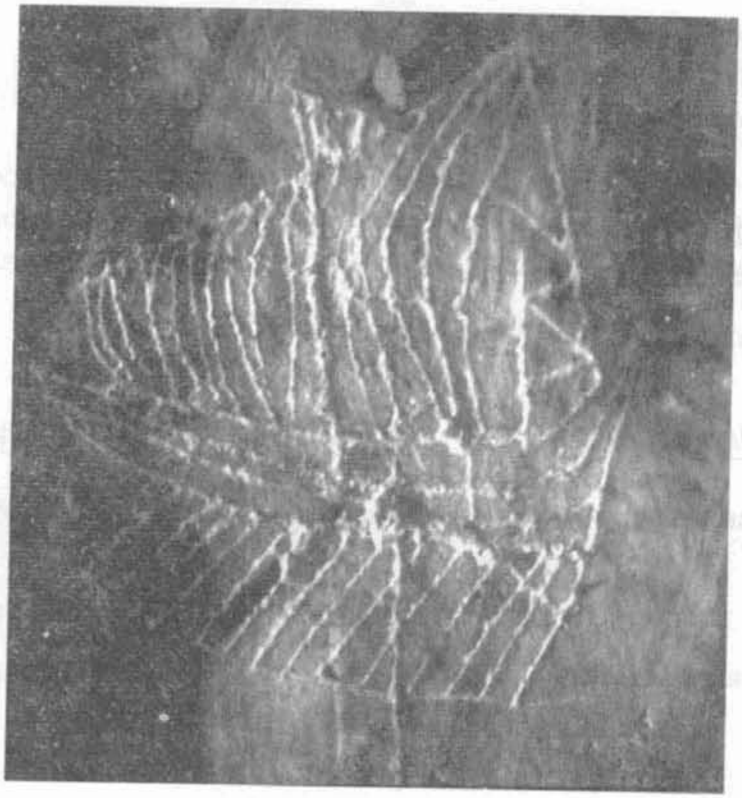


Fig. 1

Fig. 2

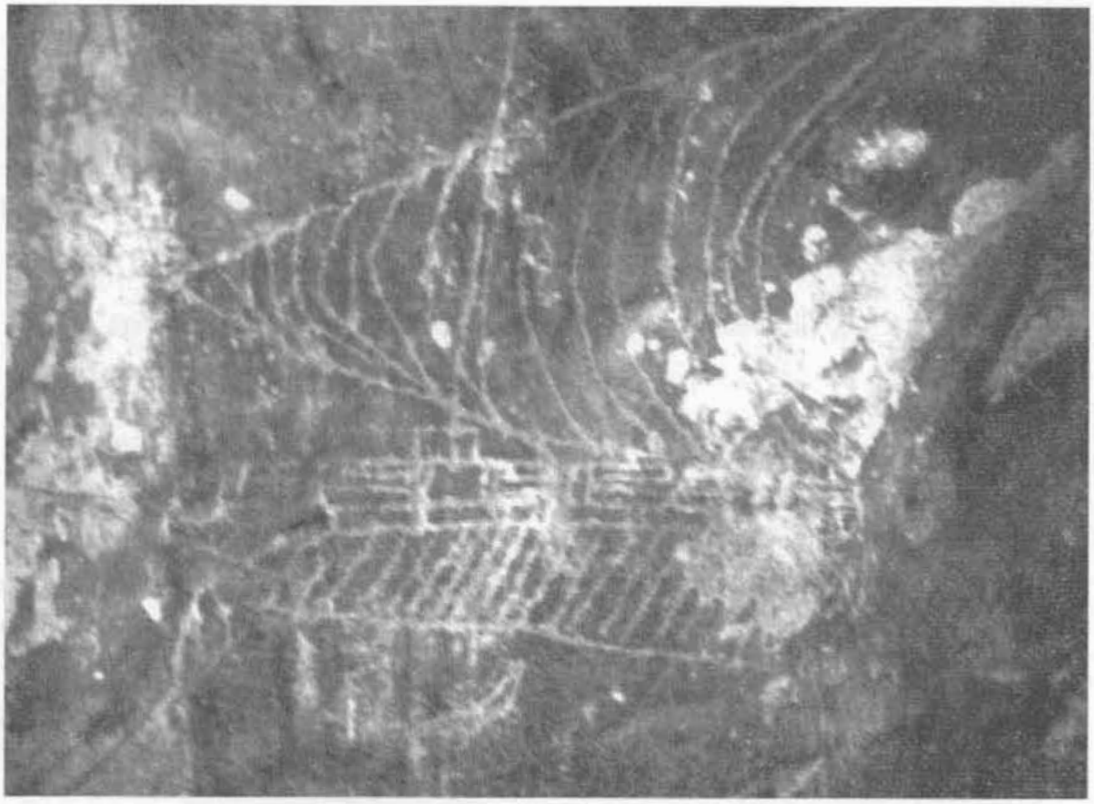
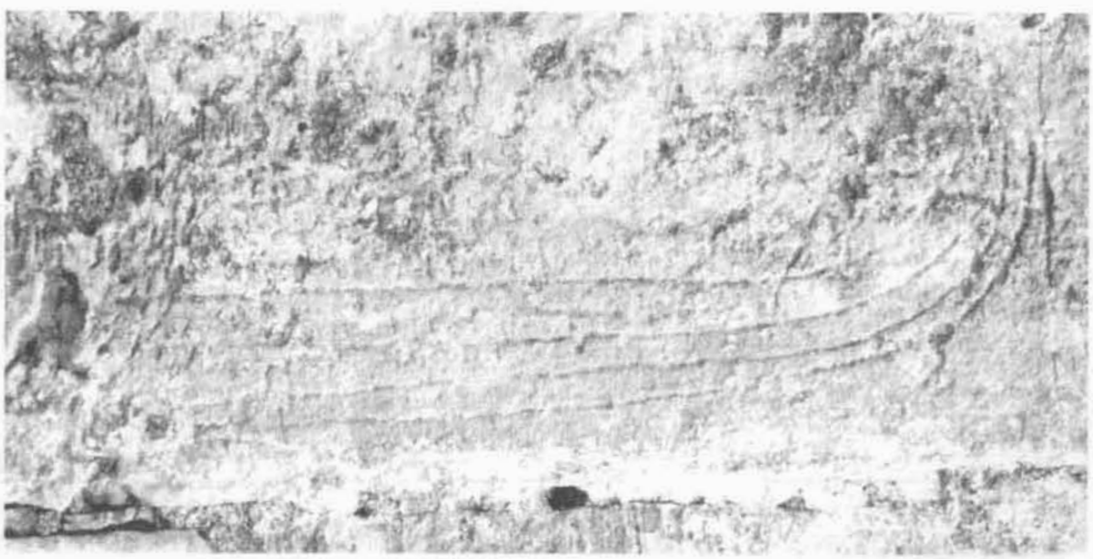


Fig. 3

Fig. 4



THE SEWN PLANK BOAT OF GELA IN SICILY
PRELIMINARY OBSERVATIONS ABOUT CONSTRUCTION OF HULL

The report is going to present the knowledge till now about the Greek boat found at Gela in 1988 under only 5 meters of water.

A first excavations campaign in 1989 allowed to:

- arrive at planking and keel in some points of the hull
- define the dimensions of the preserved part
- learn the main characteristics of the building technique

The boat, preserved for 17 meters in length and 7 meters in width, has boards of planking sewn together with vegetables ropes, fixed with little pins of wood in holes with particular shape. Biggest pins, at regular distances, join and strengthen the plank edges.

This system of construction with vegetables ropes seems used in all the hull and not only in the preserved part (that is the submerged part of the sailing boat).

The boat of Bon Porte's in France (datable at the end of the 6th century BC) is the most cogent comparison, but the boat of Giglio island at Baia Campese (excavations conducted by M. Bound) and other exemples bear witness of wide diffusion of this building technique.

The wreck dating (end of the 6th, beginning of the 5th century BC) was given from Athenian pottery, in particular two black-glazed "askoi" (or two red figure "askoi") with two satyrs and two men banqueting.

The shipload included Rhodian amphorae and various pots probably of Aegean-Eastern origin.

The second excavation campaign, expected in 1991 summer, will allow to increase our knowledge about the building techniques, the shipload and at last to acquire new data for the hull salvage in a future time.

Alice Freschi
Cooperation "Aquarius"
Cooperativa "Aquarius"

EDITOR'S NOTE

This is the abstract of Dr Freschi communication; no text was received for publication.

OLD SAWS

An "old saw" has two meanings in English and both of them have archaeological relevance. Literally, it means a cutting-blade with teeth; metaphorically, a maxim that goes on being repeated without being questioned. In archaeology, saw-blades appear very early: in scenes of ancient Egyptian ship construction. Saw-marks on ancient Mediterranean wrecks show that their planking was produced by sawing lengthwise through tree-trunks (instead of the trunks being split radially, then the segments adzed into parallel-sided planks)[1]. Metaphorically, "old saws" proliferate in archaeological footnotes for it is easy to re-quote available field-reports, without checking whether subsequent amplifications and modifications have appeared; the result is that newly discovered technical features are often either misinterpreted, or overlooked. Scholars interpreting unknown processes of engineering, through indirect allusions to them written in a dead language, run even greater risks of repeating old saws. In this respect field-archaeologists are on safer ground, because although they are as unlikely as "arm-chair scholars" to have training in engineering, anybody who actually handles objects in the field, is prompted by curiosity and bound by duty to search out their possible functions.

A general familiarity with the applications of engineering (which most people share) is no substitute for understanding the principles on which such applications are based. This may explain why the most significant constructional feature of the Marsala Punic Ship: a band of corrugations carved around the waterline of its otherwise smooth hull (fig. 1), has been overlooked during more than 20 years of published debate about this unique wreck. No such feature is present on the many other ancient Mediterranean wrecks examined hitherto. The Marsala hull does, however, differ from the rest in that it is the only known example of a "long" oared ship designed for speed, the others being "round" sailing ships designed for carrying bulky cargo. It is therefore logical to connect the curious corrugations round the Punic Ship's waterline with the uniqueness of its hull-shape... a line of enquiry that is supported by an engineering principle called "the Coander Effect", which explains why the smoothness of certain hulls needs to be broken.

During excavation, we first became aware of the band of corrugations when, after raising the 11th strake up from the keel (that is to say on reaching the level of this ship's waterline) we began to see what appeared to be the imprint of clinkers in the sand under the wreck. By then it was clear that the planking of the 3rd century BC Punic ship, in common with all other hulls of the period, was entirely united by mortise and tenon joinery. Consequently the overlapping of planks caused by nailing them one over the other was an impossibility. In fact, the imprint of "clinkers" on the bottom turned out to be a simulation of overlapping planking on the outside of the vessel, carved onto the lower edges of strakes at this particular level. The upper part of the hull was missing, but four of these carved waterline strakes survived before the break. The only person not to be mystified by this feature was the engineer and naval architect (Austin Farrar C. Ing. FRINA) who, shortly after this discovery, started working out the vessel's original shape from its surviving remains. He realized that the purpose of these corrugations was to deflect spray.

Spray-deflectors are needed only on fast vessels which have smooth hulls. Smoothness by itself, when not combined with speed, causes no problem but, when a boat is designed to travel at a rate of knots that is more or less equal to the square root of its length in feet, then the combination of speed with smoothness causes water to creep up over the sides and spill into the boat itself. The phenomenon, known to engineers as the "Coander effect", can be demonstrated by holding a spoon loosely between finger and thumb under a tap. Water flows round the bowl of the spoon, then the more the tap is turned on and the faster the flow, the more water will travel up the sides, until it gets into the hollow of the spoon. But if the spoon's outer smoothness is broken, for instance, by sticking a sausage of plasticise round it this break will throw the flow outwards, thus establishing the principle of deflecting water[2].

Given that water only spills into hulls that are both fast and smooth-skinned, it was not until motor-engines were combined with the smoothness produced by metal-sheathing, or by fibreglass, that spray-deflection became so significant that most modern designers had take it into account. A variety of solutions resulted. Metal-sheathed warships were the first vessels to have angularities built into their sides to throw spray outwards; fibreglass speedboats all have to have some form of built-in deflection, while a recent design of lifeboat has been given rounded spray-deflectors reminiscent of the sausage of plasticise illustrated in the demonstration of the Coander effect. It must, however be remembered that water does not run upwards in the same way over the corrugated surface produced by traditional clinker building.

In Northern antiquity there was a Viking tradition of clinker building East of Jutland (as distinct from the Celtic tradition of carvel building west of this line).

Sea tests, for instance, show that the clinker built "Roar Eigg" , a faithful replica of a medieval Viking Ship (No. 3 of the group excavated at Skuldelev and now conserved in the Roskilde Museum, Denmark), automatically throws off spray when travelling at speed. This brings me back to the subject of saws, because, as on all early Northern vessels of its kind, no saw was used to cut the "Roar Eigg's" planks. There are various ways of cutting up tree-trunks; parallel sided planks are produced by sawing, whereas wedging produces radial segments, like elongated slices of cake, which then have to be trimmed with an adze to make them into planks.

It was a casual conversation with the architect of " 'Olympias' the 5th century BC Athenian trireme", that made me realize that the way planks are cut may relate to a larger issue: namely, to basic methods of achieving a hull's strength and elasticity. In chatting about the Punic Ship, John Coates had suggested to me that the belt of corrugation round its hull might have been the unintentional result of using wedge-shaped, or radially split planks, which lazy Punic shipwrights might not have bothered to adze into smoothness. For anyone who had not seen the Punic ship, his suggestion is a logical possibility, but a glance at the vessel itself shows it to be mistaken for two reasons. Firstly, because saw-marks show on the planking[3]. Secondly, because the grain of the wood shows that several planks contained a tree's heart; indeed, these wider planks alternate up the side of the hull with with narrower planks which had been cut from either side of them and which match their heartwood.

With regard to strength and elasticity: sea-trials of faithfully replicated Viking ships have also shown that they owed much of their robustness to the radial cutting of their planks. In Sweeden, during the replication of one such boat, this observation was put to the test by half a dozen stalwart men jumping up and down on the middle of a radially cut plank which, unlike a sawn plank, did not snap; insteed it reacted like a trampoline under their crashing weight. This resilience can be explained by the fact that radial splitting leaves the fiberous structure of wood intact, whereas sawing cuts indiscriminately through the fibres. Ancient Mediterranean vessels also had considerable strength and elasticity (as the long sea voyage of the faithfully replicated "Kyrenia II" has shown), but their resiliance was achieved by different means: it was produced by their joinery, rather than by the quality of their planks. The "shell first" construction that characterises Mediterranean antiquity was made possible by mortise and tenon joinery. This is why "Shells" were relatively more important to the structure than the skeletal timbers that were put into them at a later stage. Professor Steffy has stressed the significance of this type of joinery, to the extent of suggesting that it would be more accurate to drop the description "shell construction", in favour of "tenon and peg construction".

Reverting to the Punic Ship: the existence of simulated clinkers leads up to an obvious historical question (to which there is, as yet, no answer). Where did Punic shipwrights see clinker-built craft throwing water outwards? Because, had they not seen the effect of clinkers on a fast vessel, they would not have copied their appearence round the waterline of a fast ship of their own. Instead of selecting this feature of a traditional form of boat-building, because it had a useful side effect, it would have been easier to adopt one of the many other simpler solutions to the problem, which can easily be observed by holding a smooth bowl-like object in fast flowing water (as Mr. Coander eventually did).

Historically, mentions of Carthaginian voyages to the North in search of tin are vague and second-hand. Archaeologically, it is not known whether clinker built craft existed in the North as early as the 3rd century BC. The 3rd century BC "Hjörtspring Boat" is, however, an interesting anomaly. Excavated in 1923, in a dismantled state, in a bog together with other ex votos it is now in the Copenhagen Museum. Although the boat is not clinker built, yet the outer smoothness of its hull does happen to be broken by a corrugation (caused by the way the parts are slotted together). Hopefully more 3rd century BC variants will be found in the North. Meanwhile, it is certain that the hull of the Punic Ship is not "round"; also that imitation clinkers encircle its water line; since the latter can serve no useful purpose besides the deflection of spray, their presence further confirms (were confirmation needed) that this hull was designed for speed.

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NOTES

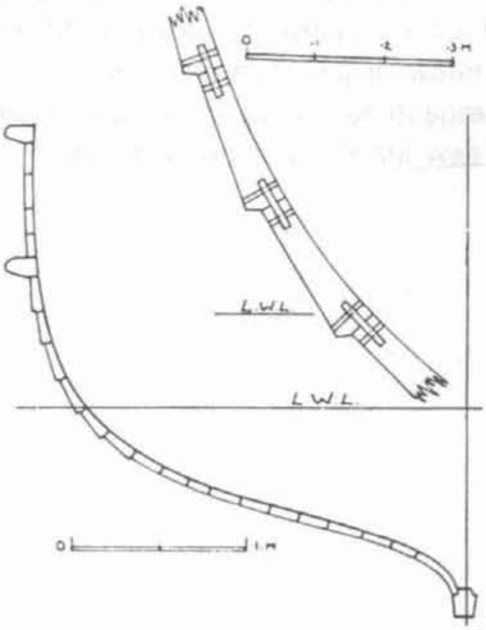
1. I am obliged to Richard J. Steffy and Patrice Pomey for answering my questions on the point.
2. Again, I am grateful to my collaborator, the engineer and naval architect, Austin Farrar, for information; see "Spray Deflectors", *MM* 73,3,271-2 (1984) and the "Sequel", *MM* 74,2, 160-162 (1988).
3. With the exception of the two unusually thick garboard strakes which, although they may originally have been cut from a trunk by sawing, were subsequently shaped by adzing in order to give the basic curve of the hull. This because the Punic Ship is of the category of ancient vessel whose tenons remain at the same angle throughout the length of the keel rabbets. The simulated clinkers, or spray-deflectors, were shaped with an adze, used on the outside only, after the planking had been sawn.

ILLUSTRATIONS

1. Detäil showing the imprint of the spray-deflectors on the bottom under the Punic Ship.
2. Sketch by Austin Farrar showing the simulated clinkers at the waterline of the Punic Ship.
3. The "Coander effect": A and B, a spoon held under a flowing tap; C, the same but with a roll of plasticine which deflects the water outwards from the bowl of the spoon.
4. Spray-deflectors on a warship.
5. Spray-deflectors on a speedboat.
6. Spray-deflectors on a lifeboat.

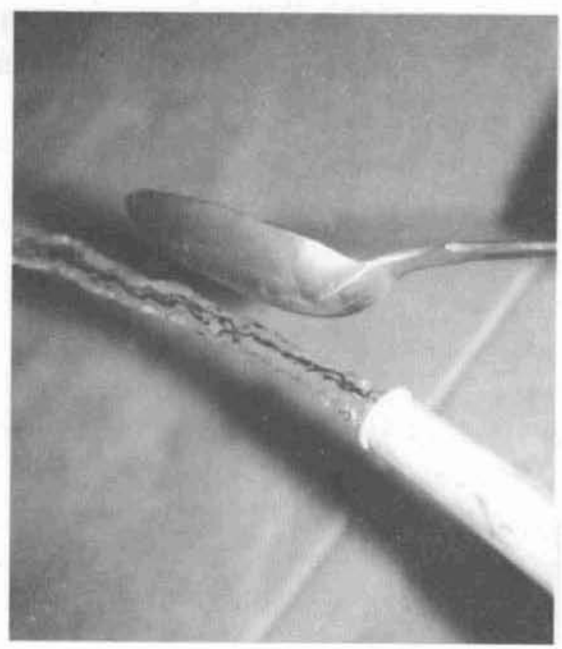
FIG. 1

FIG. 2



Sketch of Section in parallel, mid-part.

FIG. 3a



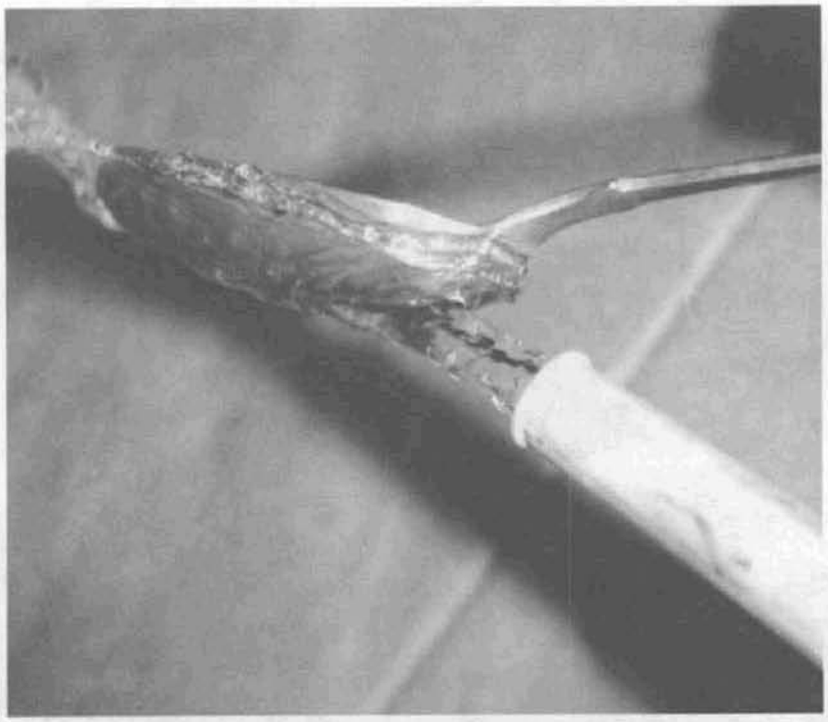


FIG. 3b

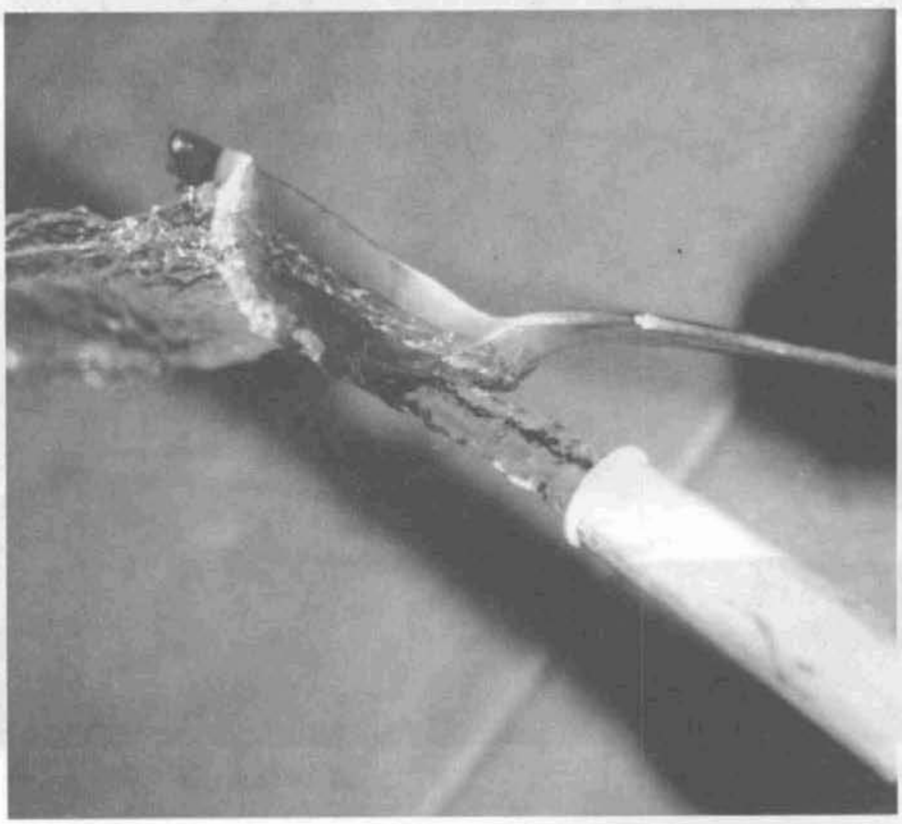


FIG. 3c

FIG. 4

FIG. 5

FIG. 6

RECONSIDERING BYBLIAN AND EGYPTIAN STONE ANCHORS: NEW FINDS FROM THE ISRAELI COAST

In recent decades extensive underwater surveys have been undertaken along the Israeli coast resulting in the discovery and documentation of many new sites and artifacts. The discoveries include shipwrecks, submerged pre-historic settlements, harbour installations and anchorage sites. The shipwrecks and their cargoes, consisting mainly of anchors and metal objects, are usually found in the coastal zone at depths ranging from 1-5 meters, at a distance of 60-200 meters off the modern shoreline. It appears that the most frequent find on the sea bottom are anchors. More than one thousand stone, metal and wood anchors have been located up to date. Most of them were found at a depth of 5 meters. The anchors appear either as a lone find or in clusters. Apparently each cluster consists of anchors belonging to a single vessel which was wrecked in the surf zone (Galili *et. al.* 1986: 25-37; Galili 1985: 143-153; Galili 1986: 69-73). Most of these clusters were found in unsheltered,open coastal areas. Another notable phenomenon is the appearance of large numbers of single anchors concentrated in one specially bounded area, or as Frost refers to them: "graveyards" of anchors (Frost 1970: 385). These are usually seen in sheltered areas along Kurkar (sandstone) islands or reefs at depths which usually range from 4-10 meters. The newly emerged data provided by the surveys enriches our knowledge of maritime practices of the ancients along the coasts of the eastern Mediterranean. Some actually require a reconsideration of previous conclusions, reached in the past. Among them is the question of one of the earliest relics of ancient navigation, the Byblian stone anchor (anchor previously defined as a Byblos type).

Until 1983 only two Byblian anchors had been recorded along the Israeli coast, both of which were located in the Carmel Ridge area (Romen and Olami 1973: 10, 27; McCaslin 1980: 37). Since then, twenty seven additional anchors have been found located mostly in the Carmel coast area (Fig. 1). Other types of anchors believed to be of Egyptian provenance were also discovered in this area (Steiglitz 1972-75: 43; Galili and Raveh 1988: 41-48).

Byblian anchors were first discussed by Honor Frost (Frost 1963: 8-9). She described the six anchors discovered by Maurice Dunand at the Temple of Obelisks at Byblos. Although she did not reach a clear conclusion as to the origin of this type of anchor, (e.g. whether they are local to Byblos or Egypt), she did postulate that they "...could have never stood on ships in motion as the anchor from the relief in the tomb of the Egyptian Vth Dynasty Sahu-re evidently does" (Frost 1963: 9). Frost continued her studies and published later discoveries and constructed a typology of these anchors which is still being used today. In her studies, (1970: 381; 1973: 401; 1979: 51) Frost made a clear definition of the Byblian and Egyptian anchors. The Byblian was characterized as "... a triangular slab of stone with an apical piercing, sometimes surmounted with a shallow groove" (Frost 1970: 381). She further suggests that the anchors did not stand upright and were probably used for warships since none of them is large and most are medium sized (Frost 1970: 385). Frost defines Egyptian anchors as: typically exhibiting an L-shaped piercing through one corner of the base, an oval top, the capability to stand upright independently and the groove above the hole. She assumes that those are of Egyptian provenance since they are similar in shape to the anchors on the prows of Sahu-Re and UNAS ships. On one specimen, uncovered in Byblos, appeared the Egyptian hieroglyph nfr. Other similar representatives are the 7 anchors found in Mersa Gawasis on the Red Sea coast from a shrine in Egyptian context.

Other scholars have addressed the question of the anchors, citing the same published material. McCaslin (1980: 36-37) accepted the typology suggested by Frost for the Byblian and Egyptian anchors. He does however point out that the Egyptian anchors do not necessarily have the L-shaped piercing in the base end. He cites the example of the pair of stone anchors from Megadim on the Carmel coast which are believed to be Egyptian as evidenced by the Egyptian hieroglyph engraved on them (Stieglitz 1972-75:). He divides the Egyptian type into two groups, an earlier one, with L-shaped groove and a later one without the L-shaped groove. He explains the paucity of these types in Egypt by assuming that they were only used for foreign voyages. To Nibbi (1984: 247-248, 260), who does not believe that the Egyptians sailed in the open sea, the "so called" Egyptian anchor with the nfr sign (found in Byblos) and another in Ugarit could not be Egyptian at all. The Hieroglyphs, according to Nibbi, could be of Hyksos or local alphabetic origin. She further claims that the Megadim anchors with their steering oars do not necessarily point to an Egyptian origin, since these signs are common to any maritime civilization.

Since these treatises were published, many additional anchors of these types have been located in the area of northern Israel. Up to date, twenty five of them were found off the Carmel coast and one off the coast of Appolonia (central coastal plane of Israel) (Fig. 1). Of the twenty six, some were found in four separate clusters and a few were found individually.

The largest cluster was found in Neve Yam (Fig. 2) and consists of 15 Byblian anchors (Galili 1985; 1987). Since they were published in detail in the past, they will not be dealt with individually at this juncture. In the main bay of Atlit, two additional Byblian anchors were found alongside an MBII storage jar(Fig. 3). The two limestone anchors respectively weighed 144 and 117 kgs and their hole is straight and not biconical. Another group of two anchors was found off the Kfar Galim coast (Fig. 4). They are similar to the Atlit ones and weigh 133.5 and 151 kgs. The most interesting cluster, was located off the coast of Kfar Samir south of Haifa. It consists to two limestone anchors weighing 152 and 211 kgs. bearing inscriptions (Fig. 5). One of the two anchors has an L-shaped groove in its bottom. Of the five anchors, found individually, one was found off the coast of Appolonia-Arsut (Fig. 6) weighing 109.5 kgs (Galili *et. al.* 1993 in press). One was found in the southern bay of Dor (Wachsmann 1989: 236 plate 170). In the area of Atlit two individual anchors were sighted, the first weighing 104 kgs. (Ronen and Olami 1978: 27) and the other weighing 95 kgs. An additional Byblian stone anchor was located off the shore of Tel Kara (Ronen and Olami 1978: 10), weighing 104 kgs. All the above mentioned anchors, found individually or in clusters, are made of limestone, with one chiselled hole in the top which is straight. The majority of the anchors cannot stand upright independently. Some of the anchors have a groove encircling the top of the anchor from both sides of the hole, whereas in others the groove is partial, or absent altogether.

Discussion

Considering the large incidence of anchors found over the past few years, it is necessary to re-evaluate certain definitions which were suggested in the past by scholars. Under discussion is the particular shape of the anchor defined as a Byblian type, its characteristics and distribution.

It has been suggested (Frost 1970: 385) that while the Egyptian anchors have the L-shaped piercing on one side of their base, the Byblian anchors did not. We found that this distinction is not always necessarily correct. In the Kfar Samir cluster, (Fig. 6) there is one specimen (anchor 2) which is a typical Byblian type anchor, yet it exhibits an L-shaped piercing in one of its sides. Both of the anchors found in Kfar Samir most likely originate from the same vessel, not only because they were found in close proximity to one another, but also bear almost identical inscriptions (Fig. 5). Alternatively, several anchors found in the same general area north of Atlit (Megadim) bear general characteristics which were defined as Egyptian (such as the oval top shape and the independent upright bearing) as well as incisions which were considered to be of Egyptian provenance for instance the two anchors with steering oar reliefs and the one with the human legs inscription (Stieglitz 1972-75: 43; Galili 1988: 41-48). All three however, lack one important attribute: they do not exhibit the L-shaped piercing, which according to Frost's definition, should have been there. In addition, it has been suggested in previous publications that the Byblian anchors cannot stand upright independently (e.g. Frost 1963: 9). We found that some of the 27 are indeed capable of doing so.

Of course, the distribution pattern for the Byblian anchors which was established in the past, when the majority were found in the Lebanese Syrian coast (Byblos and Ugarit - Ras Shamra) is no longer acceptable since the large majority were found in the carmel coast. Recent evidence further accentuates the problems of the current typology of Byblian and Egyptian anchors. The engravings on the Kfar Samir anchors are cases in point. The two anchors, of two different shapes, bear practically identical inscriptions, which are most likely of Aegean origin. Two of the three symbols may be interpreted as signs "20" and "86" in the Mycenaean Linear B syllabary (Ventris and Chadwick 1959: 41) and one in the linear A syllabary (Gordon 1966: PL. XI).

Conclusion

Based on previous discussions we are led to the conclusion that there is insufficient data to determine the ethnic or group origin of the so called Byblian or Egyptian anchors according to their shapes and other observable attributes. Thus the previous typological definitions are outdated. This indicates that the two types may actually be sub-classes of one type. Attributes of both of these two varients are the almost triangular shape of the anchors and a hole which is usually situated clearly below the center of the upper curve of the anchor, unlike the obvious case of most of the Syrian anchors in which the center of the hole is situated close or on the center of the upper curve (Fig. 12). We did not include the two Megadim anchors published by Stieglitz and an additional one with an Egyptian incision (Galili 1988: 41-47) in this triangular category (the Byblos type) since the center of their hole is situated approximately in the center of their upper curve and their form is not triangular.

Judging by the anchors found so far, the origin based upon their frequency of appearance, seems to be the Syro-Northern Palestinian coast. It should be noted that while the remainder of the Israeli coast has been as comprehensibly surveyed, 25 of the 26 of the so called Byblian stone anchors were found off the Carmel coast.

The concentration of these anchors in the Carmel Coastal area raises new questions since we might assume that the anchors carried aboard ships would have been equally dispersed along the entire coast from Syria to Egypt, unless there is some unknown reason for this peculiarity. Another question is as to the likely owners of these anchors: are they of the same group of vessels sailing one particular period? We feel that they all belonged to merchantmen, and not to warships as previously suggested (Frost 1970: 385). If we use the case of the Neve Yam cluster of 16 anchors of which 15 are of the so called Byblian type, one could not possibly expect a warship, which should be light and quick, to carry such a heavy load of anchors.

Interestingly enough, although so many were sighted underwater, there are no Byblian anchors reported from any land excavations in Israel. This may be due to the fact that few coastal sites of the likely period in which they were used, namely the middle Bronze IIa (as established according to the finds at Byblos), were not yet excavated. However, with the renewed interest in coastal sites, new data has been emerging.

The coastal site of Tel Nami which is located on a peninsula one mile south of Neve Yam, has yielded a good amount of information on the period of the Middle Bronze IIa (Artzy and Marcus 1991). Seismic tests carried inland from Tel Nami indicate a possible anchorage in a silted outlet which has not been excavated yet. During archaeological excavations which took place at Nami from 1986 to the present, evidence of contacts with Cyprus (Artzy and Marcus 1992), Egypt (Marcus 1992; Marcus and Artzy in press) and the Aegean (Kislev, Artzy and Marcus 1993: in press) were noted. It is likely that the Nami region fulfiled a role of an anchorage for the trade between Byblos and Egypt which involved the Aegeans and possibly the Assyrian merchants in the southwestern coast of Anatolia (Artzy 1993: in press) and an entrepot (Marcus 1992) in the first part of the second Millennium B.C. Thus it should not be of any surprise to find the anchors in such proximity to Tel Nami.

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Jacob Sharvit, Marine Branch, Israel Antiquities Authority.

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ILLUSTRATIONS

1a, b Location map showing distribution of stone anchors under discussion along Israeli and eastern Mediterranean coasts.
2. Photograph of Byblos type stone anchors from Neve-Yam.
3. Drawing of the Atlit Bay anchors.
4. Drawing of the Kfar Galim anchors.
5. Drawing of the pair of anchors from Kfar Samir.
6. Photograph of the pair of anchors from Kfar Samir.
7. Diver measuring the Kfar Samir anchors.
8. Drawing of the Byblos type anchor from Appolonia.
9. Drawing of the Byblos type anchor from the North Bay of Atlit.
10. Photograph of pair of anchors from Megadim North.
11. Photograph of the pair of anchors from Megadim South.
12. A key to the measurements of stone anchors in the text.

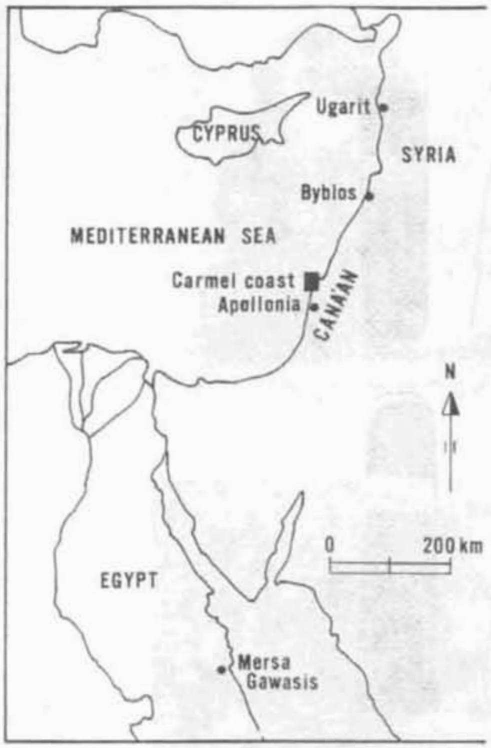


FIG. 1a

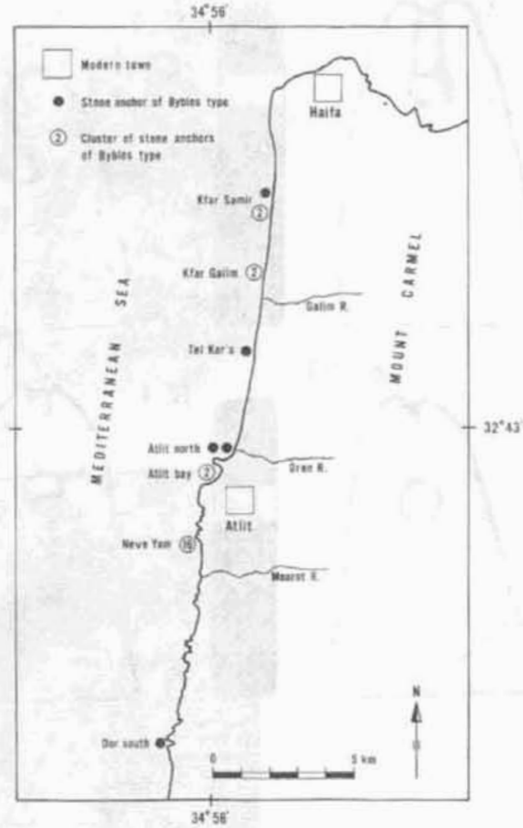


FIG. 1b

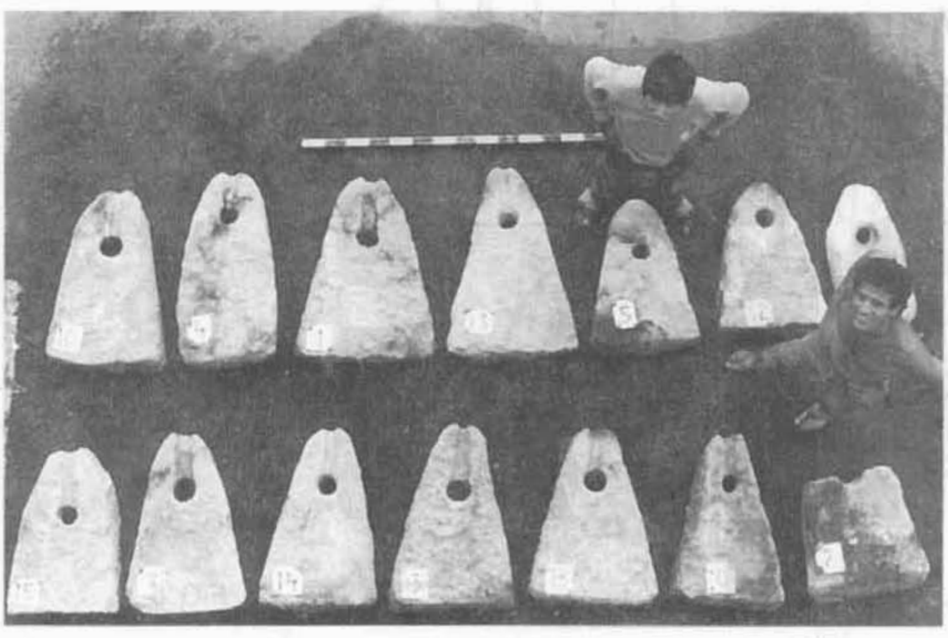
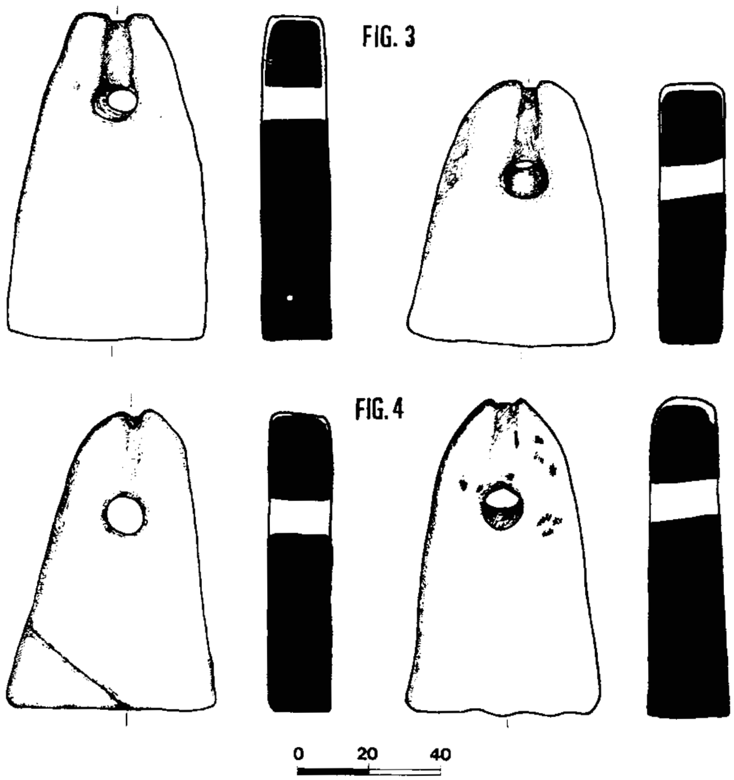


FIG. 2



FIGS. 3-4

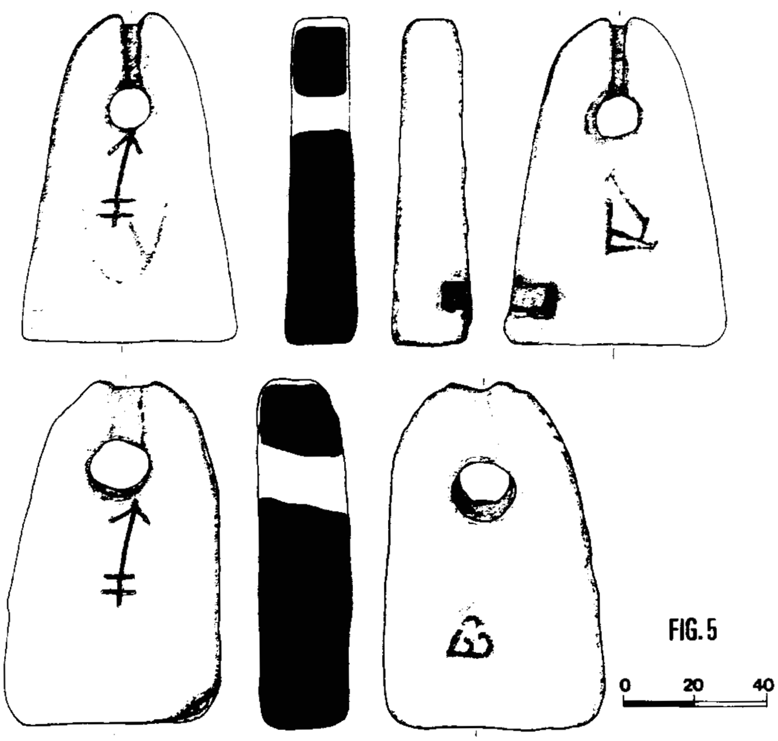


FIG. 5

FIG. 6

FIG. 7

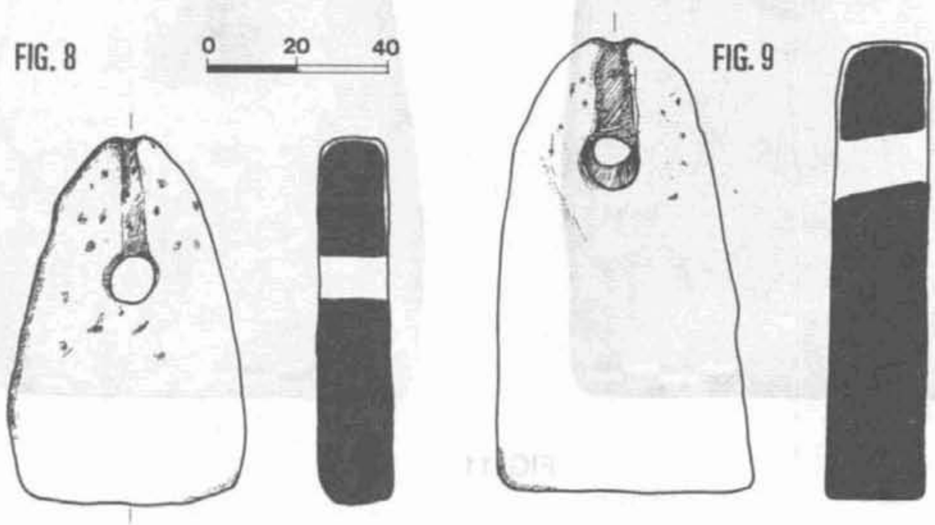


FIG. 8-9

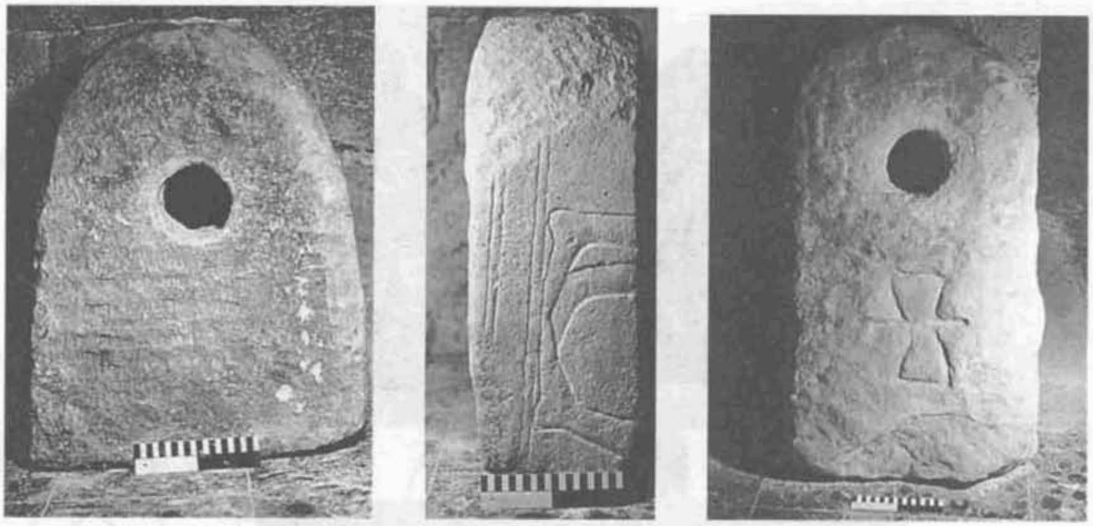


FIG. 10

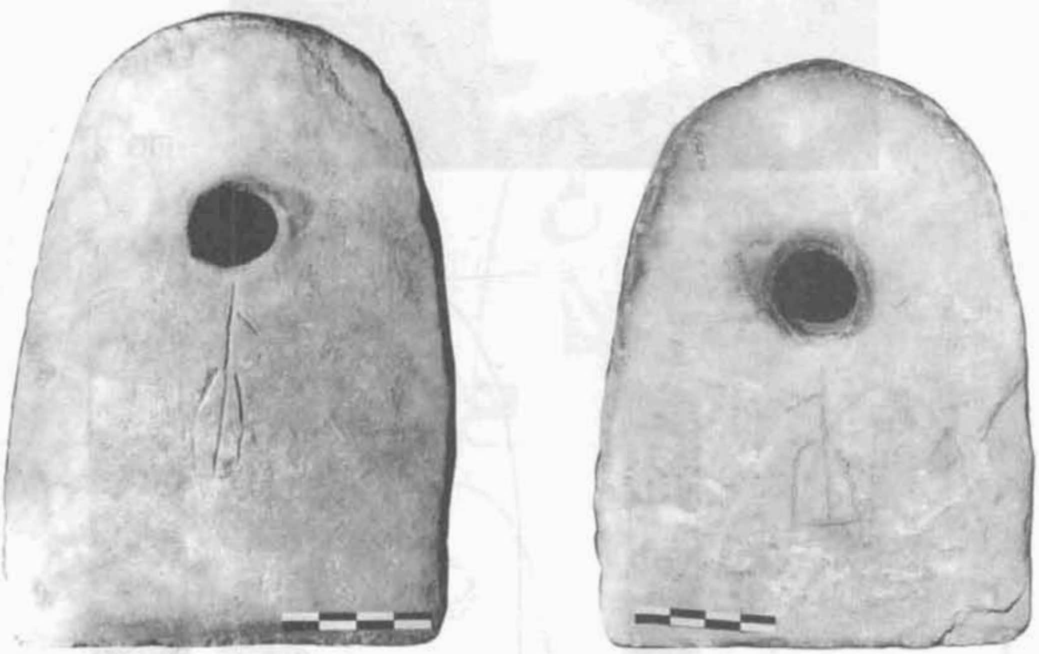


FIG. 11

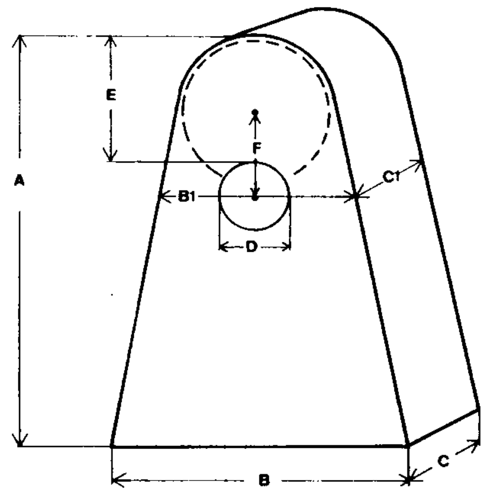


FIG. 12

Anchor s dimentions

A - Maximum height
B - Maximum width at lower part
B1 - Maximum width at hole center
C - Maximum thickness at lower part
C1 - Maximum thickness at hole center
D - Average hole diameter $\frac{D\ Max + D\ Min}{2}$
E - Distance from hole to anchor's top
F - Distance between apex center and hole center
(If apex center is lower than hole center F<0)

FIG. 12

THE RIGGING OF BRONZE AGE SHIPS

Abstract :

The ability of Bronze Age boats to sail to windward is analysed here by examining the rigging. The purpose is to shed some light on the ways in which maritime exchanges and passages could have been undertaken in the Aegean in the LBA.

1. Introduction

Local weather conditions and geography are crucial factors in the design of ships and rigging[1]. They will have influenced the way in which the earliest navigators traveled in the Aegean. Thus, some theories about trade and communication will need to be re-evaluated, in particular those which do not address actual sailing conditions. My aim is to present a technical analysis of the ways in which Bronze Age boats were equipped to sail.

The archaeological evidence for increasingly systematic sea communication in the Mediterranean during the Bronze Age is indisputable. Furthermore, the expansion and sharing of technological information between coastal sites is well documented for the LBA[2].

I have argued elsewhere that professional sailing, and by extension trading by sea was not a random activity limited by seasons, weather conditions or time of day[3]. The Aegean islands did not have autonomous economies although they may have come close to it in the EBA and the early MBA. As communities became larger, they were apt to become more reliant on trade. The spread of obsidian and later the common use of bronze and increased technological sophistication demonstrate that contacts were sought beyond the confines of island communities. Given the absolute need for efficient communication by sea, one cannot assume that boat design evolved haphazardly over the centuries. The development of designs allowing for more predictable handling of ships was undoubtedly given considerable attention. Ships were essential for supplies, for communication, and for war. The economic and political growth of islands such as Crete, Thera, Melos and Kea is inconceivable without efficient sea contacts. This essential need will have influenced ship design.

It is especially important to establish the ability of BA boats to sail to windward. The wind is the power that drives a sailing ship. The efficient use of this force will be the primary concern of a ship builder and a sailor. A major misconception about square sails is that they can only be used for running before the wind. The concept of ancient navigators running south with the aetesian winds in the summer and north with the south winds in the winter should be reconsidered. Unfortunately, it has influenced theories about communication and trading systems in the Bronze Age Aegean[4]. The way people sailed in the historical periods is certainly important as comparative evidence, but may not apply fully to the prehistoric period due to differences in economic and political systems.

2. Technical factors and historical evolution depictions of ships and known wrecks

The major sources of information about Aegean BA boats are models, images on miscellaneous objects, ceramics, seals and wall paintings, as well as recent studies of Bronze Age wrecks, and the Homeric poems[5]. Concordances between the rigging in the Thera ship painting and standard Homeric rigging terms have been discussed in detail elsewhere[6].Traditions were undoubtedly strong and many images exist as testimony to designs of earlier periods[7].

A hull propelled by oars has other requirements than a hull propelled by wind or by a combination of the two. White points out the obvious difference in equipping a fighting ship or a cargo ship: oared cargo vessels are unpractical because crew and equipment occupy space at the expense of cargo[8]. This observation is valid for any period of antiquity. While cargo ships may include oars, they will be fewer and less permanently outfitted. The hull will be designed for maximum capacity and not for the accommodation of rowers.

Increased flexibility and stability in conjunction with optimum hull speed have always been the main stimuli for changes and developments in the design of hulls and rigging. The simplest way to achieve balance in the hull design of a shallow keeled ship is to create a symmetrical hull with the greatest beam and depth at the center. On a beamy hull, it is best to avoid extremes of fineness or fullness forward in order to achieve better balance.

Masted ships that rely on wind power require different types of calculations than oared ships. The center of buoyancy will be different. The center of gravity must fall within the same fore and aft line as the center of buoyancy, otherwise the ship will sink by the stern or the head. Even the simplest sailing ship design requires a practical knowledge of these facts. Once a functioning hull design is achieved, it can be used repeatedly and refined. LBA designs surely reflect knowledge acquired by trial and error[9].

The same can be said for rigging, but here experimentation is less costly of both labour and materials and is likely to be more effective. The rigging of a ship is the most crucial aspect of the design. Because it is not a permanent construction as is the hull, it can be fine-tuned and altered by pressure according to need, individual judgment, wind and weather conditions, and angles of sail. Bronze Age rigs from the various sources mentioned and those described in the Homeric poems were easily adjusted.

Design of the rigging and considerations such as the height of the mast on BA boats are limited by specific technical considerations such as center of gravity above the waterline, weight of the rigging, balance and type of rigging[10]. These features are related, and in order to create a sea-worthy ship, the shipwright must take all into account.

A major concern has been and still is to increase the angle which a ship can sail effectively to windward. Downwind runs and broad reaches are easier to accommodate with almost any type of rigging, especially with square sails. However, a sea going sailing ship must have the flexibility to confront changing weather conditions. Although in theory the highest speeds may be attained when running before the wind, in practice, higher speeds are achieved in reaching winds. A reach is the fastest and smoothest tack. Thus, although one might expect following winds might to have been preferred when using a square sail rig, in actuality, they can be extremely dangerous, particularly in combination with high seas, rapidly leading to a loss of control. A large sail area will make matters worse. There is always a fear of broaching and swamping. Due to their rigging and low freeboard, Bronze Age boats would have been subject to these problems in addition to considerable lateral drift, especially on downwind tacks. Thus downwind is not the easiest angle to sail, nor is it necessarily going to get you to your desired destination.

a. Egyptian Ships

Some of the best comparative material for the Aegean comes from Egypt[11]. Egyptian merchantmen at the beginning of the New Kingdom are depicted with the mast planted amidships, and the sail attached to two very long yard arms made of two poles each and tied together at the mast[12]. Such exceedingly long yards naturally suggest a vast sail area, ballooning out from the mast to carry the ship downwind on smooth waters with maximum speed. This rigging may well have been practical for linear N-S passages on the Nile and the Red Sea as well as hauls close to shore in the Levant south of Cyprus[13]. It is quite another matter to set out with such a rig for the purposes of trade, barter or piracy among the Aegean islands.

Indeed, the Aegean has very different weather conditions for which considerable flexibility is required. This island studded sea with its variable wind and water currents, its rocky shores and hidden shoals is subject to sudden changes in the weather[14]. In unpredictable and stronger winds a smaller sail area will be safer and more flexible.

b. The Ulu Burun Wreck

Ballast and disposition of the cargo is especially important to the handling of a boat under sail, especially a shallow keeled boat. The evidence of the Ulu Burun ship is most informative on this point[15]. Although the timbers have yet to be raised, some observations are possible. The volume of the cargo is evident as well as its disposition: the heaviest items appear to be placed along the longitudinal axis and centered near the mast. The loading of the ship indicates practical knowledge that concentrated ballast will reduce the effect of fore and aft pitching. In the opinion of G. Bass, this ship probably capsized as a result of a sudden off-shore squall while running along a lee shore[16].

c. The Theran sailing ships

i. Iconography

At present, the Akrotiri ship painting is still the best source of information. It includes three masted ships and five others with lowered masts and rigging[17]. Although the ship under sail is very fragmentary[18], enough remains to suggest the original appearance[19]. Iconographically, the Egyptian and Thera depictions share an attention to detail which aids interpretation[20]. However, certain artistic conventions apply and one cannot expect abbreviation to shift to photographic realism whenever convenient to the interpretation. The requirements of art do not coincide with those of a technical manual on naval architecture. First and foremost, questions about rigging must be put to the test of what can and will work.

ii. Hull

The masted boats have long, narrow hulls with a curving prow which appears to narrow towards the tip. There is an affinity with earlier Cyladic designs in that the shape favours a variety of angles to the wind[21]. The pointed bows are also effective in slicing through waves. More importantly, a shallow and narrow hull with a relatively small angle of heel will perform reasonably well when reaching as opposed to running downwind or close hauled.

On the sailing ship, three deck hands are seated forward of the mast, and all are, of course, looking up at the sail. The crew is placed forward for greater stability. Two other men stand at the stern. One handles the steering oar, and the other may be handling a second steering oar and the sheets. Other oars or paddles are conspicuously absent. In this respect the sailing ship is unique among the larger craft and may well be a cargo ship[22].

In the reconstruction, a passenger is shown seated in a protected area in the stern. This cabin is a feature common to all the larger ships in the scene but may not accurately belong here[23].

The stern projection attached to the larger paddle propelled ships has been the subject of extensive speculation[24]. The high, upward curving shape of the stern does not favor the placement of a boarding plank in this position. The argument that the journey undertaken is short[25] cannot account for a boarding plank being engaged horizontally at sea level while a ship is under way. This is tantamount to traveling with the ship's ladder down. There has to be a nautical reason for this option. Visually and functionally, it is an extension of the hull to the stern. It extends the waterline without increasing hull size and may act as a stabiliser. Whatever the final word on this piece of equipment may be, any explanation must take into account its usefulness in the handling of a ship in motion.

iii. Placement of mast

The placement of the mast here is very important: it is set just forward of the center. It is not a coincidence that the mast of the Ulu Burun ship may also be placed just forward of center[26]. The Theran shipwrights were surely aware that placing the mast forward allows a ship to sail closer hauled and provides more stability in downwind situations. This significant technical advance marks an improvement over contemporary Egyptian boats and serves to demonstrate that the island and coastal populations of the Aegean were motivated and successful in seeking to improve the performance of their ships.

iv. Mast

The mast is made of a single pole. The means of support is not visible in the painting, presumably because it is located behind the gunwale. The extant mast-heads on the larger sailing ships have five sockets or pegs on either side. At least ten lines can be accommodated.

v. Rigging

a. yards, sail area

The rigging of a sailing or cargo ship of the Theran type must be relatively stiff, the mast as straight as possible and the sail area proportionately reduced in order to avoid stress. The importance of the shape of the sail and its flexibility cannot be underestimated. It is the essential tool for increasing maneuverability.

Theran sailing ships have two yards. The lower yard is the boom. Unlike Egyptian examples, each yard appears to be made from a single pole. There is nothing in the fragments of the ship under sail or in the other masted ships to indicate that the yards consist of two joined poles[27]. Furthermore, the yards are proportionately shorter than the Egyptian ones, indicating a smaller sail area. The hull is also proportionately shorter. The sail area remains greater in width than height, but is considerably smaller compared to Egyptian merchantmen of the same date. A longer boom with a squatter sail will be relatively stable, but a narrower sail will be more effective in sailing to windward. The reduction of the sail area indicates a preference for greater maneuverability over speed in order to facilitate sailing at a closer angle to the wind. Indeed, small adjustments in design all seem to share this goal.

b. halyards and lines

The presumed lack of standing rigging[28] raises interesting questions about the way that ships traveled. Morgan believes that it is evidence that voyages (or the specific voyage depicted in the Thera painting) were of short duration[29]. This does not necessarily follow. One cannot be sure that all the actual lines are depicted on the painting. When moored or under oar power, fore and back stays are not needed. The fragments of the ship under sail are of no help here. But stays and shrouds would have to be rigged and tightened before hoisting the sail.

Organic rope or cable kept under permanent pressure is easily undermined and consequently unreliable. For instance, Agamemmnon's rigging at Troy is out of commission, presumably from exposure and lack of replacement parts[30].

Square sails are rigged with the same number of lines on either side of the mast. On the sailing ship, two halyards run parallel to the best preserved side of the mast[31]. Therefore, one can reconstruct at least two lines on either side. The artist may have abbreviated the actual number of lines needed.

Four lines are insufficient to handle the rigging of a sailing ship with two yards[32]. Anywhere from two to seven or eight lines are seen on various examples in glyptic and on other ships of the Thera fresco. In the Odyssey, a double headstay rig with one yard and possibly without brails will have at least nine lines running through the mast[33]. Brails (or lifts) will require at least two more lines. A ship with a double yard rig and brails, single back and forestays and side stays needs at least ten lines and this accounts for the five loops on each side of the mast-head (Fig. 3).

Two topping lifts connect the upper yard with the mast on either side. They are for hoisting the upper yard and the sail which it supports. These are the heaviest lines in the running rigging because they carry the entire weight of the sail. In Morgan's reconstruction (Fig. 2) they appear to connect the upper yard with the mast-head rings[34]. Yet Morgan recognises that the topping lifts must have been fed through the rings and run parallel to the mast- they cannot be permanently attached between yard and mast as shown in her drawing because there would be no way to raise or lower the entire sail from the deck[35].

Sheets control the lower part of the sail[36]. The downhauls or braces attached to either side of the upper yard are for lateral adjustments. These are attached to the yards and do not need to connect to the deck through the mast-head rings.

c. reefing and furling systems

The rigging includes lifts or leechlines for reducing sail area (reefing). Two lines cross the sail together on either side at a diagonal leading from the end of the boom to the center of the yard. It is logical to assume that they passed through the rings in the mast-head at this point. The lines either attach to the boom or pass under it. If these are attachments to the sail they are brails. If they are attachments to the booms they are lifts. It is not at all clear from the original drawing how these lines are to be interpreted. One cannot exclude the possibility of some type of brailing system. In the unrestored fragments of the sailing ship, the lifts on both sides of the mast terminate at the edge of the boom and not above it as in Morgan's reconstruction. These lines can conceivably pass under the boom, through a small loop or even a tie in order to ascend diagonally on the other side of the sail. This will allow the boom to be rolled while being supported by the lifts, a cumbresome system at best. In the Cycladic islands, sails of wind-mills were furled this way in the past. In any case, each line must then pass independently through a mast ring and continue down to the deck. When reefing, the boom is adjusted by tightening or slackening of the brail lines through the mast rings. In addition, the system of topping lifts will allow the upper yard arm to be lowered and adjusted accordingly. Both yards or the boom alone can be adjusted when reefing.

The other masted ships in the Thera painting demonstrate that the upper yard was lowered to furl and stow the sail. Thus, to reef the sail, the lower yard is raised or both are adjusted. To furl the sail, the upper yard is lowered by slackening the topping lifts. In later examples at Medinet Habu and later Greek illustrations, the single yard remains stationary and the lower part of the sail is raised for reefing. But these sails had reefing points which could be secured.

Brails were effectively used in later squaresail rigs for reducing sail area and for changing the shape of the sail. A combination of two yards with either brails or lifts will allow the shape of the sail to be changed in order to take advantage of various wind directions[37]. The reefing system proposed in Fig. 3 has great potential for sailing to windward. One side of the sail could be reduced by narrowing the space between the two yards to form a triangular sail area with a leech. The raising and lowering of the topping lifts also serves to change the angle of the entire sail and the way in which it will perform. This is surely the first step in the development of the lateen rig[38]. The double yard rig is clumsy but it gives the sail rigidity and shape. Tacking with this rigging is difficult but feasible[39]. I suspect that jibing would be preferable, using the steering oars to pivot the boat. Most importantly, this rigging will allow the boat to sail on a closer reach[40]. The Kyrenia ship though differently rigged and with a single upper yard sailed far closer to windward than any one had expected[41].

At Medinet Habu the lower yard arm has been eliminated, and a more complicated system of brails has been introduced to reef the sail upwards[42]. Indeed, even the Egyptian boats at Medinet Habu are a new type of warship[43]. This change may have occurred as a result of influences from the Aegean[44]. Another possible source may be the inhabitants of the NE coasts of the Mediterranean in the second half of the 13th C. BC[45]. Clearly, ethnic origin of the boats or of the design cannot be determined from the Medinet Habu depictions alone. To determine the origins of the invention, some examples must be found of similar rigs in earlier contexts. The rig with a single upper yard arm and with a loose footed sail adjusted by brails is a major breakthrough in sailing which could not have occurred without prior experimentation. The iconographic record of the Aegean gives some indication that this may have been the case.

Either the lower yard was abandoned in the Aegean prior to this time (LH III C)[46], or, there must be earlier evidence for loose-footed rigs[47].In fact, it is possible that both the single and double yard rigs were used in the Aegean prior to the end of the Late Bronze Age[48].

Improvements on the single yard rig probably led to its eventual predominance. A single yard is described in the Odyssey[49] and continues to be preferred thereafter. I suspect that the double yard became technologically obsolete and was replaced by the efficient system depending exclusively on brails for adjusting the shape of the sail. There are many advantages in making the running rigging lighter and more easily maneuverable.

3.Conclusions

New finds may yet provide us with new information about rigging. At present, the hull and rigging designs do indeed suggest that a reach was the preferred angle to the wind and not a downwind run. This conclusion has important implications for the way in which ships traveled and for the routes they followed.

The visual sources underline the different ways in which designs evolved in neighboring and communicating cultural areas. Although the Egyptians traveled in the Mediterranean, their ships were not among the most seaworthy. For the most part, they were large and heavy merchantmen, not swift warships. It is the pirates, the raiders and the traders, namely the island and coastal populations, in particular, the inhabitants of the Aegean who were surely the most innovative and experimental boat designers. Their position demanded this.

The rigging system of the sailing ships in the Thera painting demonstrates Bronze Age experimentation with sail shape in order to achieve a closer angle to the wind. Greater flexibility was possible than previously thought. This is borne out by the material evidence for trade and contacts in the LBA in the eastern Mediterranean. Trade to and from islands involves ships. We should not underestimate the ships or the naval sophistication of those who built and used them. Even the earliest seafarers must have had some general concept of desired landfall. Thus, they could not have been entirely at the mercy of the winds, changing destinations as they went along. It was necessary to design ships that would allow for maximum flexibility and swift maneuvers.

Although these developments may have taken several generations to evolve, they were surely intentional technological changes brought about by skilled craftsmen and sailors who relied on experience and knowledge of the seas. It is clear that they created ships to fit the environment in which they ventured every day and in all seasons for subsistence and profit.

Submitted by H.S. Georgiou
University of California Irvine
September 1990

NOTES

1 Thanks are due Miriam Caskey and Christos Doumas for their interest and Michael Wedde and Lionel Casson for comments and productive criticism.
2 Georgiou1983: 75-78,88; Warren 1984; Georgiou 1986: 38, 52-53. Smith 1987; Hirschfeld 1990; Niemeier 1986.
3 Georgiou 1990 a, 1990 b.
4 Ibid. Typical are Barber's comments, 1987: 17-18,"ancient navigation seems to have been a seasonal affair"..."it is necessary always to keep in sight of land and suitable shelter."For similar opinions see also J. Davis 1979 and Schofield 1982. See White l984: 143-145 ff. on sailing to windward with square sails.
5 Morgan 1988: 121-142 passim; Georgiou1990 a and b; Bass 1967, 1989.
6 Georgiou 1990 b..
7 Morgan 1988: 121, fn. 2. Broodbank 1989: 319-337 passim.
8 White 1984: 141.
9 Continuity can be seen in the elongated shape shared by the EC shipsand the Thera ships. McGeehan Liritzis 1988. For iconography and earlier bibliography see Broodbank 1989: 327-329.
10 It is presumed that BA boats did not have permanent running rigging. Yet this may not be an important factor in the seaworthiness of the ships. Unsupported masts set in tabernacles are still common today, the catboat rig is an example. But the mast must be solid and relatively short in addition to being supported by vertical extension to the keel.The issue of stays,especially shrouds which can be rigged before setting sail, needs to be reconsidered and the iconographic evidence on this point reviewed. Although in Homer there is no mention of side stays, Minoan glyptic may provide other clues. When three stays are depicted on either side of the mast one pair may represent shrouds. Examples include CMS VII,no.104= Morgan 1988:Fig.80, MM IIa; Kenna 1960,94, no.49,50,pl.3, and Marinatos 1933 pl. 15,32 =Morgan 1988, Fig. 87, MM I-II.
11 Faulkner 1940 3-9; Landstrom 1970; Casson 1964:16. Wachsman 1989.
12 Casson 1964:16; In addition to sail power, Hatschepsut's boats are equipped with 15 rowing stations on each side.
13 Mediterranean Pilot Vol.V 8-23.
14 Mediterranean Pilot Vol. IV: 5-19.
15 Bass 1989: Fig. 2. Bass 1990 believes this may be a royal shipment of cargo dating to the second half of the 14th C or the very early l3th C.
16 Bass,personal communication.
17 Morgan 1988: 121-142. The ethnic origin of these ships is not an issue here.
18 Morgan 1988:Fig. 70; Fig. 1 in this text.
19 Morgan 1988: Fig. 71 and Fig. 2 in this text. Compare Fig. 3 in this text.
20 E.Davis1983: 3-14 addresses the specific character of the narration. Morgan 1988:124 assumes that the representation is to be taken to the letter because the patrons and the artist are asumed to be familiar with ships and their use. See Wachsman 1981:198 for related problems in Egyptian iconography.
21 Broodbank 1989: 327-329 includes earlier bibliography; McGeehan Liritzis 1988: 251,255.
22 See note 9 supra.
23 I see no indication of it in the original fragments.
24 Morgan 1988: footnote 105 and p. 135-137 concludes that it is a boarding plank. See this discussion for bibliography.
25 Morgan 1988:137.
26 Bass, personal communication.
27 Morgan 1988:124 suggests that the yards may consist of two poles each.

28 See n. 10 supra.
29 Morgan 1988:126.
30 Il. II.135.
31 The rigging of this ship has been reconstructed by Morgan 1988: Fig.71, reproduced in Fig. 2 here.
32 Morgan concurs, 1988:125.
33 Georgiou 1990 b.
34 Morgan 1988: Fig. 71. The reconstructed rigging diagram is difficult to interpret, possibly due to the size of the printed figure.
35 Morgan 1988: 125.
36 The terms stays, braces, and sheets are synonyms.
37 I agree with Morgan 1988: 124, fn.19, that convention requires the sail to be depicted parallel to the gunwale. My concern is not with the angle at which this sail is depicted but with the the angle that it can potentially achieve.
38 Casson alludes to this in 1971: 277,Fig.188, regarding a ship with a single yard.
39 See Christensen and Morrison 1976 passim for experiments with square sails.
40 Casson 1964:16; 1971: 274.
41 Comments of Antonis Basiliadis, skipper of the Kyrenia. My experience with flat cut spinnakers designed to sail as close as 15 degrees to the wind suggests the same.
42 Wachsman 1981; Raban 1989.
43 Linder 1973: 319-322; Raban 1989:168.
44 Casson 1971:37 supports neither an Egyptian nor Aegean origin while Raban 1989: 167 suggests that it is a composite type of rig combining Cretan and Canaanite modifications. Wachsman 1981:214 believes the source to have been Syria.
45 Raban 1989: 170-171.
46 Wachsman 1981: 201-202for LH III C Skyros ship with loose-footed sail.
47 CMS VII,no.254
48 Single yard: HM sealing no.146 from Knossos in PM II:244, Fig.141b and 140=PM IV,827,Fig. 806= Marinatos 1933,78,no.54,pl. XVI (MM or LM III A ?); CMS VII:254a ; Marinatos 1933: Pl. XIII,#16 (LH III). Double yard: PM I:254, Fig.190c (LM?); Kenna #107; PM II:243, Fig.139 (LM I);CMS VII,#104 (LM II); Marinatos 1933: Pl. XVI, #52 (LM); CMS II.1, : 287 (MM I-II); PM IV: 828, Fig. 807 (LM I); CMS VIII,106 (LM Ib); Morgan 1988: Fig. 80; Betts 1971: Fig.9 (LMI?).
49 Od.V.254.

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ILLUSTRATIONS

1. Extant fragments of Thera sailing ship- after Morgan l988 Fig.70.
2. The rigging of the sailing ship- after Morgan 1988 Fig. 71.
3. New rigging diagram
4. Rigging diagram showing triangulated sail.

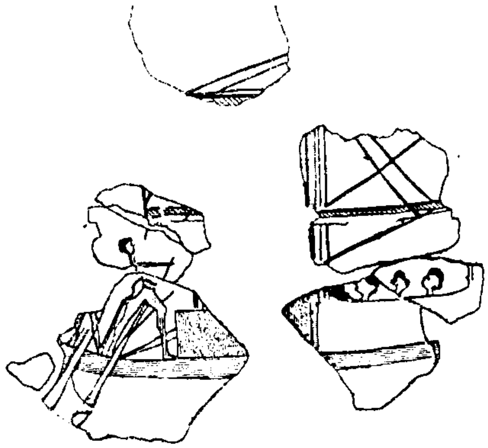

FIG. 1

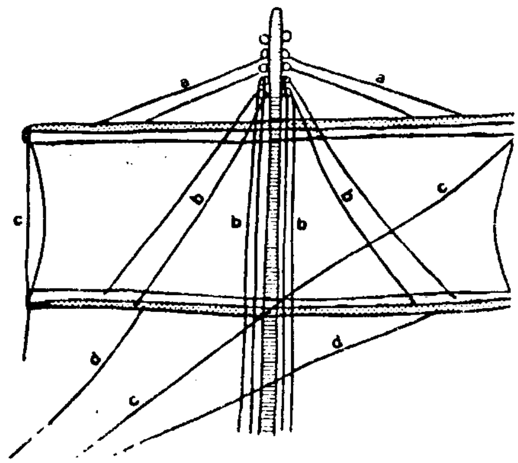

FIG. 2

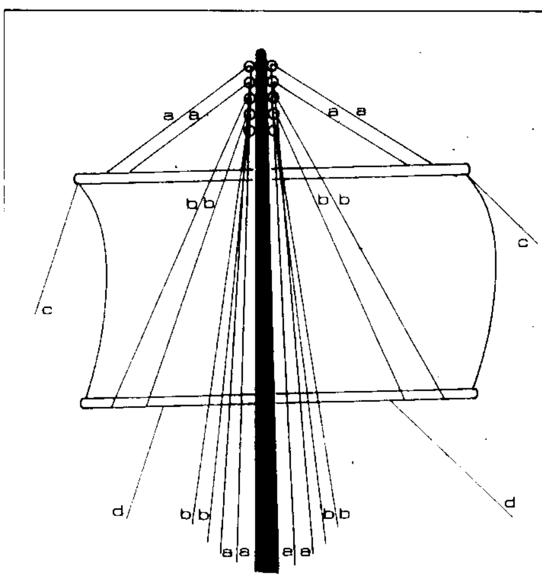

FIG. 3

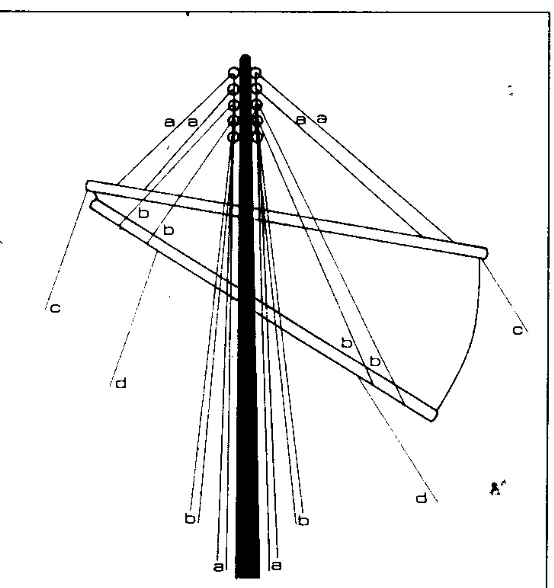

FIG. 4

NAISSANCE ET ORIGINE CELTIQUE DU BATEAU MODERNE

Nous allons étudier cette projection de puissance de la Méditerranée romaine vers une autre *Mare nostrum*, le Mor-Breiz[1] comme on l'appelle justement, où l'effort de Rome se prolongera bien plus longtemps qu'ailleurs (40 ans de conquêtes après le débarquement de 46 après Jésus Christ). Rome y aura à affronter les bateaux celtiques construits "sur squelette" dont nous avons trois vestiges, plus le "Canterbury coin", qui montrent que les Celtes ont créé le bateau moderne. Déjà les Irlandais inventaient la carcasse et la revêtent de peau; ensuite "la peau du navire" reste une expression celtique pour les vaisseaux à bordé, alors qu'au contraire Saxons, Vikings etc..., peut être par un transfert de technologie romaine, ne franchissent pas ce pas et construisent "coque première", c'est à dire qu'au lieu de poser comme sur les bateaux modernes la quille, l'étrave et l'étambot puis les membrures et d'y clouer le bordé, les anciennes marines méditerranéenes faisaient d'abord la coque du navire selon un système très compliqué dit à "tenons et mortaises" en fait des chevilles s'imbriquant l'une l'autre, pour tenir les planches de la coque puis seulement après ils y mettaient un squelette léger pour éviter qu'elle ne se replie comme une feuille morte.

Ce système couteux en travail humain, s'il a donné des navires parfaits et aussi gigantesques, que ce soit des galères de guerre, de la trirême athénienne classique (35m. de long X 5 de large) au vaisseau géant de Caligula[2] qui passe de 3 à 18 rameurs par tronçon et qui faisait 70m X 20m ou des navires marchands de la taille des navires Venètes, était fragile et sans issue. Il aurait eu des limites de taille et de tenue de mer forte. Il aurait interdit le passage du bois à l'acier d'une manière rationnelle.

Mais César le premier pour marquer ses visées sur la Bretagne[3], doit d'abord écraser la confédération Vénètes; son coeur est le Golfe du Mor-Bihan avec pour capitale non pas Vannes, création gallo-romaine et terrienne mais l'éperon barré de Locmariaquer où le plus grand menhir du monde sert d'amer à une antique civilisation celtisée (mal, de nos jours encore on y parle un breton différent et bizarre pour les linguistes).

Avec les fonds de l'époque (-1, 50m), la "ria" d'Auray est assez large, profonde et commode pour abriter 220 vaisseaux de ligne, César fit construire deux flottes de grosses trirêmes, l'une à Angers, l'autre en Poitou qui firent sans doute leur jonction à Corbilo (St-Nazaire). L'armèe suivit la "route" gauloise Nantes-Vannes pour occuper la presqu'île de Sarzeau; il y a là, face au large, une immense plage du même nom, pouvant accueillir environ 200 galères et pourvue en son milieu d'une aiguade. Un tumulus face à Locmariaquer, dit butte de César, fut sûrement l'endroit où le proconsul planta ses enseignes car c'était un point d'observation idéal d'où il vit sans doute sortir la flotte vénète en ligne de file.

Celle-ci fit une conversion impeccable et, bord à bord, après avoir viré poussé par un vent arrière se lança sur la flotte romaine encore sur la plage. Les Romains "sous l'oeil de César" eurent le courage de mettre à la rame. Les vaisseaux Vénètes étaient en fait invincibles mais les Romains, munis de faux emmanchés coupèrent le bas des voiles et s'en prirent à plusieurs contre un aux Vénètes immobilisés. Cela nous montre clairement qu'il s'agissait de trirèmes et non de quinquérèmes car si une "3" (trirême) peut porter 40 hommes, chiffre faible, une "5" (quiquérème) peut, selon Polybe y ajouter une centurie dans ce cas embarquée du camp en arrière de la plage, ce qui eut porté le nombre des assaillants à 120 Romains par vaisseaux et rendu vain ces combats multiples. D'autre part, les équipes de rameurs que César avait fait venir de la "Province" auraient du être d'un nombre considérable pour équiper 200 quinquérèmes. Bref ainsi finit par le fer et le feu la "guerre des Vénètes".

Quels étaient ces bateaux face à César avec leur gigantisme qui interdisait aux tours des galères d'atteindre leur bastingage, aux traits des Romains de porter, vu leur hauteur (alors que ceux des Celtes tombaient de haut) qui les rendaient insensibles à l'éperon et méprisaient les plus durs récifs et qui enfin devaient porter un grand nombre de guerriers pour qu'il faille que les légionnaires se mettent à deux ou trois bateaux contre eux. Je ne parlerai ici que des coques, passant sur les ancres et les chaines de fer[4] comme sur les voiles de peau fininement tannées. La supériorité technologique dans les arts utiles pour éviter l'effort humain, des Celtes sur les Romains, fait qu'il s'agit de navires marchands transformés en guerriers. Je ne parlerai pas non plus de la stratégie des Vénètes, de leurs oppida barrés qu'ils évacuaient et réoccupaient, ni de la bataille elle même et de l'utilité des faux de César dont on ne voit l'usage que le vent tombé (sur ce point on peut citer Dion Cassius écrivant sereinement 100 ans après). Ce qui m'intéresse c'est qu'à mon avis, aucun voilier utilisant les fureurs de l'Océan et bravant les armes du pro-consul n'eut pu le faire avec une coque méditerranéenne classique, c'est à dire "shell first"; par contre si l'on admet qu'il s'agissait de coques "skeleton first", presque tout le récit Césarien s'éclaire et on ne voit pas qui d'autre que les Celtes aurait pu l'inventer, soit à partir du coracle, soit pour d'autres raisons. Ce qui nous conforte, c'est que dans ce domaine, entre 1900 et 1978, l'archéologie, si elle a mis du temps, a régulièrement progressé dans ce sens.

Nous avons le bateau de Bruges trouvé en 1900, lors du creusement du premier canal maritime. Premier indice quand on le voit au musée d'Anvers, mais sérieuse piste tout de même, surtout si on balaie l'argument que c'était un bateau côtier, la région était largement ennoyée à l'époque y compris Bruges elle-même. Ce qui frappe dans ce tronçon de bateau c'est son énorme squelette trop gros même pour les dimensions qu'on lui a supposées (15m X 4m). "Brugge" est un bateau daté du IIe siècle après J.C. chez les Ménapiens (Flandres maritimes, ce grand peuple marin - il l'est toujours -) Mais nous sommes encore plus convaincus quand, soixante ans après, P. Marsden directeur du Museum of London découvre, en 1962, un bateau britto-romain à Blackfriars qui, d'après lui, est de tradition celtique et sur squelette, il date comme celui de Brugge du IIe s, a 16m de long X 6m hors tout, c'est à dire les mêmes dimensions, et est un caboteur fluvio-maritime.

Comment les Celtes faisaient-ils leurs navires? Ils posaient d'abord la quille, puis l'étrave et l'étambot, ensuite les membrures puis le bordé dont les planches étaient ajustées sur les membrures par des clous de fer.

Ce n'est pas un hasard si c'est chez ces deux grands peuples maritimes que l'on a retrouvé deux bateaux celtiques alors qu'ils étaient soumis de belle date aux Romains. Ces "petits navires" nous donnent une idée des gros qu'affronta César. Cette idée se précise avec la découverte révolutionnaire de la monnaie de Canterbury. Elle date d'environ 25 après J.C. et provient sans doute d'un chef important du Kent qui commerçait par Douvres avec les Romains avant l'invasion. Le dessin est très clair, il ne peut s'agir que d'un des bateaux qui affrontèrent César, néanmoins cette monnaie est pleine de mystère.

1. La quille se prolonge en avant comme dans le bateau romain trouvé à Giens.

2. Il serait, selon les chercheurs qui l'ont étudiée, hors d'eau sur une plage car il est très haut, les voiles carguées, et marqué à la ligne de flottaison d'un trait qui pourrait bien être un liston d'échouage... D'après ma vision je pense le contraire.

3. Tout cela vient de ce que les chercheurs lui donnent 70 pieds, c'est à dire environ 23m de long et 5m au dessus de l'eau ce qui nous intéresse, car il faut qu'il domine les tours des galères de César; selon les chercheurs de Cambridge cela suffit. Pour moi, face à des trirèmes de 37m de long, un navire de 25m environ avec une hauteur dont les tours arrivent presque à son niveau est un peu juste face aux géants décrits par le proconsul.

Un bateau de 35m X 10m, tel qu'on en voit construire à Mogador/Essaouira, correspondrait à la définition si filmique et hélas si imprécise de César. Comme les gens de Cambridge n'ont aucun argument frappant pour étayer la longueur du navire de la monnaie, je me bornerai sans plus à leur retorquer qu'une fois immobilisé, il était inutile d'envoyer plusieurs trirémes contre de si "petits" bateaux dont le tonnage selon la taille (23m ou 35m) est de deux mille ou dix mille amphores. Mais là n'est pas l'essentiel, nous avons la preuve du bateau celtique sur squelette sous l'indépendance bretonne puis sous les celto-romains de l'Empire, 150 ans après. [Le rapport de M.P. Jézegou concerne un bateau trouvé à Fos du VI siècle ap. J.C.; nous intéresse spécialement car les Celtes en pleine renaissance ont dépassé leurs mers habituelles.]

Revenons aux Vénètes. César se vante que la répréssion fut sauvage. Sans doute, car les contingents namnètes et Vénètes sont absents lors de la révolte générale de Vercingetorix. Par contre, nous voyons apparaitre après la "pacification" sur la côte nord de l'Armorique deux sites maritimes prestigieux, sans doute créés par les réfugiés Vénètes qui ont fui jusque là à travers la grande forêt centrale. Il s'agit d'Alet face à Saint Malo et du Yaudet à l'est de Roscoff, les deux "cités corsaires" de la Bretagne ducale puis royale. Ces deux oppida ont été fouillés. Ils ont dû être un refuge pour les Vénètes qui, la Gaule et la Bretagne conquises, en tirèrent un fructueux trafic que l'on a calculé, rien que pour l'alimentation en vin des trois légions basées en Bretagne. En effet, sous Claude, en 43 ap. J.C., les Romains "occupent" enfin la ligne Chester-Londres. Alet et Le Vaudet serviront, eux, de ports de commerce. Ce sont ces "Gallo-Romains", restés au fond profondément celtiques, qui exploitent à leur tour Rome! Pour conclure ce propos, il faut répéter que ce sont les Celtes qui ont inventé le bateau moderne. La technique "sur squelette" est la même" pour les porte avions nucléaires "Nimitz" avec leur 93.000t et leur 333 mètres de long, qui combinent l'énergie de deux réacteurs atomiques et les activités diverses de 6 286 hommes, et forme le microcosme à la fois technologique et humain le plus étonnant qui ait jamais existé sur la planète"[5]. Cela vaut aussi pour les paquebots de croisière géants dont le *Norway* (ex-*France*) et le *Sovereign of Seas*, construits tous deux grâce au savoir-faire des ouvriers de Saint Nazaire, comme pour les porte-containers qui transportent "la richesse des nations". Mais notre siècle, comme celui de Rome, privilégie le navire de guerre, alors que le bateau celte coupait en deux les galères de Cesar ou transportait le vin de Bordeaux en (Grande) Bretagne et était lui parfaitement polyvalent.

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NOTES

1. La "Mer Bretonne": la Manche.
2. Retrouvé clans le lac de Nemi près de Rome.
3. La Grande Bretagne actuelle.
4. Les ancres et leurs chaines de fer sont pourtant essentiels pour nous car si nous suivons le "plan" de la bataille, un simple magnétometre permettrait de les localiser et aux plongeurs de les remonter avec peut être une partie des bois.
5. Lucien Basch, Le Musée Imaginaire de la Marine antique, Athènes, 1987.

ANCIENT EGYPTIAN HULL CONSTRUCTION

Representations, written descriptions, and even graves attest to some of the features of ancient Egyptian watercraft, but the physical remains of Egyptian watercraft themselves provide us the best opportunity to evaluate hull construction. Eight ancient vessels are available for study: the two Cheops hulls of the Fourth Dynasty-built, disassembled, and buried in stone pits beside the great pyramid at Giza[1], timbers at Lisht from what were probably freight boats of the early Twelfth Dynasty (c. 1950 B.C.)[2], four ceremonial vessels of Senwosret I of about 1840 B.C. buried near a Dahshur pyramid[3], and the remains of a 2.500 year-old boat from Mataria, a Cairo suburb.

The Cheops Hulls

Features of the sewn planked boats of the IVth Dynasty pharaoh Cheops, have been described in several works that are based upon a study of the hull excavated in 1954 and reconstructed over nearly two decades. This 43-meter-long vessel was constructed of edge-joined planks 7 to 23 meters long and 12 to 15 cm. thick. Rail-to-rail lashing secured planks, seam battens, and frames before stanchions were placed to support the longitudinal spine which was notched, to receive deck beams. Sixteen frames, eight full length and eight three-quarter length, are notched over seam battens and are lashed to the hull through a mortise at each end of the frame. No dimensions are given for the frames in any of the publications available, but drawings show that they are slightly less than 10 cm thick and span about 4.25 m at midships. Frames seem designed to maintain hull shape rather than to serve as structural support.

Deck structures include a large cabin and a frame around it, probably to support reed mats. Construction techniques of the cabin differ from those used on the hull in that some joints make use of pegged mortise-and-tenon fastenings and other fixtures that pass through the thickness of the plank. Builders of the hull avoided these types of fastenings with the exception of the fender area which was then protected with additional pieces of wood.

The second Cheops vessel remains in a stone pit just beyond the museum that housed the first hull. Investigated by nondestructive exploration techniques in a 1987 joint National Geographic Society and Egyptian Antiquities Organization effort, the second boat is not as well preserved as the first. Many of its features are similar to those of the first boat, but larger and more numerous copper fastenings are visible on Cheops II. The uppermost layer of the wood in the pit holds elements of the cabin structures and steering oars in addition to other timbers not yet identified.

In a preliminary report on these timbers, Paul Lipke and I suggested that the cabin was about 20% smaller than that of the first vessel, which prompted us to wonder about the overall length of Cheops II. With the application of a computer program written to provide more accurate measuring techniques, it is clear that there are only a few centimeters difference between the two cabins, and thus the hulls are probably the same size as well.

The study of photographs and video tapes resulting from this visual exploration of the still-sealed pit form part of my continuing study of ancient Egyptian hulls.

The Lisht Timbers

Excavations by the Egyptian Expedition of the Metropolitan Museum of Art (MMA) from 1914-37 revealed more than 50 timbers buried beneath courts, ramps, and roadways surrounding the pyramid of Senwosret I, pharaoh of Egypt about 1950 B.C. During the recent re-excavation of the site by Metropolitan Museum of Art egyptologist Dieter Arnold, 20 additional timbers were located, recorded, and reburied on site. I have identified these timbers as pieces of a disassembled vessel, or vessels, and compared the construction techniques used to create them with those used by the builders of other ancient Egyptian hulls. The catalogue of material also includes a three-part frame and two model boats, one of which is built of planks.

In most cases, three sides of the timbers are mortised, and every example had the uncut side of the timber facing up, indicating careful placement of the timbers. Although adjacent timbers seem to fit together, fastening patterns show that they do not.

Timbers range in length from 1.5 m to 2.6 m and are, on average, 16 cm to 20 cm wide, but may be as wide as 40 cm or as narrow as 12 cm. Thickness ranges between 12 and 15 cm, providing a sturdy, squat appearance to the timbers. Major knots were avoided in timber selection, but economical use of the wood is apparent in the presence of major knots (more than 30 cm diameter) in the ends of many of the timbers. Identification of wood samples suggests that most of the timbers are Tamarix species, a locally available wood that provides short lengths that can be quite knotty.

The ancient woodworkers used at least two types of fastenings in these timbers: mortise-and-tenon joints and lashing. Mortises commonly measure 9-10 cm wide, 12 cm deep and 1.5 cm thick. In addition, there are partial mortises, 5 cm wide and 5 cm deep, cut into timber ends. Mortises are often paired in plank edges, and spacing of the joints is fairly consistent.

Tenons remain in some of the 4.000-year-old mortises, and measure 10.5-11.5 cm long, 6.5 cm wide at base to 4.5 cm wide at the beveled tip, and about 1.5 cm wide. These were often wedged in place with small squared pegs placed on either side of the tenon in the mortise. All tenons remaining in the timbers are broken off at plank edges, and some bear saw marks and breakage scars suggesting that planks were sawn apart from the inside, then pulled off the hull from the outside.

Straps of a plaited webbing also bound timbers together, and about half of the lashing mortises retain the webbind. Most timbers had at least four L-shaped lashing fastenings about 8.5 cm wide, 5 cm deep, and slightly more than 1 cm thick. All of the fastenings exited on plank edges of the inner planking surface, never to the outer surface.

Although it is tempting to say that all the timbers are from the same vessel, none of them actually fit together although if shape alone is used as the criterion for a match, a planking pattern similar to that seen in other Egyptian hulls can be created. Almost every scarf in the planks that I have seen was cut at an angle of about 120 degrees, and consistency in mortise sizing and patterning also supports the idea that the timbers came from a single hull. The features are similar enough to those seen in the Cheops and Dahshur boats, however, to suggest that the source of the consistency may be the shipbuilding tradition of the ancient Egyptians rather than that of a single Middle Kingdom shipwright.

The Frame

In 1914, excavators discovered a frame with a group of other timbers on the west side of the pyramid complex. Although the frame's present location is unknown, drawings and photographs provide detailed information about its structure. The frame is built of three timbers: two upper timbers about 1 m long fastened to a 2.4-meter-long curved floor timber by mortise-and-tenon joints and webbed lashing.

The top timbers are about 15 cm molded (thick) and 20 cm sided (wide) near the inboard ends. The outboard ends are notched and continue the curve shown by the floor timber for 40 cm on one side and about 25 cm on the other. The inboard ends of the timbers are separated by about 50 cm; this opening corresponds to a 1 cm deep notch on the inner face of the floor timber.

An illustrated section of the floor timber suggests that it is about 12 cm molded and 22 cm sided. It has 12 slightly triangular notches on its outer face that measure, on average, 5 cm wide at the base and 10 cm deep. There are also three circular holes 8 cm deep and 6 cm in diameter in the outer face. One is located directly in the center of the frame; the other two are about 80 cm away on either side of the central hole.

The three timbers making up the frame were fastened together with a complex system of mortise-and-tenon joints, lashing, and mortises of unknown function which pass through the thickness of the timbers. Lashing mortises, and mortise-and-tenon joints are present on both upper and lower surfaces of the top timbers. Although fastenings in the lower surfaces correspond to those in the upper face of the curved floor timber, there are no indications as to the function of fastenings on the top of the assembled frame. They may have served to attach the frame to deck beams or other reinforcing lateral hull members.

The three-part construction of the frame from Lisht is unique. Frames from the Cheops I vessel are cut from single timbers, notched slightly for battens, but with no top timbers and lashing fastenings only at frame ends. The 50-centimeter-wide notch on the Lisht frame's upper face suggests that a heavy timber rested upon it—whether longitudinal stringer, maststep, keelson, or a longitudinal brace like those visible at the prow of many Middle Kingdom boat models cannot yet be determined. The three holes in the frame's lower face suggest perhaps treenail-type fastenings of the hull to the frame, but there is no physical evidence to support this position.

The study and analysis of the recorded date for the frame are particularly important since the earliest examples of frames in the Mediterranean date considerably later than the Lisht timbers. The Lisht frame is significant not only for what it can tell us about ancient Egyptian shipbuilding technology, but also for what it can suggest about the level of technology available to Bronze Age shipwrights in the region.

The Boat Models

Two boat models were discovered early in the Lisht excavations. The larger, one-piece model was taken to the Metropolitan Museum of Art for display, but the less well-preserved model remained buried outside the mastaba of Imhotep. I visited Lisht in 1986 and was able to make a partial record of the 1.95-meter-long boat. The reason for its lack of preservation was instantly apparent: it was a plank-built model with no timbers thicker than one centimeter.

As I recorded its features, it also became apparent that the model could have served as a virtual 1:5 scale model of one of the Dahshur boats I had previously studied. Like the four known examples, the Lisht model has a central strake of three planks jointed to the three strakes on each side with mortise-and-tenon joints before rising to a gunwale. Scarphs and joins also parallel the Dahshur boats, and the model has the same number of planks in each strake as do the Dahshur boats in Pittsburgh and Chicago. It also has a similar paint scheme.

The Dahshur Boats

At least six 10-meter-long wooden boats were discovered buried near the pyramid of Senwosret III, dating to about 1850 B.C., by de Morgan in 1894. Today, two of the boats may be seen in the front hall of the Egyptian Museum of Cairo; a third is in the Field Museum of Natural History (Chicago), and a fourth is on display at the Carnegie Museum of Natural History in Pittsburgh. Wood samples from planks in the latter two have been positively identified as cedar, and ancient tenons have been identified as tamarisk.

All of the boats exhibit the same curved sheer, broad and shallow body, and narrow, tapered ends with slots for the attachment of decorative finials. The Pittsburgh and Chicago boats and the Cairo boats seem to be two "pairs" that resemble each other more than they resemble the boats in the other pair. As these boats are more well known, I will address only a few topics concerning their construction.

Hull symmetry seems to have been one of the most important factors in construction design. The planking pattern is strictly adhered to, even when smaller lengths had to be scarfed together to construct a larger shape as in the forward section of a port strake in one of the Cairo boats. The seam in the lowest strake of the Pittsburgh hull is locatd at a point almost exactly half the length of the second plank in the central strake, and the pattern of the dovetail fastenings is consistent throughout the hulls.

The dovetail fastenings are one of the least understood aspects of these hulls. Unique in their use in boat construction despite their frequent appearance in other types of wooden construction such as furniture, coffins, and even a sledge possibly used to tow one or more of the boats, the dovetail fastenings are some of the most heavily reworked features of the hulls.

When the Cairo and Chicago boats were excavated in 1894, they were transported to Cairo where they were strengthened by having tenons in joints replaced, iron bands nailed around the hulls, and dovetail mortises recut and filled with modern dovetail tenons. The Pittsburgh boat, shipped in 1901, was probably reconstructed by the same crew. Modifications recorded during my study of this hull include ends sawn off of planks, mortise-and-tenon joints expanded or recut, the use of a blue pencil to mark which tenons would receive new mortises, and the use of a heavy hammer with a distinctive head to pound the planks together.

All but four of the dovetail fastenings were also recut—usually resulting in an unfinished appearance with no symmetry, delicacy of design, or apparent utility. The four ancient fastenings on the Pittsburgh boat offer a surprising contrast to the modified ones. They also include a feature seen in some of the recut mortises: what I believe to be the bottom of a mortise which may well have served as a lashing point.

Although de Morgan makes no mention of the dovetail fastenings and does not record them in a drawing of one of the boats, he does record the presence of mortise-and-tenon joints. Reisner, in *Models of Ships and Boats*, includes this statement: "The hull is constructed of mortised and ties planking", with the added note, "So far as I was able to learn, the greater part, if not all of the dove-tail joints are modern. At any rate I so understood M. Barsanti".

I believe that this statement refers to the entire fastening, not just to replacement dovetail tenons. The Chicago and Pittsburgh hulls are almost identical in shape, construction, and dimension, but the Chicago hull has 66 dovetail fastenings, while only 50 are present in the Pittsburgh boat. One of the major differences between these two hulls is the greater separation between plank edges in the Chicago hull where, uniquely, dovetail fastenings are found across butt joins in its upper strake.

Because the dovetail fastenings visible today always include locations parallel to lashing locations on the Lisht timbers, and because of the curious depression remaining in the bottom of some of the present cuts, I believe that shallow lashing mortises may have been part of the original construction of the Dashur boats, and that the modern reconstructors interpreted them by choice or accident as dovetail fastenings similar to those in all other forms of woodworking, but never seen in another ship or boat represented by physical remains, or in tomb reliefs, models, or other depictions.

Other features of the hulls, including ancient repairs of a plank in the Pittsburgh hull, painted black lines marking mortise placement, the high frequency of saw marks in a tradition which supposedly relied almost entirely upon the adze, and details of the beams and steering apparatus will be covered in my dissertation.

The Late Period Boat at Mataria, Cairo

In November of 1988, Dr. Shawki Nakhla of the Egyptian Museum, Cairo, invited me to look at the remains of a Late Period boat found in the Cairo suburb of Mataria. Excavations for the renovation of Cairo's sewer system in 1987 revealed the boat 12 meters below the surface. About one-third of the hull was destroyed by heavy machinery, but the conservation department of the Egyptian Museum attempted to record and preserve the remainder of the hull.

According to Dr. Nakhla, the hull rested on barren sand, suggesting that it was last beached near an old river channel. Roman artifacts are found in the layers above the boat, but archaeologists discovered no artifacts directly related to the boat. Dr. Nakhla reports that the Radiocarbon Laboratory of Gif-sur-Yvette, France, C14 dated samples of wood from the hull to 2450+50 B.P. The wood samples were identified as sycomore (Ficus sycomorus), a local Egyptian wood, by the laboratory. Several additional samples have been taken of planks, pegs and tenons for further identification.

Because the sewer excavations had to continue, the hull was excavated under salvage conditions. Dr. Nakhla provided a sketch plan made of the hull, but no sectional measurements were taken. A photograph of a model suggests the hull curvature. Only the planked shell remained; neither frames, deckbeams nor separate maststep were recovered. Several sections of the hull were selected for salvage and conservation. Unfortunately, many of the pieces broke apart and lost their labels during treatment. Most pieces are 35-50 centimeters long. The Department of Conservation attempted to use the sugar treatment for the first time on waterlogged wood from this vessel. Wood fragments were placed in three small tanks in a concentration of 5% sugar solution. After one week, the sugar concentration was raised to 10% for another week. The final week of conservation treatment was in a 20% sugar solution. Following this treatment, the wood was removed from the tanks and spread in a shed to air dry.

In late 1988, the treated wood seemed in stable condition, although many of the pieces were twisted along the knotty wood grain and the surface of many fragments was highly friable or fragile. A small tub of untreated wood, mostly small plank fragments and fasteners, is characterized by wood fragments that are essentially sound, although slightly spongy, with good surface preservation remaining.

Hull Construction

The sketch plan and model of the hull illstrate a shell-built vessel about 11m. long, 4m. wide, and 1.2 m. deep[4]. A central strake, which appears to be nearly double the width of other planks, serves as the foundation of the hull. Excavators of the hull reported that the central strake protruded one or two centimeters below the vessel's outer surface. Two large mortises in this strake may be related to mast placement, but unfortunately these fragments were not preserved.

The preserved end of the vessel has 15 strakes on one side and 16 on the other. Fourteen strakes remain on the better preserved side near what seems to be the midships area. These strakes are narrow, probably less than 20 cm.

The sketch plan suggests that strakes were added to the hull with irregular shapes common near the end. Within the main body of the hull, most joins appear to be butt joins. Some of these planks are slightly swollen near their centers in a manner reminiscent of Egyptian boat construction of the Old and Middle Kingdoms. Planks below the turn of the bilge are straighter and more regularly shaped than those above.

The most striking feature of this vessel is that, despite its similarity in hull design and planking plan to boats of Pharaonic Egypt, its fastening system represents a radical departure from those traditions. For the first time, we have an example of a hull with pegged mortise-and-tenon joints from ancient Egypt. The hulls of the Old and Middle Kingdoms seemed designed to avoid such fastenings, and may have relied instead on pegs wedged parallel to tenons within the mortises (Haldane 1988). This hull is fastened with the common technique, frequently used in Mediterranean hulls such as the Kyrenia ship[5], of pegs driven perpendicularly through the tenons to lock them in place in at least some mortises. Unfortunately, the present condition of the hull remains prevents an analysis of how the use of pegs relates to the construction of the vessel.

The Deprtment of Conservation is considering plans to build either a section or a scale model of the hull that will include some of the original fragments in the reconstruction.

Conclusions

The physical remains of ancient Egyptian hulls have much to offer the student of shipbuilding techniques. In addition to providing a solid basis for understanding what the Egyptian tradition of shipbuilding was, they offer a departure point for speculation about the interior construction and design of such debate-sparking hulls as the Punt ships or obelisk barges of Hatshepsut.

The study of Egyptian hulls also includes the study of tool marks upon them. For example, the frequent presence of the adze in depictions of boatbuilding and the testimony of hulls like these timbers from the Pittsburgh Dahshur boats suggest that the adze was the primary shaping tool of the ancient shipwrights, yet my study of the Lisht and Dahshur timbers shows that the timbers retain many marks of saw blades with teeth one to two millimeters apart. The saw has not received much attention in traditional discussions of shipbuilding, but it is clear that it played a major role.

The ancient Egyptian method of building wooden boats seems to have evolved from methods used to create papyrus hulls. As has been pointed out repeatedly, the Cheops hulls are the only ones known int he world to have a rail-to-rail lashing system rather than a sewing pattern that follows plank seams. I believe this is directly related to the technique of sewing papyrus hulls together across their width. This cross-hull technique is seen in the early depictions of boats in pots of the Amratian period, and its heritage could be seen in the design-mandated tradition of carrying loads on the decks of Nile *nuggrs* rather than below.

Dendrochronological studies of the Pittsburgh Dahshur boat's planks confirmed the suggestion that some of the planks came from the same tree; further analysis of the planks will help to pinpoint the construction process in greater detail. Builders of the Dahshur boats were not overly concerned with timber wastage. The curved planks were probably cut from beams at least three times the thickness of the final piece, yet the patch on the outer surface of one plank suggests an unwillingness to forego the amount of labor invested in a single timber for the perfection of an unmarred surface.

In addition to investigating the physical properties of these hulls, I am looking at how they fit into the society and the roles played by the Cheops and Dahshur hulls in the funerary cult. I am also interested in exploring the mind of the ancient Egyptian shipwright and learning about the factors that governed the design and production of a symmetrical, cleanly finished and finely wrought hull.

The nautical traditions of ancient Egypt developed in concert with the rise of the dynastic state. Maritime and nilotic trade fed Egyptian economic growth and fostered contact between societies of the ancient Eastern Mediterranean. Because the Egyptians transformed shipping as a practical technology and commonplace activity into a primary ingredient of the ideological sphere, boats became symbols of divine power and pharaonic glory. The intersection of technology and ideology may be represented in construction patterns of these vessels, and I plan to consider these factors throughout my study of the eight ancient hulls of Egypt.

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2. C. Haldane "Boat Timbers from El-Lisht: A New Method of Ancient Egyptian Hull Construction Preliminary Report", *MM* 74 (1988) 141-52.
3. J.-J. de Morgan, 1895, *Fouilles à Dahchour.* Mars-Juin 1894 (Vienna); C. Haldane, 1984, "A Fourth Boat from Dashur", *AJA* 88: 389; C. Haldane, 1984, *The Dashur Boats*, (unpub. M.A. thesis Texas A&M Univ.: College Station, TX); D. Patch and C. Haldane, 1990, *The Pharaoh's Boat at the Carnegie* (Pittsburgh: Carnegie Museum).
4. Dimensions reported by Dr. Shawkhy Nakhla, Conservation Department, Egyptian Museum of Cairo.
5. J.R. Steffy, "The Kyrenia Ship: An Interim Report on its Hull Construction", *AJA* 89 (1985) 71-101.

ABBREVIATIONS

AJA: American Journal of Archaeology
MM: Mariner's Mirror

CONFLICTING EVIDENCE FOR DEFINING THE ORIGIN OF THE MA'AGAN MIKHAEL SHIPWRECK

This paper will deal with the Ma'agan Mikhael ship which was introduced in the 3rd symposium, by Dr. Elisha Linder and Mr. Jay Rosloff[1]. This was after the second season of excavation. Following the third and last season, all the hull components, cargo and small finds were retrieved from the site. The wood is in a laboratory in holding pools, installed with heating and mixing systems, for the long process of impregnation with polyethylene glycol (P.E.G.). The following are the preliminary results of the analyses of the finds.

Ma'agan Mikhael is located on the coast, 35km. south of Haifa, Israel. The ship was found in a depth of 1.5 meters, under a layer of sand 1 meter deep, 75 meters from the shore. It has been dated to approximately, 400 B.C.

Stones and rocks.

The ship carried about 13 tons of stones and rocks. Depending upon the method of classification used, between 5 to 7 different lithic types were identified. The largest amount, making up about 60%, is of the Blueschist type. Our geology consultant, Dr. Arie Shimron, concluded his analysis by attributing the majority of this group of rocks to the Tyrrhenian Sea - in Calabria or, preferably, Corsica. However, a portion of the remainder is most probably from the south coast of Cyprus. As far as we know all these types of rocks had no economic or commercial value, or any particular use.

Food stuffs.

Some remnants of food were found, including olive pits Fig seeds and one burnt acorn. Most of them are normally found all over the Mediterranean. But the burnt acorn has been identified by Prof. Mordechai Kislev as having had its origin in southwest Turkey or the Aegean Islands nearby.

Ceramics.

The 70 items retrieved include a pithos, basket handle jars, mortiers, a cooking pot, jugs, juglets and bowls and were analyzed by Dr. Michal Artzi and Mr. Jerry Lyon, who suggested that most can be attributed to Cyprus, although some were identified as having its originated in Greece.

Pollen.

The pollen has been identified by Dr. Mina Evron as local and summer-blooming, giving us a hint that the ship may have sunk in summer.

Ropes.

A large amount of ropes was found on the site, some knotted. Five different thicknesses were found, ranging from 2 to 40 mm. in diameter. Their characteristics and origin have yet to be identified.

Wood.

The hull was built from allepo pine as were the frames, the mast-step and the keel. The keel was removed in one complete piece, 8 meters in length. The false keel and the tenons were made of oak. The one-armed wooden anchor[2] and the carpenter's tools were also of the same material. One of the tools was made of eastern plane (Platanus Orientalis). There were some decorative boxes made of olive wood. The rocks were found resting on a layer of dunnage which was of pistachio-(Pistacia Palaestina) - pine and oak. These five types of wood are found along the Israeli coast of today, or the Phoenician coast of that period. We are checking with our consultant Dr. Ella Werker, whether it is possible that all these types of wood could be found in any other region of the Mediterranean.

Construction.

The ship was a shell-first construction with mortise-and-tenon joints secured by wooden treenails. In her bow and stern structure the knees were lashed to the planks, the stem, the stern post and the keel. The frames were held in place by iron nails. The parallels of ships fastened by being partially sewn and iron-nailed that have been found in the Mediterranean although very few in number, were discovered in the central and the western part of the Mediterranean; such as Giglio, Bon-porté, Gela and Marsala.

Hydrostatics.

A preliminary analysis of her hydrostatic characteristics, which were done according to her extrapolated body-lines, appears in the table below:

DRAFT (M.)	DISPLACEMENT (M3)	FREE BOARD (M.)
0.90	9.85	0.96
0.95	11.01	0.91
1.00	12.19	0.86
1.05	13.41	0.81
1.10	14.60	0.76
1.15	15.92	0.71
1.20	17.21	0.66
1.25	18.53	0.61
1.30	19.87	0.56

By finding her wale we could estimate her draft, which did not exceed 1.1 meters. But we must take into our calculations the limitations due to her freeboard. Assuming too big a draft will minimize the size of the narrow freeboard. We reached the figure of less than 15 cubic meters displacement, and freeboard of 75 cm. as having been the ship's original design. Her total weight reached 18 tons. This included her own weight, rigging, crew, equipment, food, water and the rocks. This figure gives us a freeboard of 60 cm. I hesitate to be convinced that she crossed the Mediterranean in summer on these conditions, knowing what a normal Meltemi is. Nevertheless the ship sailed and beached under control, perpendicular to the shore. Another factor to be considered is the fact that the ship was practically new. One could still find bark on the frames. No traces of barnacles or teredo were discovered nor any sign of friction on the keel, wale or anchor. What we did find are shavings and brand new wood, as well.

More tests.

The evidence at this stage appears to be conflicting. Therefore we shall be conducting more tests of pollen samples which appeared under some coating on the keel, and await the results of the Neutron Activation Analysis for the ceramics and ratio isotopes testing of the lead. Resins and fibers of the ropes are also being analyzed.

Conclusions.

How was it that a ship with artifacts indicating different ports of call, which carried such a large amount of rocks from the Western Mediterranean, reached the coast of what is today Kibbutz Ma'agan Mikhael in Israel, in perfect condition, as if it was built yesterday in a nearby shipyard? At this stage of our investigation, it is still an enigma.

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NOTES

1. See *Tropis III*, Athens, 1995.
2. Rosloff, J.P., *IJNA* 20.3: 223-226.

HORNELL'S IDEAS ON THE ORIGINS OF MEDITERRANEAN AND EGYPTIAN PLANK-BUILT WATERCRAFT - A REVIEW

ABSTRACT

The early Mediterranean carvel-built sea-craft, while identified as shell-first constructions with mortises-and-tenon joints, seem to be derived from the ancient Egyptian boats which were made in the same technique, though without keel and partially frameless.

Hornell's idea of the origin of the Egyptian boats, which he considers to be the result of a translation into wood of the form of papyrus rafts, is critically examined in all its aspects. Because of certain illogicalities in his arguments his conjecture remains unconvincing.

In the author's opinion it is more likely that the Egyptian plank boats are the result of a gradual transformation of an advanced type of boat-shaped log raft with deck structure into the true watertied boat, achieved with improved woodworking techniques.

The main study on which the theories about "Origins of Plank-built Boats" are based is an article under this heading by James Hornell published more than fifty years ago (Hornell, 1939). Because these ideas are still largely thought to be valid, they are here the subject of a review, as far as the ancient East Mediterranean and Egypt are concerned.

In his paper Hornell considers substantionally four main types of plank-built constructions. In his words, "These are:

A. the clinker or clench-built type, characterized by inserted frames and overlapped hull planking.

B. the carvel-built type, planked on a pre-formed framework with the planks meeting edge to edge.

C. the frameless river craft of Ancient Egypt and the present-day nagger of Nubia and the Sudan.

D. the junks of China, strengthened by bulkheads, in place of frames."

Hornell adds immediately the affirmation: "There can be no question that both clinker-built and carved-built boat derive from dugout canoes which have their sides raised by means of planks. This conclusion is based upon the fact that the process is to be seen in operation in various parts of the world at the present day, and that it has been vouched... within the past two centuries". (p.35).

On the other hand, for both types of frameless craft, in ancient Egypt and present-day Sudan and Nubia as well as for the frameless Chinese junks, Hornell's *conclusion* is that these "are just as clearly derived through two distinct lines of evolution from raft forms of different shape and material". (p.44).

The North-European clinker-built constructions are outside the scope of this review, but I should like to note at this point that, since Hornell wrote, still another type of prehistoric European watercraft, as yet found in Britain only, enriches the list of groups. This is carvel-built, but frameless and without keel, and with sewn planks some of which have cleats for fastening by means of transverse timbers. This type is now sufficiently attested by the finds of the so-called Brigg "raft" (McGrail, 1981) and the North-Ferriby boats (Wright, 1990), and perhaps also by a boat plank found recently near Caldicot Castle in South Wales[1]. As to the origin of this type, my feeling is that for reasons which are obvious and were advanced by Hornell himself for certain other frameless craft, it is more likely that it developed from a log raft than from the dugout, though this may also have played a role in shaping the ends of some strakes.

In his second section "The Carvel Build" (p.39 f.) Hornell deals with present-day craft of the Mediterranean and in the Indian Ocean areas as well as with ancient Greek, Roman, Phoenician and Persian ships. In his opinion, the common features of all these vessels are "that (a) the frames or ribs are pre-formed and erected upon a keel before the planking up of the bottom and the sides; (b) ... each strake is nailed, spiked or bolted to the frames already fixed in position". After still listing other features of minor relevance (c-d-e-) which I omit here, Hornell adds: "No direct bond between the planks of one strake with another is present..." (p.39).

Some twenty years after the describing of these characteristics, which are correct for the respective carvell-built constructions of modern times, it began to turn out that the contrary was true for ancient Mediterranean ships. The underwater excavations of Greek and Roman wrecks revealed that these ships were shell-first constructions, at least until the 3rd-4th centuries AD, and that their planks were connected to each other by means of mortise-tenon joints. Lionel Casson was the first to point out this fundamental rectification (Casson, 1964: 84 ff.).

It is not only this revolutionary correction which led me to think that Hornell's conjecture on the origin of ancient Mediterranean ships from the dugout should now be considered outdated. We also know that the construction technique of the Classical Greek ship, as, e.g., evidenced in the Kyrenia ship and still applied in Roman ships several centuries later, had been practised - and this came as another surprise - a millennium earlier in East Mediterranean Bronze Age vessels. I refer to the Ulu Burun shipwreck of 1400 BC and to what its excavation, still under way, has so far revealed (cf. Pulak, 1990: 9f., Fig. 2).

All these carvel-built vessels, except sewn plank ships, stand in a continious tradition of shell-first constructions with the use of mortise-and-tenon joints for fastening the hull planking. In addition we know that, already in the 3rd millennium BC, this method of joining planks was used in carvel-built shell-first Egyptian water-craft, while similar joints in Egyptian furniture seem to date even somewhat earlier. Obviously this particular woodworking technique was invented in ancient Egypt, and because of its ability to provide, after having been improved, a watertight connection of the strakes in ship construction - as experience made during the building of the replica "Kyrenia II" has shown[2] - it must have been of pioneering importance for the development of seagoing ships. Conformably, Egypt as the source of shipbuilding appears in an ancient literary statement, probably based upon an old verbal tradition, according to which the Greeks after having navigated on rafts introduced the ship from Egypt[3].

In view of our recently gained knowledge it seems quite possible that the ancient Mediterranean ship derived from the Egyptian watercraft. In this case, the question of its origin would be involved with that of the "Ancient Egyptian Boats" which Hornell deals in his third section (pp. 40-43).

In substance he describes these boats, which were intended for the traffic on the river Nile but were occasionally also used in coastal navigation, as beamy and of shallow draught, round-bottomed, frameless and without keel. Hornell refers to the Dashour boats. At the time of his study, the Cheops ships had not yet been discovered, nor did he know of the find of ship timbers at el-Lisht, which remained unidentified as such until recently[4].

The wide use of the papyrus raft in ancient Egypt and the fact that in many ancient ship representations its shapes are reproduced in the profiles, while raft-like lashings are painted on both ends, inspired Hornell to interpret the wooden boats as a result "evolved from attempts to translate the form of papyrus rafts.... into one of wood, built up of planks". (p.41). Previously he had explained "that the planking was held together partly by broad dowels inlet in the edges of opposed planks, partly by double dovetail tenons...", and, referring to these features, he expressed the opinion "that this method of boat construction was evolved by men who were by trade carpenters and masons, men whose trade was primarily to make house-hold articles - boxes, furniture and the like", and he adds "for this system of tenons, dovetails and struts is characteristic for the woodworking of Ancient Egypt, ... (p.41). By struts Hornell means the "numerous stout thwarts (i.e. cross beams) having their ends mortised into the sides below the gunwale' and which are indispensable for holding together frameless hulls.

In view of the stupendous and quite sophisticated structure of the reconstructed Cheops ship no.1 it is difficult to imagine that joiners and house carpenters, or even masons, should have been the makers of the first Egyptian wooden watercraft. More likely, in my opinion, it is that already since earliest times specialized shipwrights were at work. These could well have taken over the use of mortise-and-tenon joints from carpenters or joiners or whoever had used them first, as soon as it became manifest that such joints could be applied with profit to planks. These joints were certainly not a secret but well known, and could be made without particular skill by all wood-workers, provided the suitable tools were at hand. Moreover, there can hardly be any doubt that already by the earliest dynastic period, ship building was a highly specialized trade and an important one, as is shown by the fact that ship-building scenes are included in the contemporary pictorial record.

In the light of this, let us now examine Hornell's idea that the Egyptian plank boat derived from papyrus rafts. These had doubtless a great influence on the shapes of certain Egyptian plank-built ships. Landström has classified certain groups among the ancient Egyptian ships of all periods as papyrus-shaped vessels (Landstrom, 1974). What does Hornell mean with the formulation "translate into wood"? On Egyptian reliefs and wall paintings we see the elegant lines of papyrus rafts imitated in the depicted vessels, namely in the upward curving ends adorned with papyrus flowers and sometimes with unmistakable raft lashings. We may say, the shapes of the papyrus rafts, their profiles, outward appearance and ornamental symbolism are transferred onto the wooden vessels, or, are repeated in them. However, what about the internal structure?

I had the opportunity to examine three authentic papyrus rafts on display in the museum of the "Instituto Internazionale del Papiro" at Syracuse[5]. Two are from the Blue Nile in Ethiopia, from Lake Tana and Lake Zwai; the third is from

Lake Chad (Figs. 1-2, Pls. I-II). These rafts are ethnographic examples of recent make, but their structures and their lashings made with papyrus cords are doubtless basically the same as those of ancient Egyptian papyrus rafts. Differences exist only in size, shapes and profiles. Many ancient Egyptian papyrus rafts were double-enders. Present-day examples have as a rule more differentiated ends, usually a very pointed fore end, while the after end, although it also tapers, is sometimes truncated. According to the various needs of water transport papyrus rafts of very different design were still used some decades ago, including examples which are more square in plan and rather squat in profile[6].

Both the rafts from Ethiopia consist each of a certain number of lashed bundles of papyrus stalks, tied in continuation side by side into o construcion which is shaped like a small canoe (Fig. 2). The bigger lower ends of a few papyrus stalks were lashed at first and form the slightly raised fore end, while the after end is made from the upper ends of stalks from which the flowers have been cut off. Towards the centre the bundles are made by adding further papyrus stalks whose lower ends are visible inside the bundles, where the hull space is left (Pl. I. A). In the central part this space is filled with a separately made cushion - or bolster-bundle, reaching up to the height of the raft or even somewhat above. In this way, even when water stands in the hull space of the floating raft, anyone seated on the bolster bundle does not become wet. The bolster bundle is left removable in order to facilitate drying, while the raft is set on land.

The raft from Lake Chad has a truncated after end and an upward curved fore end kept upright by a cord fastened between two lashings (Pl. II). Here, the papyrus bundles are lashed in two layers, and yet the plaited papyrus cord used in each lashing is likewise continuous. The hull space between the outer bundles is comparatively shallow. No bolster bundle is required, the inside bottom being sufficiently high over water level.

There is probably no way to learn whether the ancient Egyptian papyrus rafts had, or had not, a hull space with a bolster bundle, but obviously they consisted of papyrus bundles up to the top side surface or almost. This is clear from ancient models of papyrus rafts as well as from pictures which show persons sitting or standing on them (cf. Landström, 1974: 94 ff.)[7].

At all events, the result of attempts to translate the form of the ancient Egyptian papyrus raft into one of wood, built up in planks, certainly would be a boat-shaped construction, but without hull and cross beam. Athwart the longitudinally arranged bundles of Egyptian papyrus rafts no rigid structural elements existed which could have stimulated the making of cross beams. Moreover, the entire volume of a papyrus raft rebuilt in wood would become similar to that of the so-called block models of boats, such as were found in Egyptian tombs. It would be a structure without hull, functionally a raft, not a boat. It may be that considerations like these induced Hornell to introduce in his conjecture the land carpenter familiar with structs, who would have readily applied them in form of cross beams. Because of this and the other illogicalities Hornell's interpretation remains unconvincing.

Towards the end of his article, in order to underline his conclusion "that junks, like Ancient Egyptian river boats, are derived from the translation of raft structures into a plank-built form", Hornell mentions "contemporary evidence from India to show how an analogous change from a simple raft to a craft of incipient boat form is in course of actual evolution there". He refers to the Kattu-maram log rafts in the Vizagapatam District on the Indian east coast to which "a plank strake has been pegged on each side, rowing thwarts... installed, together with the provision of mast and sail, regularly used..." (p. 44, pls. III, IV; see also Kapitän, 1987: Fig. 7).

The Vizagapatam kattu-maram are an interesting example for the improvement of a log raft and for its gradual transformation towards a plank-built boat. No log rafts are reported from ancient Egypt, at least not from the Nile. There is, however, evidence for their use on the Red Sea, in ancient and modern times (Kapitän, 1989).

Based upon this evidence, as well as on that of ethnographic examples of improved log rafts. — so-called freighter rafts or platform rafts — the following course of evolution is imaginable: In predynastic times the earliest Egyptian wooden watercraft were functionally still rafts, though already boat-shaped and provided with a deck structure resting on cross beams. This type of vessel would little by little have been transformed into the true water-tight boat, thanks to progress made with improved tools, used for shaping better fitting planks and cutting more suited mortise-and-tenon joints. Because of the advantages which the true boat presented, the original raft-type watercraft that once had been employed for the same scopes of transport, would have had no chance to survive, while, on the other hand, papyrus rafts continued to be used for hunting and fishing.

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NOTES

1. A report on this boat fragment is to be published in the proceedings of the Roskilde boat archaeology symposium 1992. Preliminary information on this find, based on a communication by S. Parry to the NAS Annual Meeting in April 1991 in London, was kindly sent to me by Dr. Anthony J. Parker of Bristol.
2. I have already pointed to this significant process in my preceding paper (Kapitän, 1989).
3. Pliny, Nat. Hist. 7.57.15, cited in Kapitän, 1989.
4. The first interpetation of the timbers excavated around the pyramide of Sesostris I at el-Lisht as parts of an Egyptian watercraft was published by Cheryl Haldane (Ward Haldane, 1988). The find is discussed in Kapitän, 1989.
5. Seat in Viale Teocrito 66, along the new National Museum. I am very much obliged to Mr. Corrado Basile, founder and Director of the Institute and the Papyrus Museum, for having kindly allowed me to record the rafts in scale drawings and photographs. These rafts and numerous other papyrus objects were acquired by him in the countries of origin during travels which he repeatedly undertook for his studies on the manifold use made of the true papyrus plant. At Syracuse Cyperus papyrus L. grows along the Ciane river and around its spring basin. In the last decenniums this has led to the development of an intensive trade producing souvenirs of papyrus sheets made by imitating the ancient Egyptian production technique of pressing together, in crossed layers, thin stripes cut lengthwise from the papyrus stalks.
6. Photographs on display in the Papyrus Museum Syracuse illustrate some large papyrus rafts which still fourty years or so ago existed on Lake Chad.
7. Some ancient Egyptian papyrus rafts had on top a platform, probably made from wooden boards. Because the respective representations do not show any cross rod beneath the platform, this must have rested directly upon the papyrus bundles, and hardly any unfilled hull space could have existed below.

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ILLUSTRATIONS

1. Room in the Papyrus Museum Syracuse dedicated to the rafts. In a half-open transparent plastic case in the centre the papyrus raft from Lake Chad; in the background to the left, both the rafts from Ethiopia.

2. The papyrus rafts from Ethiopia in the Papyrus Museum Syracuse. In the foreground the raft from Lake Tana, and behind it, aside the wall, the raft from Lake Zwai which likewise has a bolster bundle in the hull space, and, in addition, shelter bundles on top the outer bundles.

Pl. I. Scale drawing of the papyrus raft from Lake Tana, Ethiopia. A. plan, B. elevation of port side, C. cross sections.

Pl. II. Scale drawing of the papyrus raft from Lake Chad. A. plan, B. elevation of starboard side. C. elevation of after end and cross sections. (Note, in B. and C., the lateral balance bundles fastened in addition and separately onto the sides.)

Fig. 1

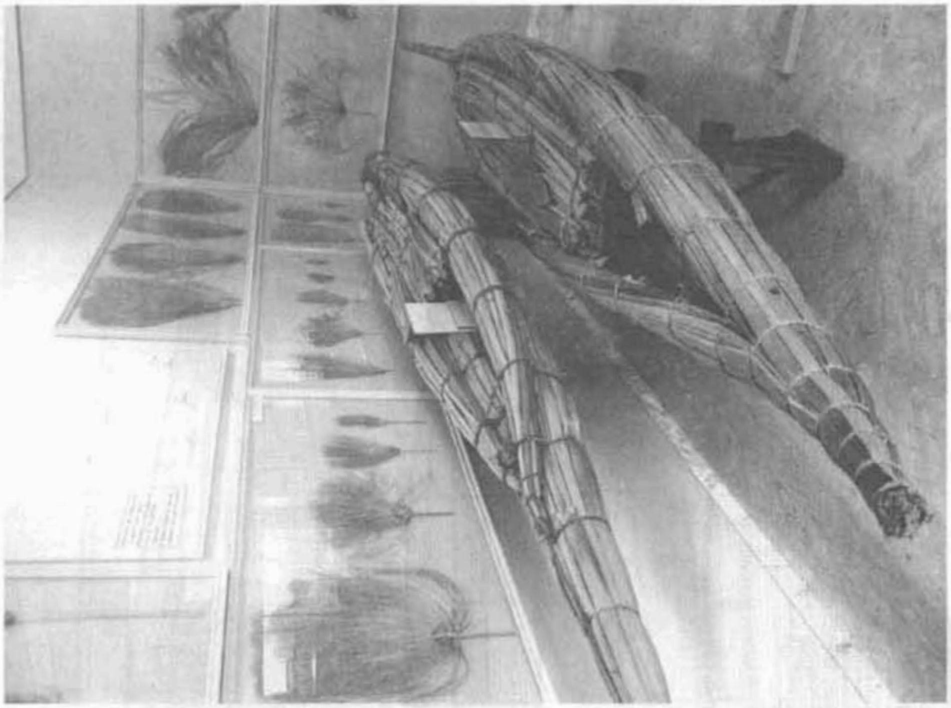
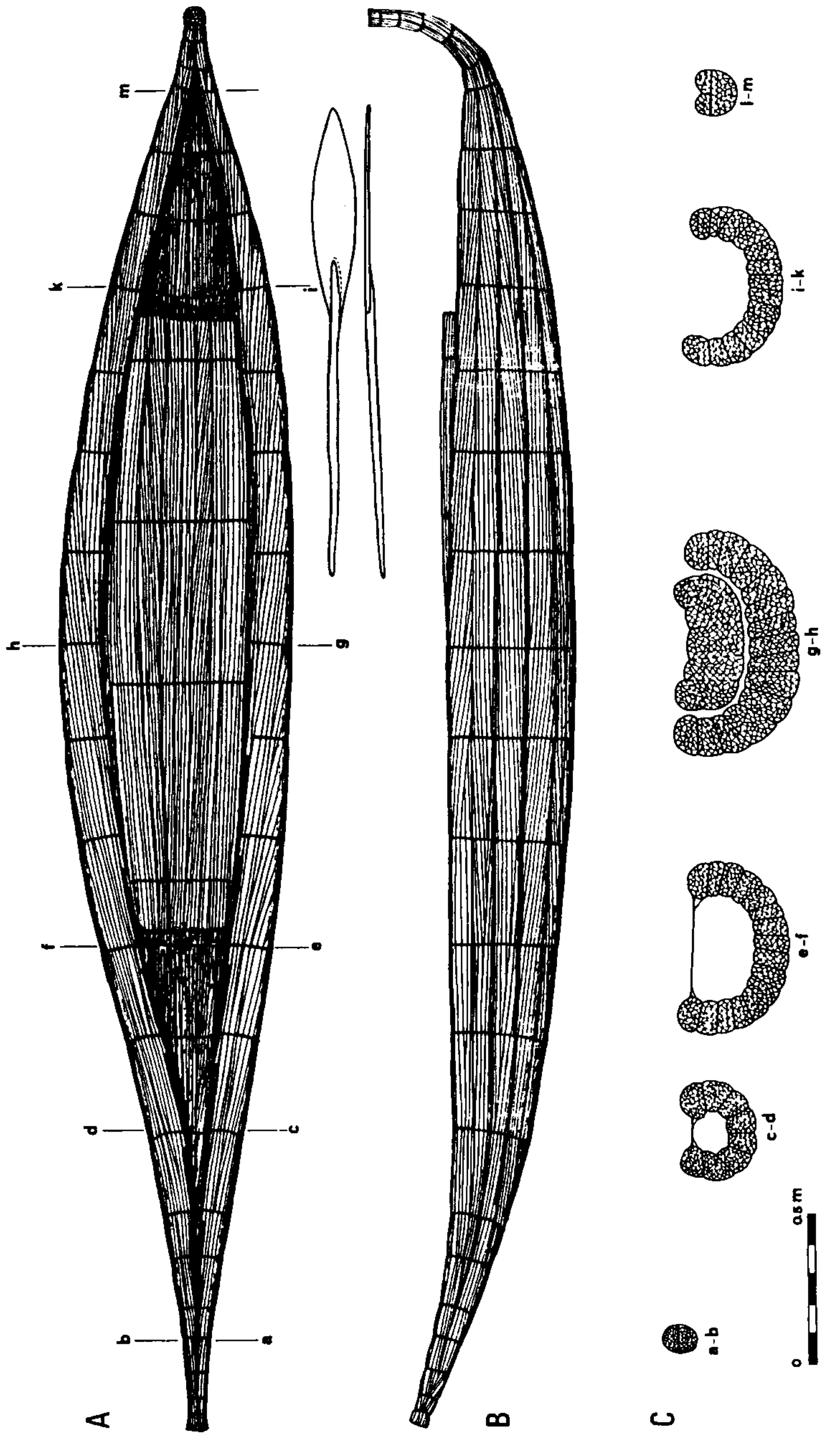
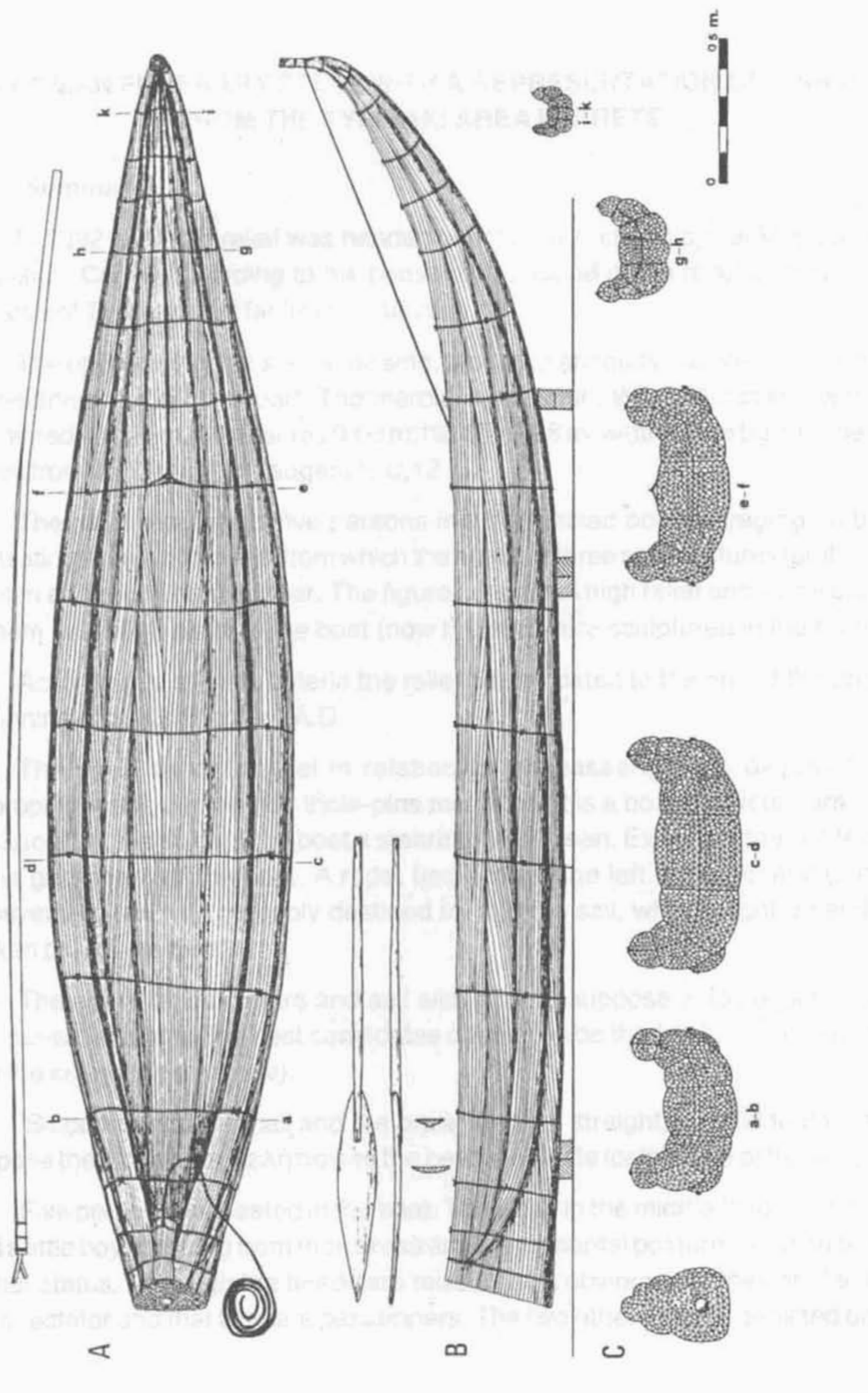


Fig. 2



Pl. I



Pl. II

A ROMAN FUNERARY STELE WITH A REPRESENTATION OF A SHIP FROM THE TYMBAKI AREA IN CRETE

(Summary)

In 1992 a marble relief was handed over to the Archaeological Museum of Heraclion, Crete. According to the peasant who found it, the relief comes from the area of Tymbaki, not far from Phaestos.

The upper part of the slab is missing, broken in antiquity, but the initial width is preserved in the lower part. The marble is imported. Whitish in colour with a yellow-redish patina, it measures 0,68 m. high by 0,88 m. width, while the thickness varies from 0,05 m. (at the edges) to 0,12 m.

The relief represents five persons in a two-tholed boat, voyaging on the undulating waters of the sea, from which the heads of three sea creatures (probably dolphin and two fishes) appear. The figures are cut in high relief and some parts of them as well as parts of the boat (now broken) were sculptured in the round.

According to stylistic criteria the relief can be dated to the end of the 2nd - beginning of the 3rd century A.D.

The scale of the vessel in relation to the passengers is deliberately disproportionate, but the two thole-pins mean that it is a boat with four oars (δί-σκαλμος). At the stern of the boat a stearing-oar is seen. Exactly at the sea level is the gardboard of the boat. A rope, tied around the left thole-pin and going transversally up, was probably destined to hold the sail, which might be at the broken part of the relief.

The coexistence of oars and sail allows us to suppose a ἱστιόκωπος (or sail-oar-er) *actuaria*. The best candidates could then be the λέμβος, the ἄκατος and the κέλης (or κελήτιον).

Since the size is small and the prow is rather straight, I would tentatively propose the δίσκαλμον κελήτιον as the best candidate for the type of the vessel.

Five persons are seated in the boat. The three in the middle (two adult men and a little boy), judging from their dress and monumental posture, seem to be of higher status. Although the heads are missing, it is obvious that they are facing the spectator and that they are passengers. The two other people, depicted on a

small scale, are probably mariners. Both wear short chitons, a typical dress of the seamen. The one seated at the stern holds the stearing oar (κυβερνήτης). The other is standing at the prow and he seems to look toward the direction of the navigation.

They wear a long χλαμύς (or cloak), which is clasped by a conical button on the right shoulder.

The figure on the left leans his right arm on his thigh and points his index finger towards the direction of the navigation. His left palm, projecting under the cloak, holds the handle of a sword, a symbol of his military career.

The figure on the right has almost the same posture but he holds with his left hand a little boy seated on his left knee.

The boy wears a chiton and a cloak clasped on his chest. The right arm and the face are cut off, but long curls frame the neck and the head is covered by a conical hat. The posture looks too official for a boy of that age.

It is beyond doubt that the relief is a funerary stele for the family tomb of the three central figures. It probably depicts the grandfather (on the left), his son and his grandson, navigating after death to the Islands of the Blest.

It is probable that when the stele was erected, only the grandfather was already dead, but it was quite common to erect funerary monuments, depicting dead members of the same family together with others still living. Thus the stele belonged to a funerary monument of a military family living in the then prosperous Gortyn, to which the territory of Phaestos also belonged at that time.

The theme of the navigation to the nether world on funerary stelae becomes more and more popular in the roman imperial times. It reflects the influence of philosophical ideas.

According to them human life is compared to a navigation and death as the last harbour of destiny. Thus the commandment or wish of the dead to the living εὐπλόει (navigate well).

Every just and kind man is allowed to travel to the Islands of the Blest (Νήσους τῶν Μακάρων), the legendary land of the Heroes. These Islands according to the tradition were either around the ocean or on the celestial sphere. The journey to them might be the human destination, and the anchoring in the celestial harbour (καθορμίζειν είς τὸν λιμένα τῶν οὐρανῶν) would be the final destiny.

From a simple means of transportation the boat became gradually a symbol of the happy navigation to the coast of paradise.

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NOTE

This text is a preliminary presentation of the stele. The proper publication is under preparation.

ILLUSTRATION

Roman tomb relief from the Tymbaki area (Crete).

FIG. 1

FIVE CENTURIES BEFORE OLYMPIAS

In 1446 Leon Battista Alberti sent divers down on what is now known as Nemi ship I (Ucelli, 1950). Hooks were attached to it and planks torn off. Well may the archaeologist shudder! Alberti identified the wood and described the lead sheathing. (Alberti, 1512,I,5,12).

In 1535 Francesco de Marchi dived on the same ship in a diving-bell. He found the same things Alberti found, but also the mortise-and-tenon construction (Marchi, 1599, ff.42ro 44vo). Nobody was interested. Much was being written about ships in antiquity, but interest centred on the arrangement of multiple rows of oars and/or oarsmen. They had little evidence of that from ancient litterature. Chiefly:

1. Line 1074 of Aristophanes' Batrachoi (farting into the face of the thalamioi, but who did it?)
2. A scholion to Aristophanes, according to which the thranitai sat aloft, the zygitai in the middle, and the thalamioi below, while also the thalamioi sat forward, the zygitai in the middle and the thranitai aft. This probably indicates the way the rows were staggered, but for ±3 centuries scholars thought the 2 statements contradicted one another.
3. Measurements of Ptolemaios Philopator's tesserakontéres. (Athenaios, V. 203c. - 204b.)
4. Vitruvius' remark about the interscalmium being a module in naval architecture, that might decide the size of ships. Complication: he mentions a greek name for the interscalmium; space between tholes, that is not clear in the manuscripts, but looks like meaning 2 cubits, which, if meant litterally, would contradict the idea of a module. (Vitruvius, I, 2, 4,).
5. Byzantine descriptions of Dromons, from almost a 1000 years later than Vitruvius (Leo VI,XIX, 7-8. Anon. PBPP,II,7).

All this was treated as belonging to one period.

In the 15th and 16th century "trireme" was a household word in the Italian maritime republics. It indicated the common galley a sensile, where on every bench 3 oarsmen sat, each with his own oar. So many scholars thought that this had been the system of the ancient polyereis. A Venetian professor of Greek, one Vettor Fausto, who was also a good shipbuilder, produced a quinquereme on the a sensile principle, claiming that he had found the measurements for her in "libri greci antiquissimi". The ship was a success, technical as well as personal, but in these books he can only have found the word "penteres". (Fincati, 1881, pp. 49-56).

A Portuguese priest and sailor, Fernao Oliveira, tried to apply Vitruvius' idea of the interscalmium to the current (horizontal) trireme. He calls the distance between the 3 oars in one "bunch" belonging to a bench interscalmium and the distance between bunches "interordinium" (between rows), then he realizes that ordines (rows) are supposed to go longships and not the men on one bench, so his purely verbal way is to claim that interordinium is the distance between the places where the rows come together. (Oliveira 167v - 168v).

In 1536 Lazare de Bayf published a book in which he took the second part of the Aristophanes scholion and thus created the longitudinal trireme, with the thranitai aft etc. He honestly and modestly confessed to be at a loss as to the nature of the larger multiremes, especially the 40er. (Bayf, 1536 pp. 42-43).

In the second half of the 16th century, the oarsmen of one bench got one oar; this system was called ascaloccio. The earlier system was soon forgot. So the classics were read without horizontal triremes blocking the view.

Already in 1550 one Piccheroni della Mirandola offered a set of drawings to the doge of Venice. They showed refinements in a sensile rowing and section of vertical multiremes, including one of 50 rows, with no comment except the promise that these ships would sail better than others. More articulate scholars later in the century showed that the first part of the Aristophanes scholion had become gospel. In 1581 sir Henry Savile in a note to a translation of some books of Tacitus, casually remarked that "warships were sorted into their several kindes according to the number of bankes and oares placed one above the other" (sonte, 1581, notes p.49).

A vigorous polemist in the cause of the vertical multireme was Josephus Justus Scaliger. He also set the arrogant and mocking tone common among the adherents of the vertical "school". His special butt was the dead Bayf. A rather fatal idea of his was, that a trireme could be compared to a building with 3 floors, etc. (Scaliger, 606 notes to Eusebius pp.6-63).

Some of his followers were among the most famous scholars of the 17th century in other subjects, but the tesserakonteres had a great attraction for them. The mathematician, astronomer and surveyor Willibrord Snellius said, that however the oars were arranged, the oarsmen would always be packed like pickled herrings (Snellius 1614 unnumbered page). One Thomas Ryves (Rivius) had the modern idea (cf. Casson 1971), that no ship had oars at more than 3 levels, but that the qualifications came from the number of oarsmen thranite oars, so the trieres had 3 men at every top-level oar, and the tesserakonteres 40! and 30 and 10 at the two other levels to make up the number of 4000 oarsmen Athenaios mentioned, for you could only have 25 oarsmen in a row. Why? Because Leo VI in the 9th century A.D. said that this was the case in a dromon! (Rivius, 1653 pp.309-312).

Jacques Lepaulmier, known as Palmerius, designed something like a staircase for his oarsmen to sit on, contrary to the Aristophanes scholion, it went up and aft! (Palmerius 1694 p.174).

Marcus Meibomius from Holstein, had a rather clear idea for staggering the oars, with the bottom ones forward, but he put his oarsmen on tall one-legged stools, with a minimal footrest attached to that leg, so that they would never have been able to pull (Meibomius 1671 tolding-plate by Romeyn de Hooghe). He was a brilliant writer of Latin and in a flamboyant preface he told Louis XIV of France to scrap all his galleys and replace them with multiremes built by "a German man". (Meibomius of course), and then conquer the world. He actually managed to obtain a long interview with Louis' minister, the Marquis de Seignelay, before he had to climb down. (Barras, Ms. Fr. pp. 188v-189v).

Giovanni Alfonso Borelli became famous all over Europe for his thick book De Motu Animalium, which seems to be the product of systematic observation and logical thinking. He also wrote, in Italian, a lecture for the "royal academy" of queen Christina, in Rome, late of Sweden. It was about "moltiremi" and he warns that he does not know whether his system was applied in antiquity, but that he thinks it is a good idea. He proposes to build a huge vault on the deck, which he calls "testudo"; but which seems inspired by the fish's swimming bladder, illustrated in the animal movement book. Gianbattista Falda drew a beautiful picture of the intended result (now in the Cabinet des Estampes of the BN in Paris), with parts cut away to show the inner workings. Oarsmen cling to the outside of the "testudo" like flies, at the inner end of oars that on 3 levels pass through the sides of a blow-up of a contemporary galley. Falda mercifully does not show us how long these oars are.

Fabretti wrote a description of Trajan's column, but finding only biremes and 1 trireme there, he added a polyeric chapter. He believes Borelli's bladder to have been a common feature in antiquity and also adopts le Paulmier's staircase. he contends that it became less steep as there were more rows and so the interscalmium on each level became steadily longer. Demetrios Poliorketes' 16 rower had an interscalmium of over 10 feet!

Isaac Vossius also tackled the interscalmium. He said the Greek word in Vitruvius should be read "eiresia" and mean the distance from thole to handle, in other words: the loom! He very ingeniously demonstrated the drawbacks of Palmerius' staircase and wanted to put oarsmen on beams sloping down to the side of the ship, never on more than 7 levels in this way, he designed his tesserakonteres. He based this idea on Pollux, who says ships don't have more than 7 tropoi, by which he probably meant beams sticking out through the side, counted horizontally. (Vossius, 1685 pp. 98-101).

The much writing galley-captain Jean Antoine Barras de la Penne read all this and at great length proclaimed it all nonsense. There had never been anything but galleys a scaloccio! He also designs a tesserakonteres, surprisingly phantastic for something thought up by an experienced sailor. He followed Bayf's idea of the longitudinal trireme, with 20 men at each oar. Moreover he put the zygites (midships) a deck higher than the forward thalamioi and the thranites aft one higher again. This was probably thought a plausible idea, because of the contemporary sailing ships with their quarter- and poopdeck. His idea was later taken up by one André François Deslandes. We are now in the 18th century, when generally the theories of the 16th and 17th centuries were rehashed by lesser men.

In 1820 Jean Rondelet published a plausible section of a trireme, among a crowd of by now familiar phantasies, only drawn better than before (Rondelet 1820. pl. 1).

He was the last knight going on the old style polyeric quest. Soon after, in the 1830ies, the naval inscriptions at Piraeus were discovered and published by August Boeckh. Later the shipsheds. So there were possibilities to know more about common or garden triereis and tetrereis, and as more data always cause more questions, there was a marked decline in speculations about the ships with the higher numbers. We may say that the polyeric quest in which we are engaged, began.

The "spectre" that haunted 19th century polyeric lore was decks between the rows of oarsmen. There were partly derived from unclear indications in classical litterature and Scaliger's floors, but probably reinforced by the importance of gundecks in the last years of the great men of war under sail and the first decennia of the steampowered ones. The trireme that Jal and Dupuy de Lôme designed and built for Napoleon III, even had tumblehome! (Jal, 1861, pp. 14-17),

There were some relapses, apart from the phantastic "underground" that goes on and on. Bernard Graser, though he had taken part in the search for the ancient harbours in Piraeus, drew the whole Palmerian staircase for the Philopator ship, and other topheavy things and published in Latin. And from 1904 to 1934, W.W. Tarn fiercely defended Bayf's longitudinal trireme.

The new knowledge, acquired in the 19th century led to the building of the Olympias. She is probably the nearest thing to a Greek trireme, designed since many centuries, but we should not forget that she is not a reconstruction, as for the greater part are the Kyrenia II, some replicae of Vikingships afloat in Denmark and Norway and a "Bremen cog" built in Kiel. Olympias is a floating hypothesis, but many new data will have to turn up before a better trireme can be launched.

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ILLUSTRATIONS

Fig. 1 Venetian horizontal trireme. Fragment of the painting: Return of the ambassadors from England, by Vittore Carpaccio. In the St. Ursula series in the Galleria dell'Academia in Venice. (Photo: Kunsthistorich Institut. Universiteit van Amsterdam).

Fig. 2 Marcus Meibomius ideas for polyreis, from his De Fabrica Triremium. Drawings by Romeyn de Hooghe.

Fig. 3 Isaac Vossius. Section of a tessarakonteres with oars'a scaloccio' on 7 levels. (Photo unit the verzameling van de bibliotheek van de Universiteit van Amsterdam).

Fig. 4 Barras de la Penne's idea of a tessarakonteres. Title page of one of his few printed treatises. (Photo. British library, London).

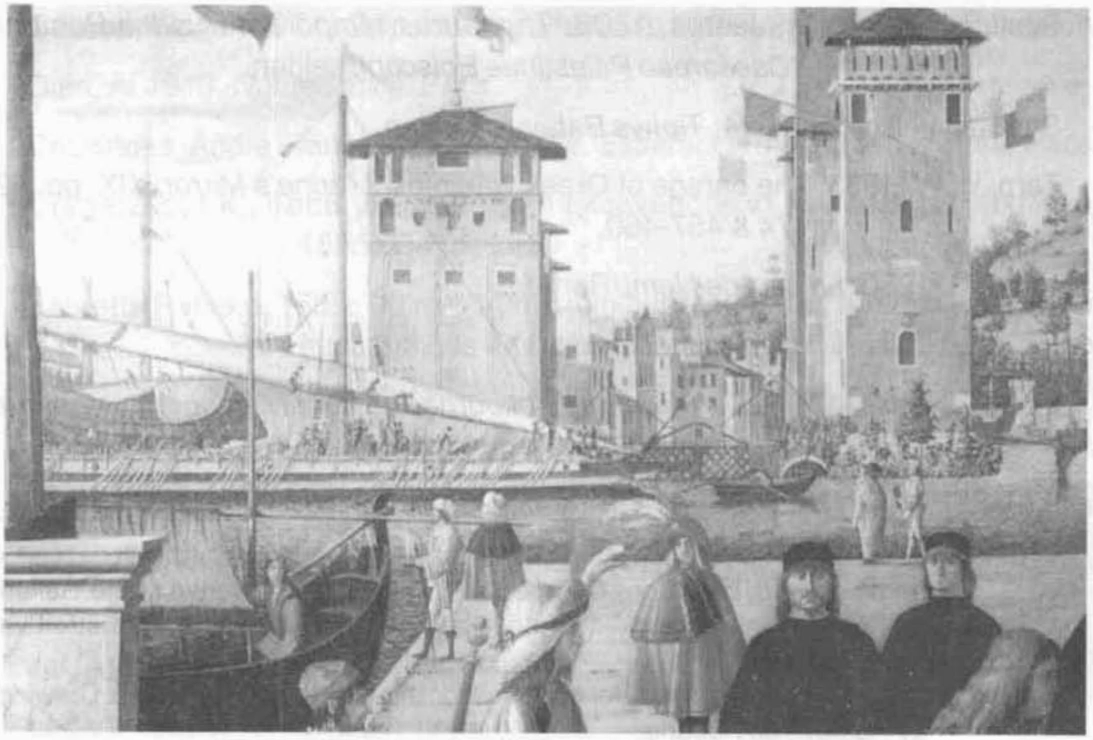
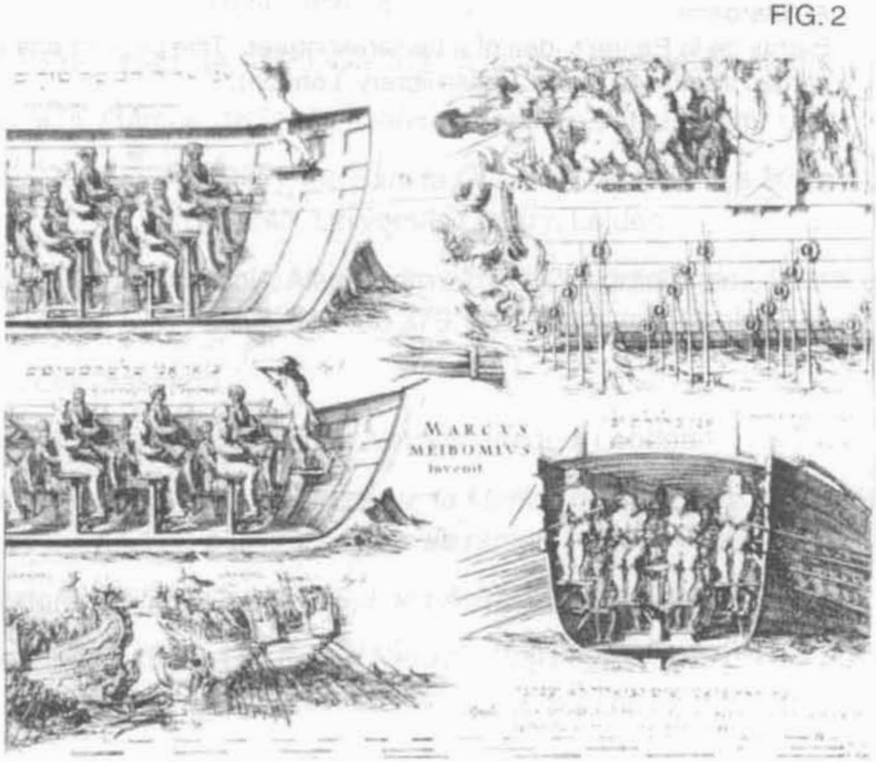


FIG. 1

FIG. 2



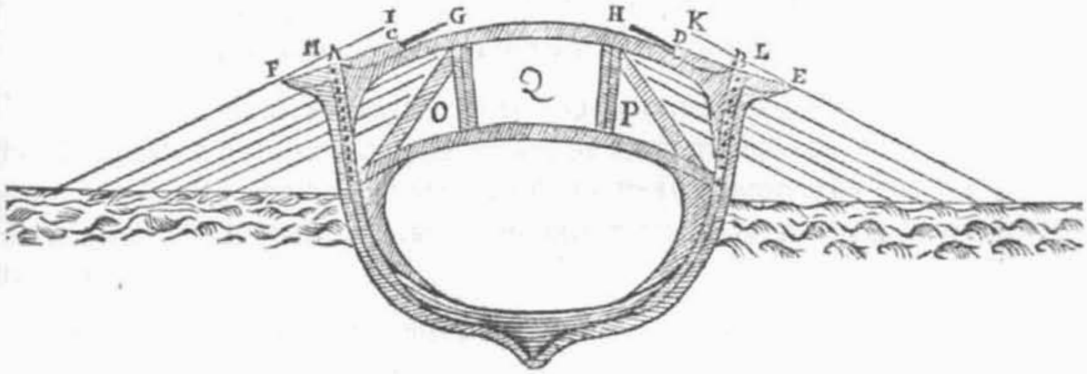
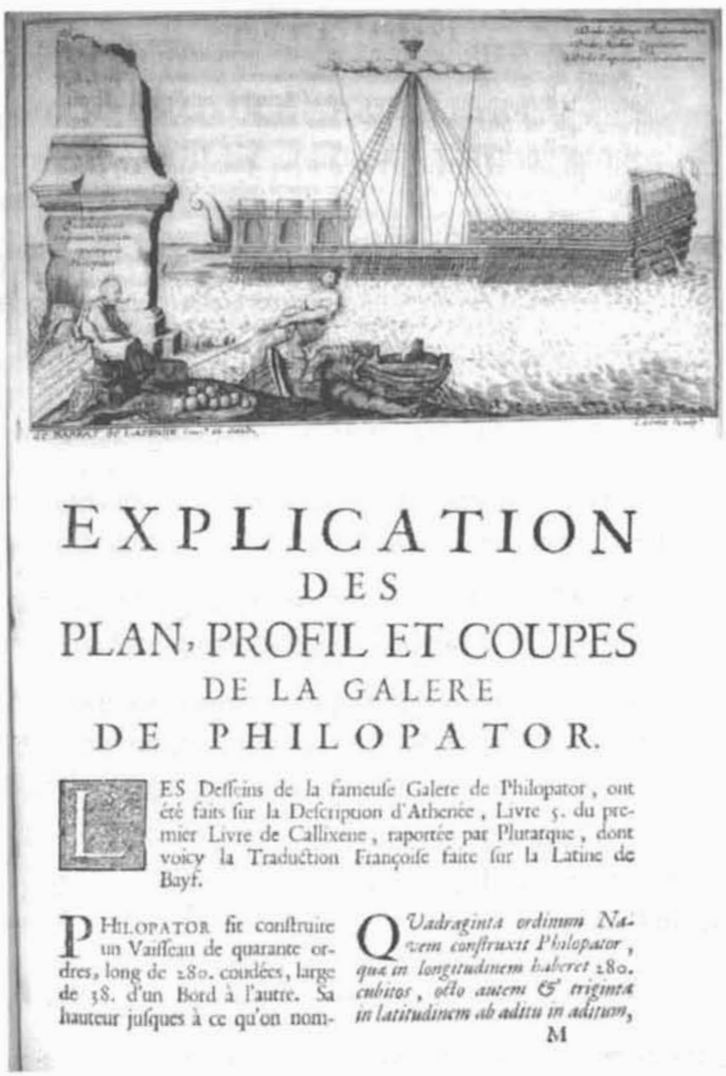


FIG. 3



EXPLICATION
DES
PLAN, PROFIL ET COUPES
DE LA GALERE
DE PHILOPATOR.

LES Deſſeins de la fameuſe Galere de Philopator, ont été faits ſur la Deſcription d'Athenée, Livre 5. du premier Livre de Callixene, raportée par Plutarque, dont voicy la Traduction Françoiſe faite ſur la Latine de Bayf.

PHILOPATOR fit conſtruire un Vaiſſeau de quarante ordres, long de 280. coudées, large de 38. d'un Bord à l'autre. Sa hauteur juſques à ce qu'on nom-

Quadraginta ordinum Navem conſtruxit Philopator, quæ in longitudinem haberet 280. cubitos, octo autem & triginta in latitudinem ab aditu in aditum,

M

FIG. 4

THE MA´AGAN MICHAEL MERCHANTMAN IN THE HISTORICAL SETTING OF ITS TIME (the transition between the 5th & 4th centuries BCE)

The difficulties in defining the origin and cultural affinity, the ship's route and the identification of its main cargoe, as well as the immediate cause for capsizing —are discussed in another paper presented in this conference by Yac. Kahanov. His analysis and partial conclusions are based on the archaeological evidence the hull and its contents.

We wish to introduce the historical dimmension in a broader sense, with an attempt to outline a scenario which is based on the following inquiries:

a. Who controlled the regional maritime trade routes in the eastern Mediterranean and who was preoccupied with the long distance trade across the Mediterranean and beyond?

b. What was the relation between the trading partners among themselves and with the host society along the shores with whom they conducted their commercial enterprises?

c. How did the political divisions affect the freedom of movement at sea, the degree of safe sailing versus piracy?

d. Which were the principal commodities in maritime trade which were carried in ships of similar loading capacity as the Ma´agan Michael merchantman?

e. What role did Cyprus play in the history of our ship, knowing its position as an intermediate trading depot and as a major shipbuilding center.

f. Which "legal clauses" and treaties were maintained to safeguard the interests of seafaring traders, their ships and goods.

These and other related questions, even if only partially answered, may help solving some of the enigmatic problems concerning the M.M. ship which capsized on what seems to be its "maiden voyage".

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EDITOR'S NOTE

Dr. E. Linder made a verbal communication and the above is the relative abstract.

FROM MIDDLE NEOLITHIC TO EARLY BRONZE AGE: CONSIDERATION OF EARLY BOAT MODELS.

This paper is the second part of a paper given in 1990 at the Congress "Thalassa" in Corsica[1]. The first part examined the earliest known Aegean three-dimensional boat representations, dating mostly from the Late or Final Neolithic Age and thus preceding the famous Cycladic incised or lead boats. Now, in view of new evidence[2] and following reconsideration of the old material, we can go back further to the Middle Neolithic and forward towards the Early Bronze Age.

One has to underline two major difficulties concerning the study of miniatures in general: First, some artefacts which could have been tools or vases are shaped in such a way that they could also be considered as autonomous plastic representations, and therefore it is impossible to attribute to them a primary function - utilitarian or symbolic[3]. A number of everyday activities could in fact be related to several figurative themes, although not necessarily. - Second, precise identification of an original modelled in reduced size is a very complex matter[4], even though a general idea may be instinctively implied.

In spite of these problems, an attempt at identification of primitive craft models has resulted in the recognition of a varied typology as early as the Neolithic Age and showed a differentiation, not only between possible boat types, but also presumed model functions between the Neolithic and the Early Bronze Age.

The earliest[5] known terracotta boat models from South-East Europe come from Serbia and Thessaly. Two of them belong to the Vinča B2 and "Early Vinča" cultures: an "ellipsoïd vase" from Crnokalačka Bara[6] and a recently published small "shallow container" interpreted either as a model boat or as a possible loom piece from Selevac[7] phase II (Fig. 1). Both have two projections, one at each end; those of the Selevac artefact are perforated, therefore it has been suggested that it could possibly have been used as a bobbin in the manufacture of textiles, since it could "hold a small ball of thread"[8]. The same alternative interpretation has been suggested for a number of artefact types with horizontal of vertical perforations through which a thread could have passed -and did- as well as protuberances, such as figurines, amulets, the so-called cross-pieces and perforated cylinders from the same site[9]. Quite apart from the possibility of accidentally combining both a suggestive form and a practical use, an alternative interpretation proposed in the publication on terracotta weights should also be mentioned here, that is, their possible use as net weights or net sinkers in fishing and trapping[10]: it is possible that use has influenced the shape. If we add the fact that certain fish species consumed at Selevac must have been caught (by means of lines with large baited bone-hooks) in the Morava or Danube rivers, flowing at some hours distance, smaller fish probably deriving from local waters[11], we can consider the representation of a fishing boat as highly likely, although we cannot guess another practical function for the artefact. This representation is all the more likely, since the actual model was found with other miniatures, in particular several figurines and a miniature piece of furniture. The perforated extremities of the boat model, through which a thread could have passed -and it actually did- do not contradict the possibility of identifying it as a dugout, holes being frequently attested through logboat ends. On the other hand a miniature, whether a house, chair, figurine, vase or boat, may either be suspended or lie on its own: stability and possibility of suspension may coexist[12].

The third model, found at Tsangli[13] (south-eastern Thessaly), can, without doubt, be identified as a boat, although its structural characteristics are not easy to interpret. It has an astonishing keel-like device, a hydrodynamic hull and prow, a length/width ratio of only 1,5 (10,2:6,7cm) and an internal transversal separation shaped like a slot receiving a fitted transom (Fig. 2-3).

The Late and Final Neolithic Ages offer even more variation on possible boat types. Since they have already been presented elsewhere[14], I will simply list them. The artefacts come from Polgar (Vinča C)[15], Vučedol[16], Bitola[17] and Suplevec[18] (Pelagonia), Maliq[19] (south-eastern Albania), Osikovo[20] (near Razgrad, Bulgarian Thrace), Drama[21] (near Burgas, Bulgarian Thrace), Otzaki[22], A. Sophia[23], possibly Pyrgos[24] and Platia Magoula Zarkou (Fig. 12)[25] (Thessaly) and further away from Cascioarele[26] (Muntenia, Romania). To these should be added a model from Teliš-Redutite[27] (Pleven, Bulgaria). The types include possible dugouts of symmetric (Cascioarele, Pl. Magoula Zarkou, Teliš-Redutite) or asymmetric (Osikovo) form, rather quadrangular (A. Sophia) or ellipsoïd transversal sections, mostly ellipsoïd longitudinal sections and an unusual anthropo- or zoomorphic end, shaped like a figurehead (Otzaki), fitted transoms (Teliš-Redutite), as well as probable paired logs (Bitola, Maliq). The length/width ratio of those complete models whose measurements are known, could be from 2,02 up to 3,44 or even 5,8 (Osikovo: 22,3: circa 11cm; Otzaki: (estimated) 10:2,9 cm; Pl. Magoula Zarkou: 7:1,2 cm; cf.: Teliš-Redutite: (length) 19,2 cm).

Since some of the more developed types, such as the paired logs or the Tsangli boat, could have been used in the sea, the above mentioned evidence resulted in the paradoxical conclusion of an Aegean craft, or, at least, Aegean craft models of continental origin. Nonetheless, the problem of the missing link between these primitive continental boats -apparently used in inland waters, rivers or lakes for fishing, water-fowling, crossing, transport of bulky material, people or animals- and the Cycladic sea-going paddled vessels of the Keros-Syros phase of EB II, remains open.

After re-examination[28] of an artefact published in the '30s[29], we can now move a step forward (or, rather, backwards): a small terracotta model (preserved length 8,8cm, original length not less than 10cm) from the Vth town of Thermi, in the island of Lesbos, dating from the end of EB I or the beginning of EB II, contemporary of Troy I-IIa-c (end of town I or beginning of town IIa-c[30] phase, depending on the accepted chronological system), narrowly precedes the Syros and Naxos longboats. This model presents a distinct "keel" (or central plank) and slightly wavy sides, due apparently to the crude modelling: it is asymmetrical, though unfortunately, the ends are not completely preserved: the hull and "keel" at one of the ends are wider, but at the same time the hight of the "keel" itself is smaller; this end clearly rises higher than the other one, at an angle of about 10 to 20 degrees, but we don't know how it ends. The other (broken) end of the "keel", rising very slightly (5 degrees), almost horizontal, is higher but narrower; the gunwale, partly broken, is also clearly narrower on this side, and should actually end here; it leaves the "keel" projecting distinctly. The length/width ratio is 3,82 (according to the preserved length, 8,56: 2,24) and should originally be approximately 4,46 (according to an estimated original length of 10:2,24) (Figs. 4-7, 10).

From the point of view of typology, we have to admit that the Thermi boat model shows similarities with some of the two-dimensional boat representations from the Dorak finds. The latter -their genuineness has often been contested[31] - are supposed to be contemporaries of Thermi II-V (Troy II)[32] and to belong to the neighbouring so-called Yortan culture which is related to Troy[33]. Of course, once more, we have here the famous Cycladic (Korphi t'Aroniou slabs[34], Syros frying pans[35]) and Cretan (Palaikastro terracotta model[36]) "keel projection"[37].

If we add the fact that Syros (Kastri settlement) had contacts with the North-East Aegean[38] and the fact that most of the longboats of the "cycladic" type incised on frying-pans come from, or are related to, the Syros (Chalandriani) cemetery [39], the question remains, whether the Thermi V (Troy II) inhabitants knew the "cycladic" type of boat before, or at the same time, as its presumed inventors.

There is no need of course to discuss the use of the original Thermi boat in the Aegean. The settlement is situated within view of the sea (Fig. 8-9) and the Asia Minor coast is not far away. Relation with sea resources is more than evident here: Fish is consumed and shell occupies an important place in the cuisine[40]. Cultural and commercial exchanges with Troy, Poliochni and the Cyclades have often been discussed. Distances between the latter and the islands of the North-East Aegean can be covered in a relatively short time[41]. When Thermi V was abandoned – since no signs of conflagration or of any other catastrophe mark the end of Town V[42] –, its inhabitants would have left by sea -by boat- presumably towards the south[43]. If longboats have sometimes been considered as more appropriate for warfare and raiding and if other mercantile boat forms may have appeared in the EBA, as it has been argued[44], perhaps the Thermi boat, rather more modest in size than the longboats, could also have been one of them.

* * *

Boat models have to be considered in relation to other contemporary three-dimensional reduced terracotta representations of man-made structures or humans and animals. In MN and LN this miniature material can be found together in pits, houses, foundation offerings or general domestic context. Relevant evidence on boat models is rare, but the MN Selevac artefact was found in the preserved northern part of a post-hole house (Selevac House 4)[45], on the Southern edge of feature 23, the latter being clay rubble coming from a wattle-and-daub structure and containing the remains of an oven floor. The preserved post-holes belonged to the northern wall (feature 59) of the house[46] (Fig. 11). In addition to the boat model, an important concentration of material was found at the same time in and around feature 23 and the underlying feature 44 (which is associated with feature 23): ceramic sherds, bone-tools, pieces of copper and copper-ore rock, some clay cones, a clay decorated disk, as well as twenty anthropomorphic figurines and a stool or table model fragment of approximately the same length as the boat[47]. In the Late and Final Neolithic general domestic associations are certain in most cases. Precise associations of boat models, in particular with other miniatures or/and with figurines are however rarely specified, as at Căscioarele or in an Otzaki pit, but the foundation offering at Platia Magoula Zarkou (beginning of the Late Neolithic) contains a model which could be interpreted as a monoxylous craft, although other alternatives might be more plausible[47bis]. This presumed craft model was also situated near the (model) house oven, as were several figurines and some unidentified models (or figurines) (Fig. 12). It is worth noting this similarity of space disposition between the real Selevac house and the fictive Platia Magoula Zarkou house model.

Besides figurines, neolithic miniature iconography generally comprises subjects from the domestic interior[48], furniture, vases and fixed structures (such as ovens), boats having rarely been identified. Of course it seems difficult to introduce a boat into a house interior, unless the object, represented at Pl. Magoula Zarkou, which looks like a dugout, is in fact a tool, or if the same shape or the same implement could be used in both ways. One could also argue that the house model did not show the real household and their implements, but rather the miniatures and figurines a real house was fit out with.

In contrast with the above-mentioned situation, the boat model in EBA Thermi was found in the main street, in EΛ area, in front of the most important houses of the town (group Λ), since they have *antae*, their anteroom is equipped with an unusual platform (Λ 2)[49], they are situated on the highest point of the site and the street in front of them is paved[50]. Unusually four anthropomorphic figurines or fragments (two heads, a body, a torso) and a miniature bowl have been found in five different rooms[51] in this group. Thermi V (Fig. 8-9, 13) is a fortified[52] proto-urban[53] settlement, with wide streets, free-flowing circulation on the main thoroughfare, itself at right angles with the street leading from the main entrance and gateway to the interior of the town[54]. Thermi has no yards, but the streets become larger in some places[55]. At a short distance from the Λ houses, in the centre of the town, a space (N2) had been paved as a square or market place (Fig. 14)[56]. Three streets (two wide ones and an alley) branch off and lead from this main street towards the sea. Parts of this main street are bare, others are covered with pebbles. It passes in front of open space N2 and reaches the southern gateway. In front of what seem to be the principal buildings in Λ (Fig. 14), it is very well paved with large stones and pebbles. Projecting walls form porches[57] in front of rooms Λ2 and Λ3[58] (called thus “megara”[59]), the anteroom of Λ4 being enclosed by one of the walls of Λ2. These porches must have been open, because the paving of the street extends inside them, at a higher level than the foundation of the walls[60]. Communication with the main street is evident.

Early Bronze Age miniature iconography in general comprises clearly fewer (implement) models than the preceeding periods[61]. Relative frequency of boat models is however greater. Besides, models are now distinctly differentiated from the other categories of miniature representations, that is, vases and figurines. Not only have they been found in distinct contexts, but also different settlements are now specialized in the production of specific categories of miniatures[62]. Thermi is one of the exceptional sites, if not unique, in that it specializes in terracotta figurines (phases III-V) as well as miniature vases. Town V has produced a total of eleven figurines and six miniature vases. The boat model is unique, only one or two other terracotta models (a tool and an unidentified implement) are known from the whole settlement, a fact which makes this boat model all the more striking. Most of the small number of miniatures from all categories, which date from Thermi V and whose context is certain, are concentrated in area Λ.

In conclusion, when considering miniatures, we may remark that, if boats were modelled in reduced size, in the Neolithic they are probably to be considered as domestic implements. In view of the primarily agricultural economy and family social structure of the neolithic settlements, these boat models were probably related to the land, and concequently survival -food acquisition-, and to the house: house models are often represented open and furnished[63]. One of the models' functions could be magic or prophylactic, as is suggested by the discovery of the Pl. Magoula Zarkou model under the floor of a Thessalian neolithic house. On the other hand, EBA model iconography shows an opening to the exterior of the house, the house models, which are now rarer, are hermetically closed[64]; it also shows a tendency for communication, trade and specialized activities, since the number of boat models increases, miniature tools are more frequent and musicians are carved in marble.

Clearly distinguished from EBA stone or metal offerings in select tombs, as well as from the so-called domestic "cult scenes" of the Neolithic, terracotta miniatures found in EBA streets or squares should, in several cases, attest open-air activities. Proximity of a boat model to important buildings of a proto-urban settlement could hardly be considered as fortuitous. This artifact could have belonged to an important family. Considering these facts, and without excluding other possibilities, its crude execution could possibly be understood if the Thermi boat model had in fact been the toy of a rich child.

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NOTES

1. Marangou 1991a.
2. Ibidem, p. 24, note 37; cf. p. 28, note 78 about Middle Neolithic boat models.
3. Cf. idem, 1992a, p.2 and idem 1992b.
4. Idem 1992a, pp. 3-4.
5. Earlier (Early Neolithic) boat models of different types come from Central Europe. I am grateful to Dr. O. Höckmann for this personal communication. Greek unpublished material might include Early Neolithic boat models.
6. Vinča; L'art des Premiers agriculteurs en Serbie, number 119, p. 117, National Museum of Krusevac, inv. number 41. L/w ratio 19:16 (circa 1,18).
7. Length: 6,3cm; thickness: 2,2cm (width circa 3cm; L/w ratio circa 2). Tringham et alii 1990, p. 336, pl. 10.5, no (02-1178) and p. 373. Vinča B2, Gradac phase/VinCa-Tordos II.
8. Ibidem, p. 336.
9. Ibidem, p. 325 and 334; cf. Chapman 1981, pp. 122-123 about loom pieces.
10. Tringham et alii 1990, p. 334.
11. Brinkhuizen in Tringham et alii 1990, p. 246. Nonetheless, judging from their quantity, fish remains seem to be of comparatively little importance at Selevac.
12. See, for example, Marangou 1992a, p. 206.
13. Giannopoulos 1910, Fig. 3; Marangou 1991a, pl. IV, VIIb-IXd. Plate no VIIIa of the last paper mistakenly illustrates the same (starboard) side (reversed) as plate no VIIIb; the former should be replaced by Fig. 2 of the present paper, illustrating the port side. Plate no VIIc of the 1991a paper, showing the lower side of the model, has also been reversed. I am grateful to Mrs. Argyroula Indzesiloglou for permission to study this model at the Volos Museum.
14. Marangou 1991a.
15. Gordon Childe 1929, p. 81.
16. Schmidt 1945, pl. 42, Fig. 9.
17. Sanev et alii 1976, no 430.
18. Prendi 1982, p. 42.
19. Prendi 1982, pl. IX, 10-11.
20. Razgrad: Le Premier Or, p. 91, no 74; Frey 1991, Fig. 2.
21. Published since by Frey 1991, Fig. 1,1.
22. Hauptmann and Milojcic 1983, pl. 23, no 10.
23. Milojčič et alii 1976, pl. 18, no 12.
24. Batziou A. in Anthropologika 2 (1981), p. 110, Fig. 1b; cf. Marangou 1991a, p. 23, note 15.
25. Gallis 1985.
26. Stefan 1925, Figs. 18,9 and 26, no 14.
27. Busch 1981, p. 160, no 175; Ellmers 1986; Frey 1991, Fig. 1,2.

28. I am grateful to the Ephor of Antiquities of Lesbos, Mrs. Aglaia Archontidou, for kindly permitting the study of this model (Mytilini Museum).
29. Lamb 1936, p.156, no 31.5, pl. XXIV.
30. Naumann 1971, p. 484.
31. For the Dorak treasure, see Podzuweit 1979, p. 72, note 571 for references and a short discussion; see also Basch 1987, pp. 90-93, Figs. 189-190 (particularly nos 2, 8, 10, 14) for the boat representations.
32. Troy IIg according to Podzuweit 1979, p. 72.
33. Kâmil 1982, p. 8 and note 40.
34. Early Cycladic II or III; Doumas 1965, p. 53, Fig. 7, pl. 37a; see also the recent Κυκλαδικός Πολιτισμός, Fig. and no 88, p. 89, EC II-III.
35. Early Cycladic II; Tsountas 1899, pp. 90-91; Coleman 1985; Basch 1987, p. 80ff; Broodbank 1989.
36. Early Minoan II; Bosanquet and Dawkins 1923, p. 7, Fig. 4.
37. For a recent discussion see Basch 1987, pp. 85ff. and Morgan 1988, pp. 135-137.
38. See for instance Stos-Gale et alii 1984, especially p. 31; cf. Doumas 1986.
39. Broodbank 1989, p. 331, 336.
40. A premaxilla of a Wrasse (Labrus sp.) and a few vertebrae of more than one species of small shark have been found (Lamb 1936, p. 216).
41. Cf. Broodbank 1989, p. 333, Fig. 6.
42. Lamb 1936, p. 51.
43. According to Doumas 1986, p. 28.
44. Broodbank 1989, pp. 334, 336.
45. Tringham et alii 1990, p. 180, Figs. 4.28, 4.53, pl. 4.30.
46. Some other post holes found in the southern part of house 4, could also have belonged to internal supports of the roof.
47. Preserved length: 6,4; height: 1,3; originally it would be about 13 cm long.
47bis. Cf. Marangou 1991a, p. 23-24 and note 24.
48. Marangou 1992a, pp. 166, 171.
49. Lamb 1936, p. 50.
50. Lamb 1936, p. 47.
51. Figurines: rooms 1, 2, 4, anteroom 1; miniature bowl: room 3.
52. Naumann 1971, p. 218.
53. Renfrew 1972, p. 127.
54. Thermi V is a town rather than a village: Naumann 1971, pp. 218, 341, 484.
55. Naumann 1971, p. 341.
56. Lamb 1936, pp. 43, 51.
57. Covered anterooms? (Naumann 1971, p. 337).
58. Naumann 1971, Fig. 450b.
59. Cf. Naumann 1971, p. 340.
60. Lamb 1936, p. 47.
61. Marangou 1992a, p. 171.
62. Ibidem.
63. Besides Pl. Magoula Zarkou cf. the Sitagroi III, Thermi and Vassilica (Eastern and Central Macedonia) open house models (Sitagroi: Renfrew et alii 1986, Fig.8.20a, pl. XL 1a-d; Thermi: Marangou 1991b, no MK 9; Vassilica: fragment at the Thessaloniki Museum; I am grateful to Dr. D. Grammenos and Mrs. M. Pappa for granting permission to study the Vassilica and Thermi miniature material).
64. See for instance Zapheiropoulou 1969 = Κυκλαδικός Πολιτισμός, no and Fig. 23, p. 56, a *poros* house model from Melos.

ILLUSTRATIONS

1. Middle Neolithic model from Selevac (after: Tringham et alii 1990, pl. 10.5)

2-3. Middle (?) Neolithic model from Tsangli; port- and starboard side (photos by the author).

4-7. Early Bronze Age model from Thermi (photos by the author).

8. Thermi settlement (Town V): watch tower, western gateway and main thoroughfare (after Lamb, W., in BSA XXXI, 1930-31, pl. XXIV, 4).

9. Thermi settlement (Town V): view of southern area and street in Λ (lower left) (after Lamb, W., in BSA XXX, 1928-29 and 1929-30, pl. III, 2).

10. Early Bronze Age model from Thermi (drawings by the author).

11. Selevac House 4, building horizon 77-78: VII, trenches 18/21 and 15 (after Tringham et alii 1990, Fig. 4.28).

12. House model containing figurines and miniatures from Platia Magoula Zarkou (after Gallis 1985, pl. XVb).

13. Thermi Town V (after Naumann 1971, Fig. 67).

14. Thermi Town V, group of houses in Λ (after Lamb 1936, plan 6).

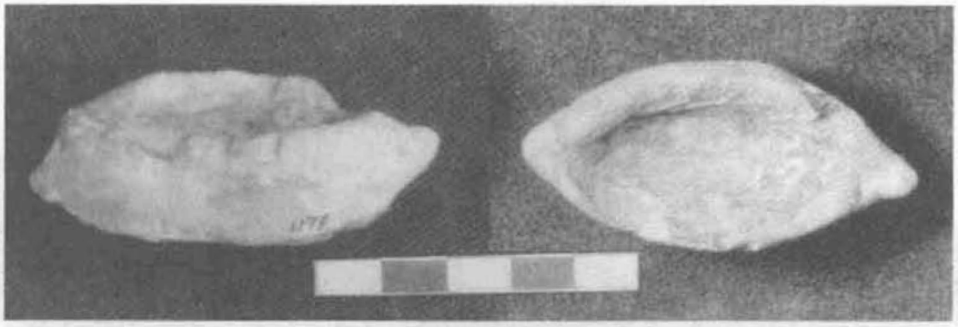

FIG. 1

FIG. 2

FIG. 3

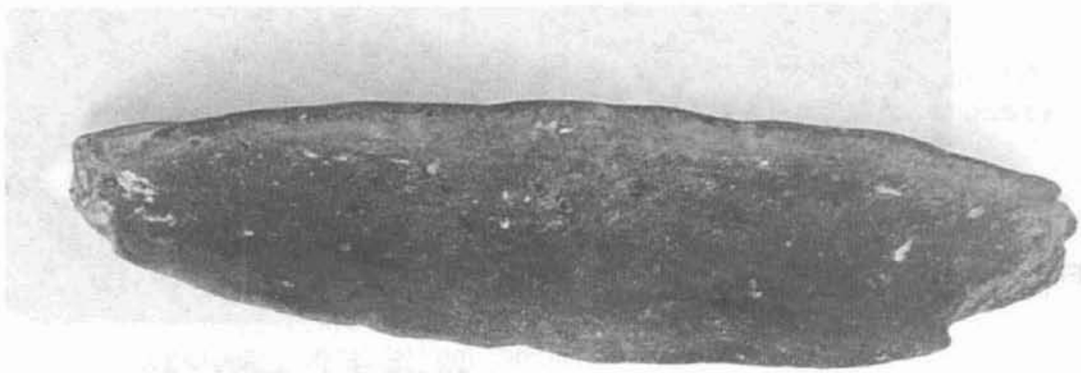

FIG. 4

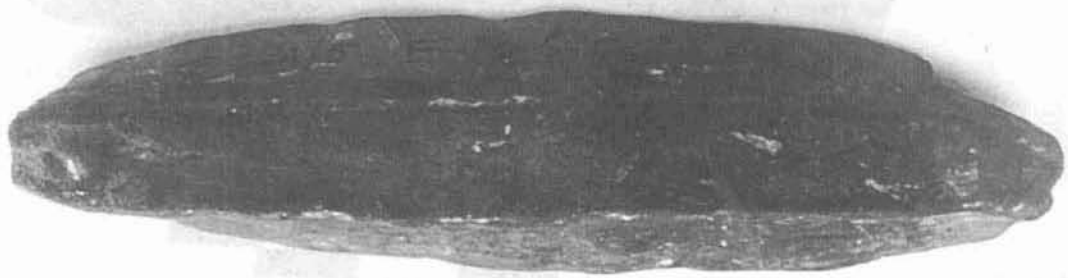

FIG. 5

FIG. 6

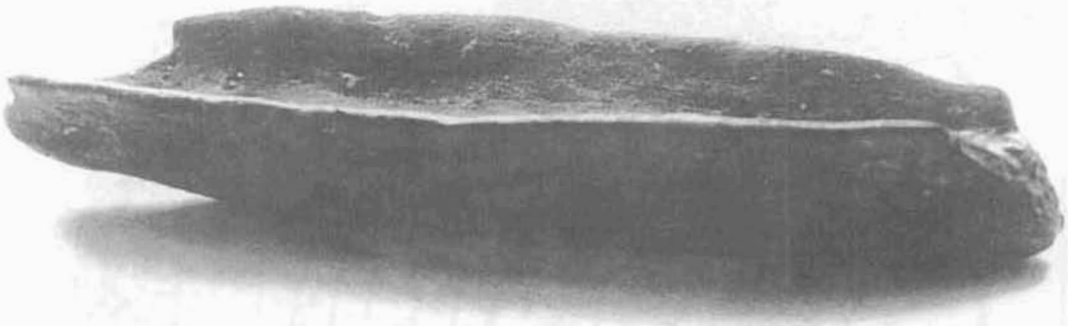

FIG. 7

FIG. 8

FIG. 9

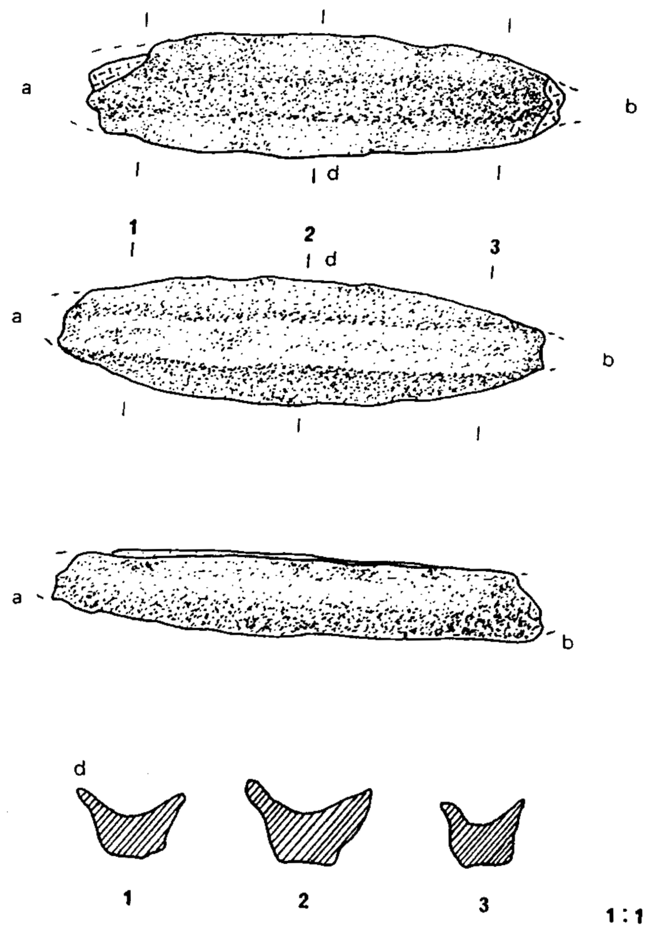

FIG. 10

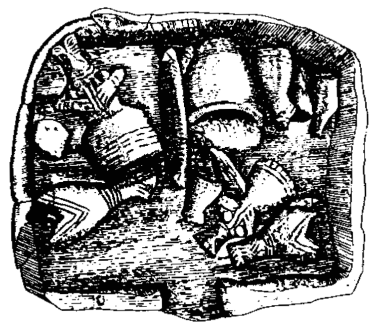

FIG. 12

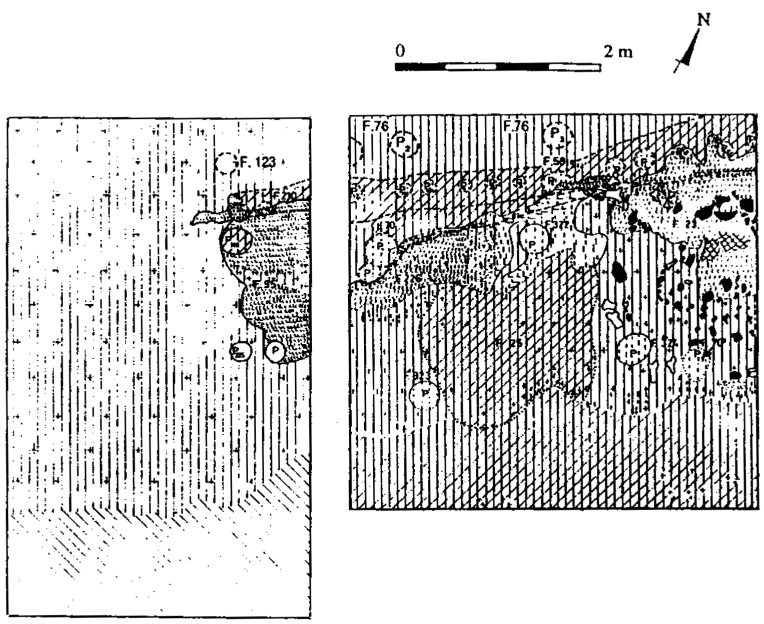

FIG. 11

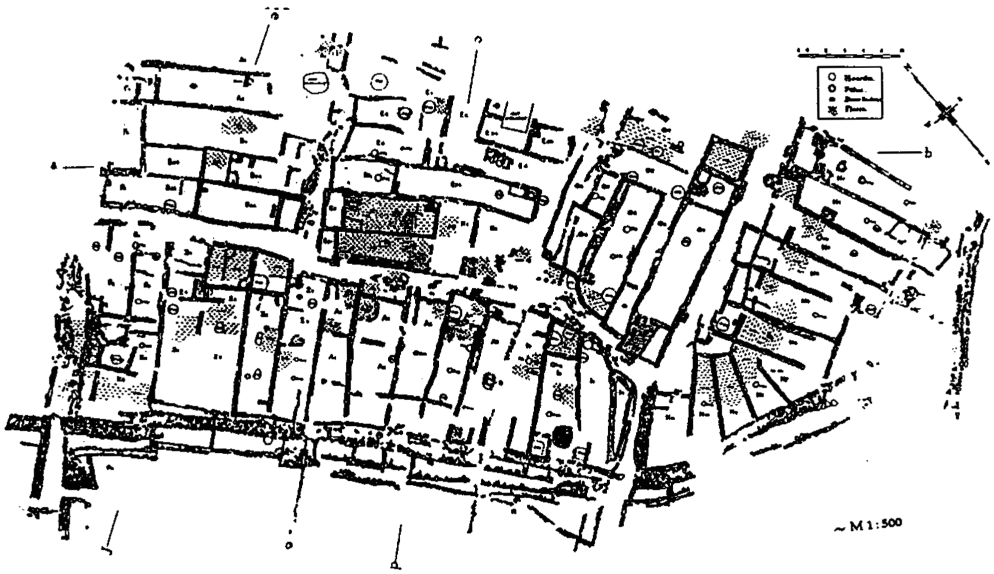

FIG. 13

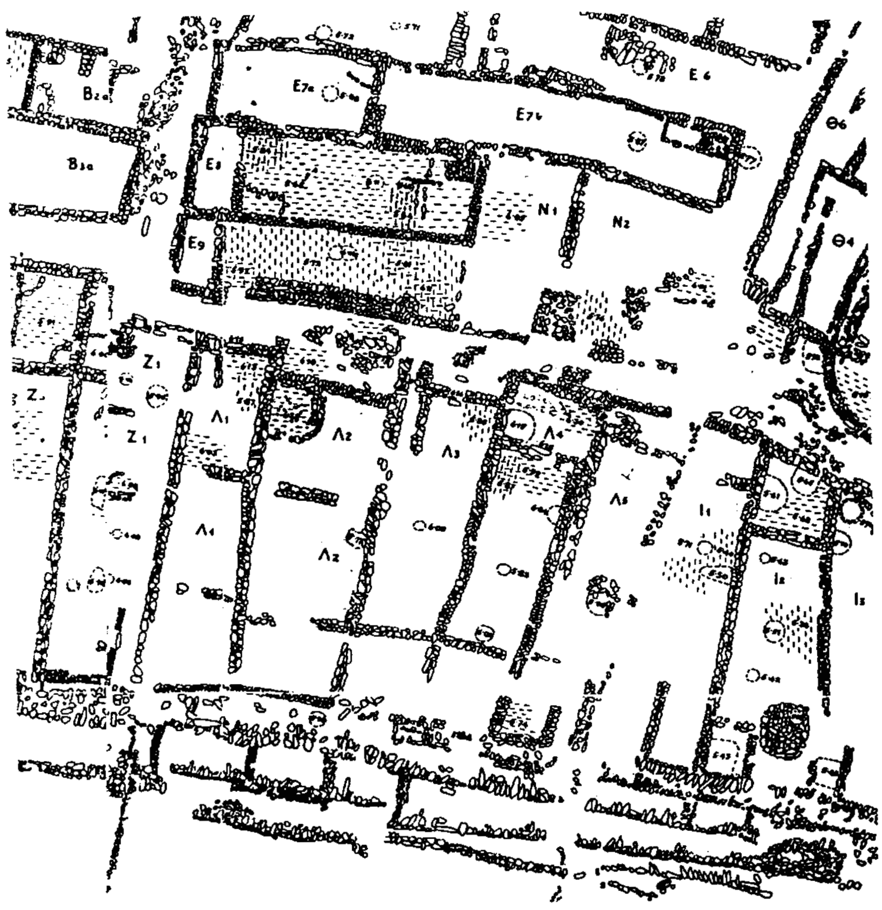

FIG. 14

PICTORIAL REPRESENTATIONS OF HARBOURS DURING THE SECOND MILLENIUM

Although Bronze Age ships representations have been dealt with at length by numerous scholars, the depictions of ports, harbours and anchorage have not been studied in any great detail. This paper will survey the pictorial evidence from Egypt and the Aegean in order to fill that lacuna. Synthesis of that evidence with historical, philological and archaeological documentation will be used to elucidate the types of anchorages, the means of mooring, and the nature of harbour activity common in the Second Millennium. Based upon that evidence, it will be suggested that the conceptual, if not the technological development of artificial harbours has a partial Egyptian ancestry.

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EDITOR'S NOTE

The above is the abstract of Mr. Ezra S. Marcus verbal communication.

CLASSICAL MEDITERRANEAN SHIPBUILDING OUTSIDE THE MEDITERRANEAN

Although it is well known that Greek and Roman trading ships sailed as far as Britain before the Roman invasions of northern Europe (McGrail 1990), it is not clear what the various local types of ships there looked like, though it is thought that the shapes of some of the native vessels are depicted on pre-Roman Celtic coins minted in north-west Europe (Allen 1971; Muckleroy et al 1978). However, it has long been assumed, in Britain at least, that once Roman rule had begun in the 1st centuries BC and AD most Roman trading ships were like those of the Mediterranean. Is this valid? Recent research on ships, cargoes and ports in northern Europe is enabling us to examine evidence for water transport and its use and conclude that the assumption is not valid.

Many of the vessels, strange by Mediterranean standards, that are depicted on Roman stone sculptures from the Rhineland are believed to be of Celtic type (Ellmers 1978), and it is significant that of the thirty-two plank-built vessels of the Roman period, excluding planked logboats, that have been recorded in the central and northern provinces only five are of a Mediterranean type of construction: Oberstimm, 2, on the Danube (Hockmann 1989); Vechten (de Weerd 1988, 184-194) and Zwammerdam, on the Rhine (de Weerd 1988); and London-County Hall, on the Thames (Marsden 1974); Moreover, three-ring analysis and a study of the vessel sizes shows that these were all probably locally built and could not have sailed from the Mediterranean. The four vessels found on the European mainland date from the 1st - 2nd centuries AD and were associated with military forts, and it now seems probable that their Mediterranean type of construction was due to their having had an "official", usually military, use.

The absence in central and northern Europe of any discovered vessels that had been built in the Mediterranean region would seem to suggest, then, that Roman trading ships did not generally sail around Spain to the north. This view is supported by a separate study of the find spots of goods, particularly amphorae and certain other types of pottery, that were imported from the Mediterranean to the northern provinces (Peacock 1978). Their distribution pattern has suggested that the trade was carried by ship on the main rivers of Gaul and Germany. But for this to be conclusive, however, much more information is needed about the distribution of these goods in Portugal, Spain and western France for it could be argued that the absence of find spots there is due to a lack of archaeological recording. Nevertheless, there is an undoubted concentration of finds beside the Rhone and the Rhine indicating that these rivers were important shipping routes. In contrast it seems significant that only one amphora with goods from Portugal has yet been identified in Britain to attest an Atlantic trade (Britannia 5, 1974, 467, n. 41). If this theory is correct then it indicates that in central Gaul the navigable heads of rivers draining into the Mediterranean, particularly the Rhone, probably marked the limit of the voyages of ships of the Mediterranean tradition (Fig. 1). The lands beyond, whose rivers, such as the Loire, Seine and Rhine, drained into the northern seas, were inhabited by Celtic peoples, and it now seems that there the native traditions of shipping prevailed. This will explain why almost all of the ships found north of the Alps are of Celtic type.

Quite apart from these cultural reasons for differences in shipbuilding methods between northern and southern Europe in Classical times, there is important new evidence to show that the environment also played a significant part. In particular we are beginning to understand the methods of berthing at ports. At London (Londinium), the major port of the Roman province of Britain, extensive excavations on the Roman waterfront have shown that the River Thames was then tidal, but with a maximum depth of water beside the timber quays at high tide of less than 1m. during the 1st and 2nd centuries AD. This shallow depth is puzzling for in the 1st and 2nd centuries AD the city received its greatest quantities of imported goods, including great barrels of wine, olive oil and wine in amphorae, and stone for buildings and monuments. So the shallow depth of water at high tide at the London waterfront may well have created berthing problems. Building deeper water berths with jetties or moles could have been one solution, but only one jetty extending into deeper water had been found. Another solution would have been for seagoing ships to moor in the tidal stream and offload into barges. Alternatively, seagoing merchant ships may have all had relatively broad flat bottoms that did not draw much water when laden. There is evidence to suggest that all of these solutions were adopted, and it means that instead of studying ship construction it now becomes important to consider the design of ships to study how they might have worked. In other words, shape instead of structure becomes significant.

Fortunately, the hydrodynamic analysis of reconstructions of ancient hull forms is now made relatively easy by the availability of computer programs. These enable the theoretical design of ancient ships to be considered in terms of stability and performance as if they were modern vessels on a drawing board, for the rules of hydrodynamics apply as much to ancient ships as to modern vessels (Marchaj

1986; McGrail 1987, 12-22). As Sean McGrail has pointed out (McGrail 1988, 35), this type of theoretical analysis is considerably cheaper and quicker than building full-size working reconstructions, though in certain circumstances the latter forms the ideal system of analysis. This makes it necessary to consider how theoretical analyses should be published, for although some specialists publish the specifications and calculations in detail, others give only their conclusions, and this makes it difficult to make comparisons between vessels. It is also important to know how valid is any reconstruction, for if there is too much speculation it is hardly a valid basis for hydrodynamic analysis. It seems that the minimum amount of information required before attempting the reconstruction of a whole vessel should include at least some indication of length, form of the ends, midship beam, midship form, height of the gunwale amidships, height of the deck, position and size of the hold, the total weight of the ship and the average hull density per square metre. Also there should be an indication of the methods of propulsion and steering, and if there was a cargo, then the weight of the cargo needs calculation, both as individual items and in total. Finally, care should be taken to look for traces of ballast which if found should be weighed.

There are various computer programs available which allow the hydrodynamics of theoretical reconstructions of ships to be examined, and for comparisons to be made between ships. I have been using "Boatcad" (manufactured by the Aluminium Boat Company, Trewen Road, Budock Water, Falmouth, Cornwall, TR11 5DY, England) which is quick, easy to use, and is well suited to archaeological purposes. Apart from plans, elevations, and hydrostatic analyses it also calculates and plots strake diagrams, cross-profiles at any point, and waterlines, buttock lines and the distribution of volume in the hull. With this it has been possible to consider classifying hull shapes by their volume distribution and show, for example, that the reconstruction of the Romano-Celtic seagoing trading ship from Blackfriars, London, was stable in the "lightship" condition (i.e. not fitted out or containing cargo and supplies) at a draught of about 0,67m. and that it could carry a cargo weighing about 50 tones at a draught of 1,5m. Such figures are, of course, only approximate since they depend upon the accuracy of the reconstruction. This ship may have been typical of Romano-Celtic vessels generally in that it had a flattish bottom and was ideally suited to sitting on tidal shores at low water for loading and unloading (Fig. 2a, b). Such beach berths may well have been the most common feature of prehistoric and Roman ports in northern Europe, for they have been found at Hengistbury, a late Iron Age port of the 1st century BC beside the English Channel in southern England (Cunliffe 1990), and in the initial settlement phase at Roman London, about AD 50.

A particularly valuable clue to determining the maximum possible original draught of an ancient ship is the graph of its righting moments, for in the case of the Blackfriars ship this (Fig. 3) shows the draught (about 1,5m.) at which the maximum righting force occurs, and this is linked to displacement (about 80 tones) and load (about 50 tones). It is presumed to be unlikely that a ship's master would have loaded his vessel beyond the point of maximum righting ability, for although he would not have known this point in a scientific way it is likely that experience will have established how his ship behaved safely.

Rarely is there sufficient archaeological information to carry out a complete ship reconstruction, but in contrast to the Romano-Celtic ship from Blackfriars there is also the hull of the Anse des Laurons ship of similar date which was found off southern France. Of Mediterranean construction the Anse des Laurons ship is as close to the ideal amount of evidence that is ever likely to survive. By using the excellent interim published report (Gassend et al 1984) it has been possible to undertake a reconstruction of the hull form in the computer (Fig. 4a, b), and then to make a hydronynamic analysis. For a more accurate analysis further information is needed, but even this limited published study shows that the maximum righting moment reaches its peak when the ship and its load totals about 50 tones (Fig. 5), at a waterline of about 1,45m. Assuming that the approximate weight of the ship, its equipment, crew and their possessions was about 20 tones, this would give a cargo weight of about 30 tones. In contrast to the Blackfriars ship this vessel is close to being unstable in its "lightship" state, at a draught of 0,78m. The ship would be close to heeling over because of the high Centre of Gravity relative to the transverse Metacentre, but it could be made more stable by adding a suitable cargo or ballast. It had flaired sides, as also had the Yassi Ada 7th century ship, whose reconstruction was also reported to have been unstable in the "lightship" state, though this too could have been overcome by adding some ballast (Marean 1987). Both vessels therefore were designed for the Mediterranean environment with no tides, in contrast to the Blackfriars ship which was designed for the tidal northern seas. Just how typical of Mediterranean ships these are cannot be judged until many more vessels have been carefully excavated and evidence for their hull forms reconstructed.

It is important to remember that the shape of a ship enables it to harnes considerable forces that are vital to its stability, performance and use. The construction simply gives the shape strength, and, of course, this is achieved in different ways according to the shipbuilding tradition. Therefore, as there is a relationship between the weight of a ship and its cargo load relative to its stability and performance, even when the upper part of a hull is missing, the discovery of a relatively undisturbed cargo and the bottom of a ship, as for example at Madrague de Giens, should make it theoretically possible to reconstruct on the computer a hull size and shape that embraces all that is known, including the weight of the cargo and the hydrodynamic "rules". This would then give a scientific basis for any reconstruction of the missing hull structure. It would then be possible to assess the ship for a range of typical loads, as well as in the lightship state and at its maximum righting arm.

The view that the tidal range in northern seas was an important factor in determining how ships were loaded and unloaded is also suggested by heavy individual items or packages, such as stone blocks or barrels of wine that were once shipped but are now found on land. None has yet been recorded in Britain weighing more than 1.5 tones, as if the berthing and loading and unloading facilities were restricted, as at Roman London. This contrasts with sites in the Mediterranean region where much heavier individual items of cargo are found both on land and in Roman wrecks, and show that there were some very large ships indeed. The 40 tones block of marble in the 3rd century wreck off Marzamemi, Sicily, is an extreme example (Throckmorton & Parker 1987, 76), and indicates the existence of comparitively advanced methods of cargo handling.

The tidal range in the north suggests that the total cargo of about 50 tones that the Blackfriars ship could have carried may have been typical for that region, and that more substantial cargoes were rare. In this respect it is noteworthy that the recently excavated Romano-Celtic ship of the 3rd century AD from St. Peter Port, Guernsey, Channel Islands (Rule 1990), was of similar capacity to the Blackfriars ship. In contrast, estimates of whole cargo weights in Classical wrecks in the Mediterranean show that there were some particularly large vessels: Torre Sgarrata, Italy (stone, *c.* 170 tonnes); Marzamemi, Sicily (stone, *c.* 190 tonnes); St. Tropez, France (stone, 200+ tonnes); Mahdia, Tunisia (stone, *c.* 240 tonnes); Isola delle Correnti, Sicily (stone, *c.* 350+ tonnes); Madrague de Giens, France (amphorae *c.* 325 tonnes); and Albenga, Italy (amphorae, *c.* 550 tonnes) (Gianfrotta & Pomey 1981, 282-284). The contrast between the Mediterranean and the northern provinces, therefore, suggest that the tideless Mediterranean was better suited to the construction of deeper water berthing facilities than were the northern tidal seas.

But the County Hall ship, found in London in 1910, is different from the remaining vessels with a "Mediterranean" type of construction found in central and northern Europe. It is later, larger and not known to have been associated with a military fort. Reconstructing the original dimensions of the ship is not as easy as might be thought for only part of the hull remained. The remains were about 13m long and comprised the hull bottom and one collapsed side up to the gunwale, from the widest part of the ship towards one end. But both ends were lost. By reconstructing the side onto the bottom the beam is found to be about 5.06m, with the gunwale originally at about 2m. above the bottom of the keel. There was a deck at about 1.5m above the top of the lowest frames of the hull, and although the hull strakes were held by mortice-and-tenon joints no parallel to its deck support structure is reported from the Mediterranean.

It is the length of its hull that is difficult to assess, and to estimate this it has been necessary to consider not only the discovered hull form, but also the forms of other Roman ships. Since the gunwale of most excavated ships is normally missing the only means of establishing what was the normal breadth - length ratio of Greek and Roman vessels is to measure the ratio at the turn of the bilge. This, of course, is not a specific spot so it is not possible to be exact, but if it can be approximately established then this would be a point for comparison with the County Hall ship. A study was made of eleven ships found in the Mediterranean area which gave the following rough breadth - length ratios at the turn of the bilge: Fiumicino 1 (1:3.2), Fiumicino 2 (1:3.2), Fiumicino 3 (1:3.3), Fiumicino 4 (1:4), Fiumicino 5 (1:2.5), Nemi 1 (1:3.4), Nemi 2 (1:3), Nemi 3 (1:3.5), Kyrenia (1:4.1), Kinneret (1:3.6), and Yassi Ada 7th cent. (1:4.8). Although not necessarily typical of Mediterranean ship proportions this range of 1:2.5 - 1:4.8 gave an average of 1:3.5, and if this ratio is applied to the County Hall ship then its length should be approximately 10.64m. This is far too short, for the discovered parts of the ship suggest a minimum length of 19.1m. This would give a breadth - length ratio of about 1:6.3, which is well outside the range found in the Mediterranean amongst the wrecks cited. What can this mean? Perhaps the comparisons in the Mediterranean region were too few or too varied as ship types to be valid. Alternatively, perhaps the County Hall ship had some form of "official" use which made it narrower than usual relative to its length. In this possible context it should be borne in mind that the recent tree-ring dating shows that it was built around south-east England not earlier than AD 285, at which time Britain had been declared independent from the Roman Empire by the usurpers Carausius and Allectus. Could the ship have been associated with the restoration of Britain to the Empire under Diocletian after AD 296? Or is a suggestion made in 1912, that the vessel might have been used as a warship, the answer? Parallels to its deck support construction have not been noted amongst Greek and Roman ship finds in the Mediterranean region, and this author would welcome a notification of any parallels (Shipwreck Heritage Centre, Rock-a-Nore Road, Hastings, TN34 3DW, England). It is otherwise interesting to note that the recent full-sized working reconstruction of the Greek trireme Olympias, shows a deck structure similar to that of the County Hall ship, indicating that the possibility that it was a warship should be considered. However, the sides of the County Hall ship were not parallel, and there is no evidence for the seating, footrests and oarports that would have been necessary for rowers. So, although the reconstruction of this ship is still uncertain, it does open up the possibility that it had an official Roman use, and future discoveries in the Mediterranean region may help with its interpretation.

Although the majority of Roman ships in central and northern Europe appear to have been Celtic, there are hints that the Roman economy, shipbuilding methods and religion may have influenced Romano-Celtic ships and shipbuilding. For example, so far no immediately pre-Roman plank built ships of the Celts have yet been found in Europe north of the Alps, and yet there are there a considerable number of plank-built vessels of the Roman period suggesting that the Roman economy was responsible for a massive increase in shipbuilding in the Celtic region. This too might have led to the fairly simple native vessels being constructed to greater sizes than before the Roman invasions, particularly on the Rhine where very large barges existed, as at Zwammerdam, Netherlands, where the largest was 34m. long, 4,4m. wide and only 1.2m high (de Weerd 1988). Moreover, the Celts sometimes used hooked iron nails to hold planks to frames in some of their ships at least during the Roman period, and as these were bent in exactly the same way as were nails, normally of bronze, used in some Mediterranean ships, it is possible that this technique was copied from the Mediterranean (Casson 1971, 207). Finally, the use of the votive coin in the mast-step of the Romano-Celtic Blackfriars ship was probably derived from the Mediterranean for ships found there as early as the 1st century BC also sometimes include coins (Casson 1971, 232). In order to solve some of these queries we urgently need to find examples of native ships in western, central and northern Europe dating from the immediately pre-Roman period, from a time before Roman influences took effect. At present all we have are descriptions by Julius Caesar and Strabo, and a few tiny pictures on Celtic coins (Fig. 6) (Allen 1971; Muckleroy *et al* 1978; McGrail 1990, 43-44).

We are still only beginning to understand how ancient ships were used, and the full-size reconstructions of the Kyrenia merchant ship and the Greek trireme are extremely important in giving us a major insight. Nevertheless, it is clear that, although a broad pattern of shipbuilding traditions in Roman Europe is emerging, there is still much fundamental data to be found and understood. There is no better example of this than a small logboat, with mortice-and-tenon fastenings to hold side strakes, that was found in an inland lake, Lough Lene, in central Ireland. This has led to a suggestion, supported by a Carbon 14 date of 400-100 BC on a piece of Yew heartwood which might date the vessel perhaps as late as the 1st century AD, that the vessel could be of the Mediterranean shipbuilding tradition even though it lay well outside the Roman Empire (Farrell 1989; Brindley & Lanting 1991). Since the local boatbuilding methods of Ireland at that time are completely unknown, it is unwise to concude on the present published evidence that this vessel was built by a Roman shipbuilder from the Mediterranean, as has been suggested. But, just how the construction of this curious boat can be otherwise explained is far from clear - until there are further boat finds in the region.

A major research and publication programme, due to end in 1996, on the many remains of ships, waterfronts and cargo goods found in London dating from the 1st - 17th centuries AD, is helping to clarify the broad picture. Already it shows that the history of nautical tradition and practice, in which the Mediterranean played and important part, was much more complex than anyone realised. An underlying feature of the ancient port of London from the 1st to the 11th centuries AD is that almost all known major shipbuilding traditions of Europe are represented in locally built vessels - traditions of Greece and Rome, of Scandinavia and the Slavic lands around the southern Baltic, as well as of the native Celts. The explanation is no doubt that this port was cosmopolitan from the beginning about AD 50, and it has now become particularly significant that one of its founding merchants was Aulus Alfidius Olussa, of the Pomptine tribe, who was born in Athens at the time of Crist and died in London aged 70. His tombstone (Fig. 7), found by the Tower of London in 1852, is preserved in the British Museum.

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ILLUSTRATIONS

1. Distribution of ship-finds of the 4th century BC - 4th century AD of the three major shipbuilding traditions: Mediterranean, Celtic and Scandinavian.
2. (a) Computer view of a reconstruction of the 2nd century AD Romano-Celtic ship from Blackfriars, London. (b) End elevations (i.e. "body plan") of the ship as reconstructed.
3. Heeled righting moments of the Romano-Celtic ship from Blackfriars, London. The maximum righting moment occurs at a displacement just above 80 tones and suggests maximum load that the ship would normally carry.

4a, b. Computer generated reconstruction of the small Roman merchant ship from Anse des Laurons, southern France.

5. Heeled righting moments of the Laurons ship as reconstructed, showing that at a displacement of 50 tones the ship was at its most stable.

6. Small pictures of ships on Celtic coins of the pre-Roman Iron Age (1st century BC/AD) from southern England and northern France.
7. Tombstone from London of "A(ulus) Alfid (ius) Olussa, of the Pomp(tine) tribe; set up by this heir in accordance with his will; aged 70; born at Athens; he lies here".

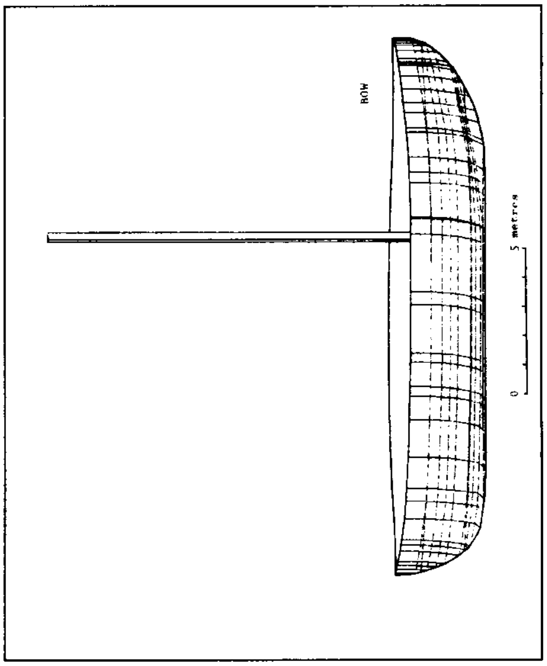

FIG. 2a

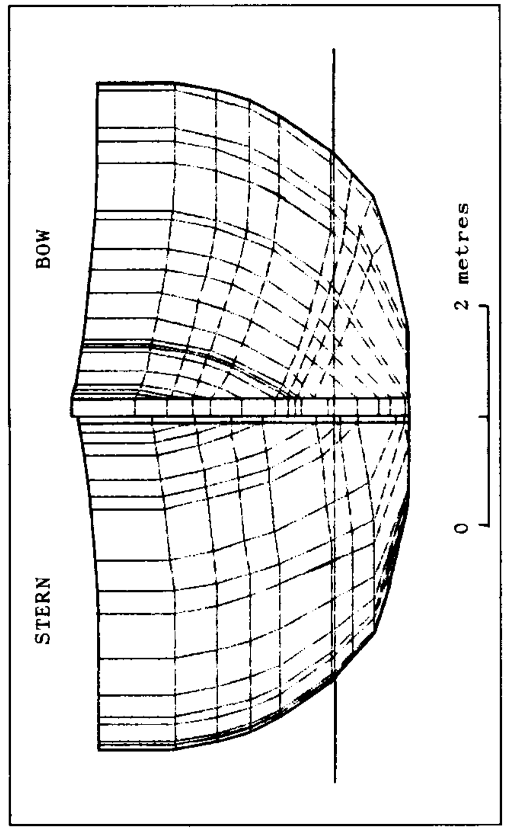

FIG. 2b

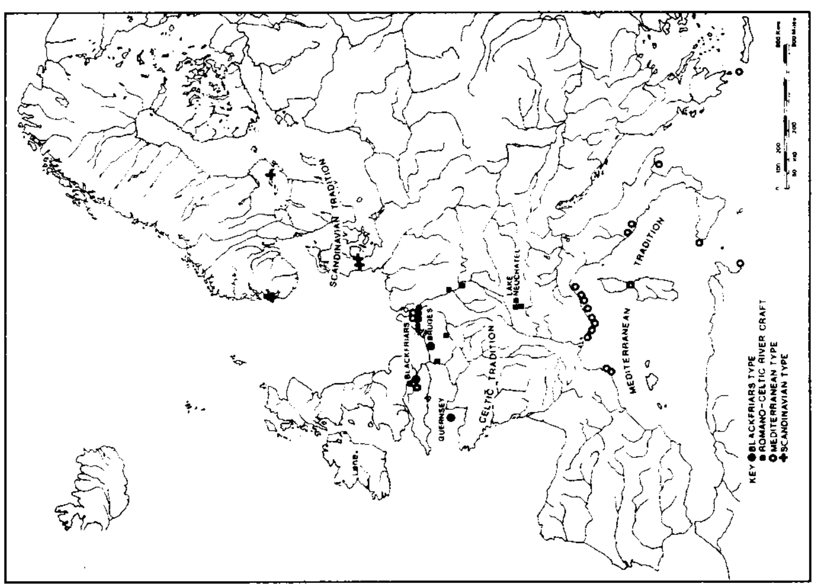

FIG. 1

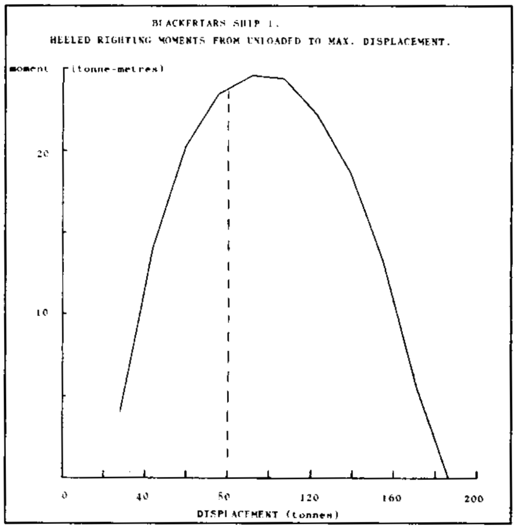

FIG. 3

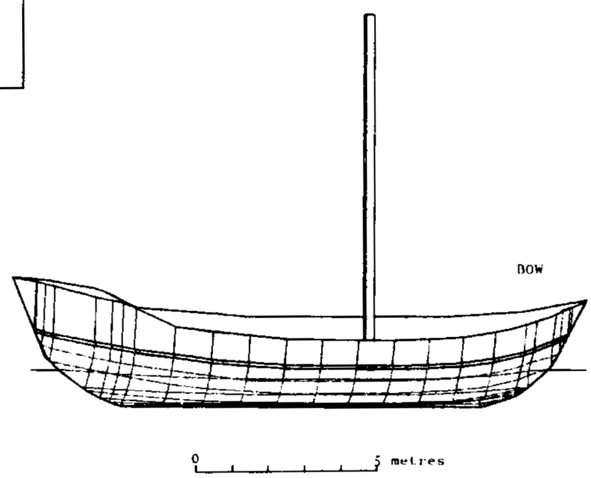

FIG. 4a

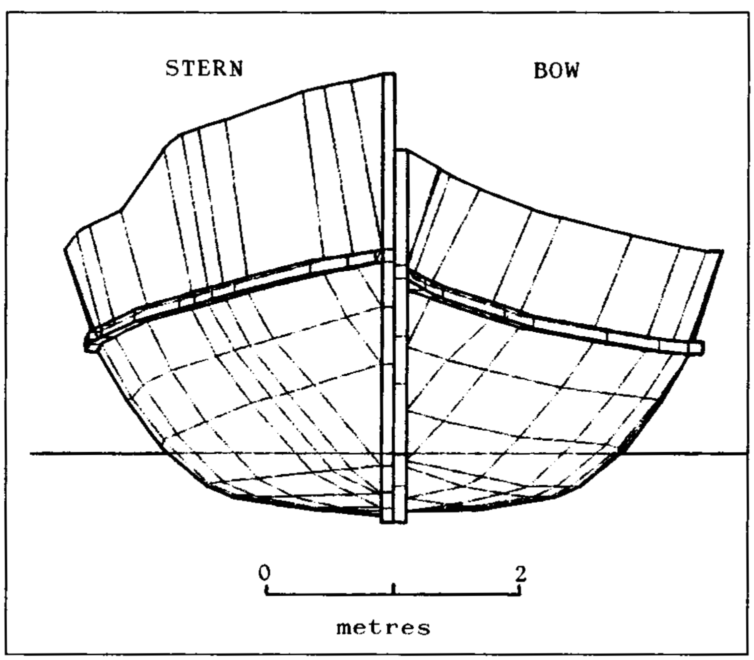

FIG. 4b

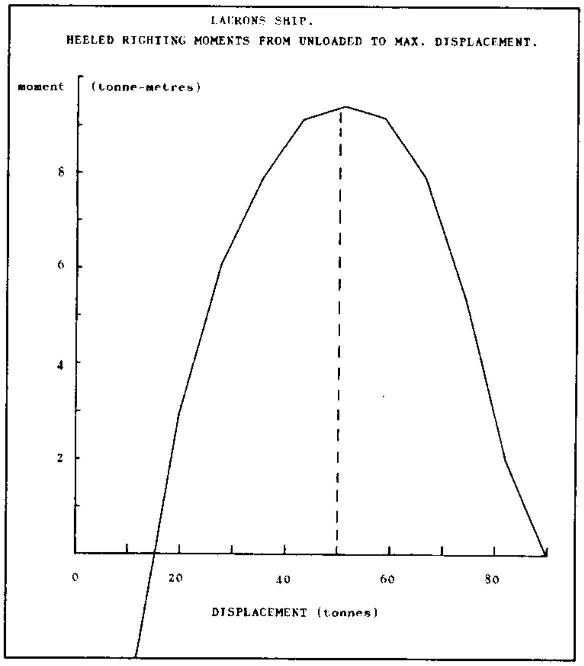

FIG. 5

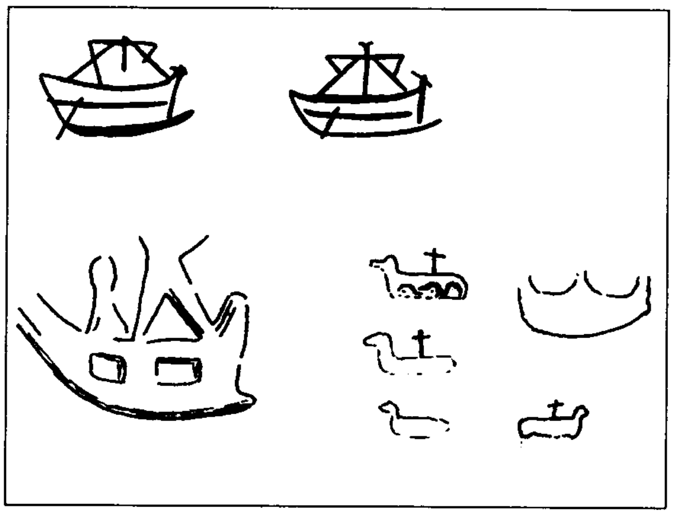

FIG. 6

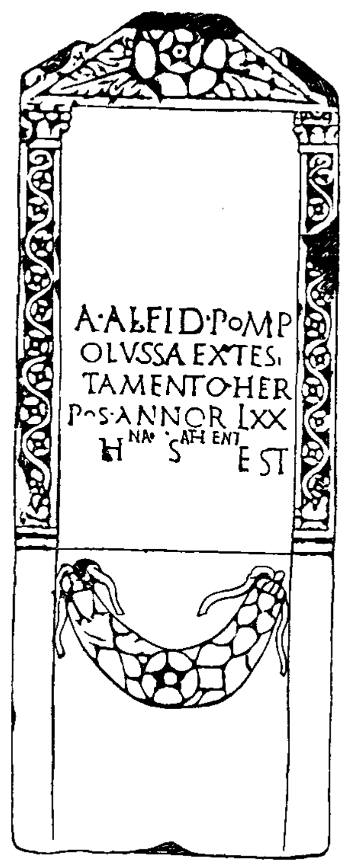

FIG. 7

NAVIGATIONAL TECHNIQUES IN HOMER'S ODYSSEY

Although much has been published about how ships in the ancient Mediterranean were built, fitted out, manned, propelled, steered and fought (Morrison & Williams, 1968; Casson, 1971/1989; Morrison & Coates, 1986, for example), little has been published about how these ships were navigated. By *navigation* I mean the art and science of knowing where you are at sea, and how to get from A to B and back again. In this paper I aim to present what can be deduced from Homer's *Odyssey* about the pilotage techniques used by the ancient Greeks in coastal waters and about the navigational techniques they used in open sea conditions when out of sight of land. I do not read Greek and therefore have had to rely on translations, in particular that by Rieu (1946).

Greek Seafaring

It is clear from many passages in the *Odyssey* that Homer's seamen could undertake not only coastal and inter-island voyages, but also open sea voyages. There are, for example, two occasions when the choice has to be made whether to undertake one type of voyage or the other. On their return from Troy to Greece, Nestor, Menelaus and Diomedes paused at Lesbos Island to consider whether to choose the coastal and inter-island route east of the island of Chios and through the Sporades and Cyclades to their waters, or to take the direct route north of Chios, leaving the Island of Psyria to port, thence across the open sea to a landfall at the southern end of Euboea (3, 165-175). On another occasion, Odysseus recounts to Eumaeus how he sailed in a Phoenician ship from the Levant bound for Libya (14, 300-305). In a northerly wind, "they took the central route and ran down the leeside (i.e. the southern coast) of Crete". The alternatives to this central, mainly open-sea, route would seem to be coastal passages, either clockwise along the North African coast or anti-clockwise along the coast of Asia Minor.

Navigational Aids

Throughout the world, from earliest times until well into the medieval period, seamen used *non*-instrumental navigational techniques based on inherited traditions, personal experience and detailed observation of natural phenomena (McGrail, 1987, 275-6). The only navigational aid for which there is any evidence being the sounding lead - not mentioned in Homer, it is known from Middle Kingdom

Egypt in *c* 2000 BC (Landström, 1970, Fig. 238; Bass, 1972, Fig. 18); and Herodotus (2.5.2) of the 5th century BC tells us that the lead was used when approaching the Nile delta, not only to check the depth of water but also to bring up a sample of the sea bed, the nature of the sample giving an indication of position (Fig. 1).

Although Odysseus had no instruments and no chart or map, it is clear that he had a "mental chart" in his head. He knew, at least in a general way, the spatial relationships of the coastal lands and the islands of the eastern Mediterranean. For example, the direction of mainland Greece from Troy (3, 155-175), the relative positions of many Aegean islands and the relationship to each other of Crete, Egypt, the Levant and Libya (14, 250-260, 290-305).

Such spatial relationships are nowadays often defined in terms of directions and distances: *directions* in broad terms such as North, South, East, West and so on, or, with more precision, in terms of degrees within a 360° circle system; *distances* are given in nautical miles. How, then, did Odysseus, without compass or chart, define and estimate directions and distances?

Directions

Let us take Directions first. When sailing away from Calypso's island, Odysseus kept the Great Bear *(Ursa Major)* or Plough on his port side (5, 270-275). Now this constellation, like all stars, appears to rotate about the Celestial Pole (the heavenly null point), but it is one of the few constellations which, from the latitudes of the Mediterranean, do not go below the horizon. Throughout the night its pointers indicate the direction of this Pole which nowadays we identify as the position of *Polaris* the North Star. In Homer's time the star nearest the Pole was, in fact, *Kochab* (Taylor, 1971, 9-12, 43); nevertheless the pointers of the Great Bear showed Odysseus the Pole, thus providing a fixed direction in space from which he could get his bearings.

Once any one direction in space is fixed, the horizon can be divided into sectors by halving the azimuth circle again and again until, for example, after five of these divisions you have 32 sectors each one of 11 1/4° (in our units). These sectors were known to medieval seamen of North West Europe as points (Fig. 2) and to medieval Arabs as "*rhumbs*" (Tibbetts, 1971).

We may conjecture that Odysseus used a similar system, perhaps of only 16 points (each equivalent to 22 1/2°) - in our terms these would be N. NNE. NE. ENE. E. and so on. Thus when Odysseus kept the Celestial Pole on his port beam, as he had been instructed by Calypso, he was heading east. If he had kept the

Pole just forward of his port beam he would have steered NNE; on the port bow, NE; fine on the port bow, NNE; and so on, around the horizon.

Odysseus was also able to obtain his bearings by reference to the rising and setting directions of constellations such as Orion and the Pleiads, and prominent stars such as Arcturus which he carefully monitored as he steered eastwards from Calypso's island (5, 270-275). This implies that he had a relatively detailed knowledge of the movements of the heavenly bodies.

Odysseus also knew that winds from different quarters had recognisably different characheristics: for example, a wet wind was from the West, a cold wind from the North, and a hot dry wind from the South (12, 285-290; 14, 455-460, 476-480). Once a particular wind had been indentified Odysseus had another datum or direction in space - at least for as long as that wind continued to blow - and the horizon could be divided again, this time into a "wind rose" to give reference bearings (Fig. 2.). Eight elements of such a rose can be seen on the faces of the octagonal Tower of the Winds in Athens (Fig. 3). Away from the land, the swell, a surface undulation of the sea which is caused by the wind, persists in direction for much longer than the wind and thus can be relied upon for bearings over a longer period (McGrail, 1983, 316).

A "wind rose" and a "swell rose" can be used in daylight as a directional reference system, and also at night if the sky is obscured. Another fixed direction in daylight is that of the Sun when it is at its zenith (highest point), the direction we call South today. I may have overlooked a reference to the use of this in the *Odyssey* but as Homer (12, 310-315) refers to the stars at night reaching their zenith, it seems likely that the significance of the Sun's zenith was also appreciated. Other checks on directions can be made at sunrise and sunset (east and west at the times of equinox) even though their position on the horizon varies through the year, for, over the few days of a Mediterranean voyage, this change in direction is not great (McGrail, 1983, 316; 1987, 281).

Distances

Now to turn to the measurement of distance. As in many other maritime cultures (e.g. Viking, Arab) the ancient Greeks measured distance at sea in units of a "day's sail". For example, Menelaus tells Telemachus that from the R. Nile to Pharos Island is a day's sail "for a well-found vessel in a fair wind" (4, 355-360); and Odysseus tells Eumaeus that it is four day's sail from Crete to the R. Nile (14, 255-260). Thus a "day's sail" was some *average* distance, that achieved by the *usual* sort of ship in *fair* wind and sea conditions in a 24 hour period in the summer sailing season. To match this standard distance there was a corresponding standard speed which, from later evidence, appears to have been (in our terms) *c* 4 knots (McGrail, 1987, 262-4). Speeds achieved, and thus distances covered, on a *particular* voyage would have been estimated by Odysseus as faster or slower or equal to the standard.

Position at Sea

On open sea voyages Odysseus would have used all the environmentally-based methods available to him to determine the direction he had sailed and the distance he had gone since last losing sight of land. That is, he would be continually estimating his boat's deviation from the standard route, caused by variations in wind and sea from standard conditions, and secondly, by any abnormal performance (better or worse) by this boat, or thirdly, by himself as sailing master and helmsman. Thus he could "mark" on the mental chart in his head, his estimated position as a deviation from that usually expected, and could then decide whether to alter course to regain his desired track and/or revise his estimate of when he would next make a landfall.

Landfall

A good landfall is made when the navigator recognises the coast at a range when his boat is still clear of coastal hazards. When still out of sight of land, the sounding lead may be used to detect decreasing depths of water. Other signs of approaching land include: colour changes in the water where a great river meets the sea; orographic cloud rising over distant land; smoke from shore fires, and so on. Odysseus used *natural* landmarks whenever possible: offshore islands such as Pharos west of the R. Nile (4, 355-360), and Psyria when crossing the Aegean (3, 172); or prominent mountains such as the "wooded peak of windswept Neriton" when approaching his home land of Ithaca (9, 20-25). We also learn from Homer that artificial landmarks were sometimes built. Thus the bones of Achilles, Menoetius and Antilochus were buried under a "great and glorious mound on a foreland jutting out over the broad waters of the Hellespont, so that it might be seen far out at sea by the sailors of today and future ages" (24, 75-85). Moreover, Elpenor, one of Odysseus' crew, was buried under a similar mound on "the summit of the boldest headland on the coast" off Circe's island, and his oar was left sticking vertically out of the tumulus so that it would be even more conspicuous from seaward (11, 75-80; 12, 10-15).

Position Finding

When Odysseus arrived at previously unknown lands he got his whereabouts and onward sailing directions from local people, as for example from Calypso (5, 270-280) and Circe (10, 505-510; 12, 25-30). Furthermore, Telemachus, when he was searching for his father Odysseus, took Mentor with him, presumably because the latter had a detailed knowledge of the waters to be sailed (2, 395-435).

There were occasions, however, when neither local informations nor pilots were available to Odysseus, yet he was able to find his way home. How? I venture the possibility that he had a method of estimating his "latitude" by some form of celestial observation. Now, by *latitude* I do not mean what is understood by that term today; rather Odysseus' "latitude" would have been a relative assessment, some measure of his north or south displacement from his home port or from some other wellknown place. A measure of this displacement could be the relative *altitude* (vertical angle) of the zenith sun (if direct glare could be avoided) or of the Celestial Pole (in our times *Polaris*). These angles vary as one moves north: the altitude of the zenith sun getting less, that of the Pole getting greater.

Could such angles have been measured by Odysseus? The vertical angle or altitude of any heavenly body may be measured in thumbs, palms/fists or handspans: at arms length one handspan subtends *c* 16°; a clenched fist *c* 8°; and a thumb's breadth *c* 2°. At Crete, (36° N) for example, the vertical angle of the Celestial Pole would be 4 fists and 2 thumbs, whereas in the Nile delta (*c* 32° N) it would be only 4 fists. A corollary of this is that if, on an unknown coast, the Pole subtends fewer handspans or fists than it does at your home port, you know that you are south of home.

A related aspect is that, from the Nile delta, the Great Bear constellation just grazes the horizon as it orbits the Pole, whereas off Crete it is c 4° (2 thumb breadths) above it. Thus a voyage south across the Mediterranean is marked by the Great Bear getting closer to the horizon. Precise measurements if vertical angles in spans, fists and thumbs may be attempted on the open sea but generally such measurements would be more reliable when taken in sheltered coastal waters.

Instead of using fists and handspans a wooden tablet on a string calibrated with knots can be used to measure star altitudes (Fig. 4) - such a simple device, known as a *kamal*, was used by early medieval Arabs in the Indian Ocean with remarkable accuracy (Tibbetts, 1971; McGrail, 1987, 278-9). Whether such an instrument was used in earlier times is mere speculation, but perhaps one day such a navigational aid may be excavated from an early site in the Mediterranean.

Seafaring Lore

Descriptions of coastal landscapes and key landmarks, the directions and distances between frequently-used ports, the apparent movements of the stars and constellations, the weather to be expected seasonally and regionally - all these would have been transmitted to Odysseus by his seafaring forebears in easily remembered phrases and rules of thumb. Nowadays we write such things down or draw lines on charts; in Odysseus' time they were transmitted orally or by example. We can, for instance, imagine the following Homeric oral sailing directions (with some help from Herodotus) for the route between Crete and Egypt:

" Leave Cape Samonium, Crete with a NW wind, which is generally the case in summer. Keep this wind astern or fine on the starboard quarter for a period of four nights. At night, keep the Great Bear on your port quarter - you will notice this constellation getting nearer the horizon each night of your voyage. Use the sounding lead on the morning of the fifth day and, if you are on schedule, you will record 11 fathoms and a muddy bottom. Keep the distinctive outflow from the R. Nile on your port bow until you sight Pharos Island ahead. Then turn towards the direction of the rising sun and follow the coast for the delta of the R. Nile".

Concluding Remarks

I have tried to show how we can gain an insight into the methods used by early pilots in the Mediterranean, by applying a knowledge of the basic navigational problems to the tantalising glimpses that Homer gives us. For practical reasons I have restricted this paper to the *Odyssey*, but more can be learned from the *Iliad* and from Herodotus, Strabo and other Classical authors (McGrail, 1991).

Sean McGrail

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ILLUSTRATIONS

1. Sounding leads from the French Mediterranean coast, dated to the first half of the 2nd century BC (no. 4&5) and to the middle of the 1st century AD (no. 1&2). Note the cavity for recovery of a sample of the sea bed. Drawing: after Fiori & Joncheray, 1973.
2. A 20th century Greek compass card on which can be seen three methods of estimating directions:
   i. in degrees - on the outer circle
   ii. in points - 32 black triangles or diamonds on the inner circle
   iii. by reference to the wind direction - eight Greek names outside the degree circle.

   Phono: Aegean Maritime Museum.
3. An 18th century engraving of the 1st century BC Tower of the Winds below the

Acropolis of Athens. On the eight sides are carved symbols of the principal Mediterranean winds.
Photo: Aegean Maritime Museum.

4. Method of using an Arab *kamal* to measure the altitude (vertical angle) of a star. The further away from the eye the tablet is held (the fewer knots exposed) the smaller the angle. The knots on the line correspond to the altitude of the Pole Star (Polaris) i.e. latitude, of known places.
Drawing: Institute of Archaeology, Oxford.

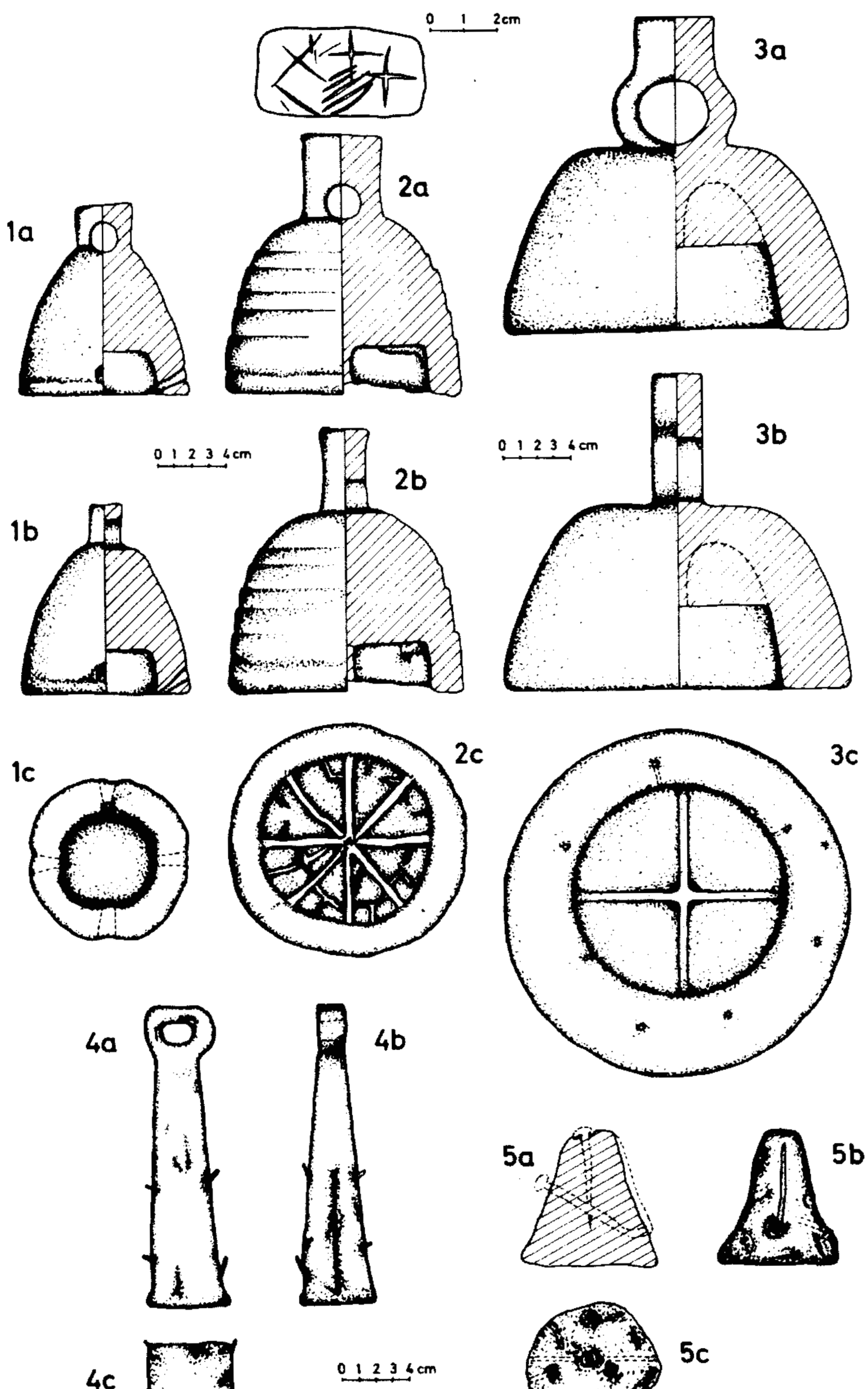
0 1 2cm
3a
2a
1a
0 1 2 3 4cm
2b
0 1 2 3 4cm
3b
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Fig. 1

Fig. 2

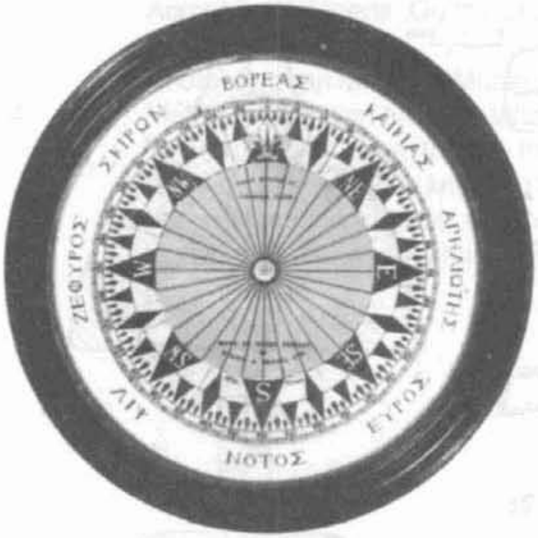
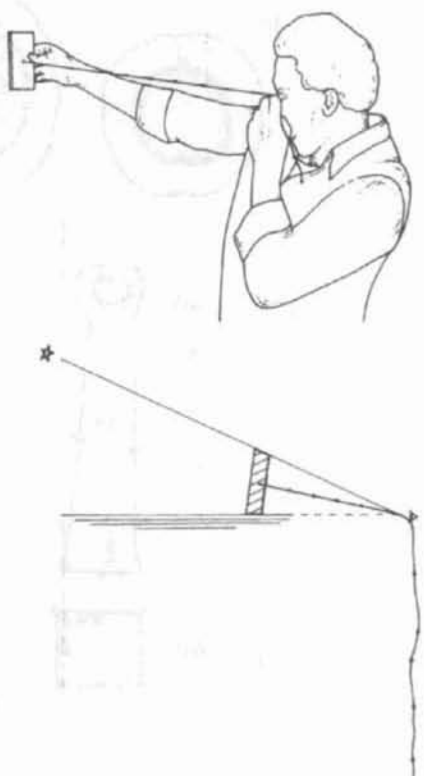


Fig. 3

Fig. 4



SHIPS IN ARSINOITE ARCHIVE OF SITOLOGOI

Social and economic historians of the ancient world are often disappointed to find that literary sources have not enough relevant information on ships and shipbuilding. Ancient authors only rarely discuss trade and commerce, and when they do so, their comments are vague and sometimes biased[1]. Of course, there are exceptions like Demosthenes, who in his speeches gives important data on trade, trading adventures, finances, banking, etc., but the speeches and the numerous inscriptions found in the eastern part of the Roman empire tell nearly nothing on ship and their loading capacity.

Far better material is found in Egypt. Thanks to thousands of papyri scholars now have a relatively good knowledge of ships and shipping in Egypt. In this paper I will concentrate on Egyptian ships of the second century BC. In that period the social stratification in Egypt showed a relatively small upperclass, consisting of the Macedonian-Greek and Egyptian elite. The economic power was in the hands of this elite. The Ptolemaic dynasty, the top of the elite, developed numerous instruments to maintain their position. They had made regulations to ensure tax-collection and transportation of tax-grain to Alexandria. From there the royal grain was transported over the Mediterranean.

I confine myself to the middle of the second century BC. and concentrate on the new data given by Ph.A. Verdult in his Papyri Erasmianae II. Parts of the Archive of an Arsinoite Sitologos from the Middle of the Second Century BC (Amsterdam 1991). This second part of the Papyri Erasmianae which were bought in the middle of the 1970s by the Erasmus University of Rotterdam, consists of 37 contracts, all concerning the shipping of the tax-revenues in kind in Ptolemaic Egypt for the years 152-148 BC. All these texts belong to an archive of at least two sitologoi who managed the ergasterion at Oxyrhycha. The texts are 13 loading-orders and 24 naukleros-symbola, documents which naukleroi after loading gave to the sitologos and the supervisors. In all cases but one the cargo loaded was tax-grain. The crops generally came from the ergasterion at Oxyrhyncha and were loaded in the harbour of Kaine. The destination of the cargo was the basilikon at Alexandria.

The organisation of the transports began with the orders given by the central government at Alexandria to the provincial governor. Then this official sent out two documents, one, a loading order, to the sitologos, the manager of the ergasterion, the other to the basilikos grammateus, an administrative official at provincial level, who was his subordinate. The loading order to the sitologos intended to ensure that he could take care of the actual loading of grain. The document addressed to the basilikos grammateus played a role in the supervision system.

When the loading began, the sitologos, the inspectors and the naukleros, the shipowner who was to transport the cargo to Alexandria, were present. On the ship were guards, and, sometimes, phylakitai, a sort of policeman. They took care of the deigma, the sample taken upon loading, so that upon unloading at Alexandria the quality of the sample and that of the cargo could be compared.

After the loading the sitologos and the inspectors gave a symbolon and one on several antisymbola to the naukleros. He for his part gave a symbolon to the sitologos and one or several copies of the symbolon to the inspectors. From that moment onwards the naukleros was responsible for the transport to Alexandria. The guards accompanied the transport on the Nile. When the transportation had been properly executed, the naukleros received a releasing receipt and could receive his freightage from the state bank.

SHIPTYPES

In the loading orders and naukleros-symbola different types of ships are mentioned. Mostly the word ploion, the general term for ship, merchant galleys as well as sailing craft, is used. Sometimes this term is used for very small boats of only 60 artabs (1.5 ton), sometimes for ships with a capacity of more than 5.000 artabs (125 tons). In other cases the ships are more specifically defined: kerkouros, kerkouros halegos, kerkouroskaphe, konauthion and prosagogis. I will now discuss the different types.

KERKOUROS

The standard type for the transport of grain on the Nile was the kerkouros. This was usually a fairly large ship, as we know from P. Tebt. III 856. The 22 ships mentioned in this papyrus, of which details are known, have a capacity varying from 9.000 artabs to 18.000 artabs, i.e. from 225 tons and 450 tons[2]. Smaller kerkouroi are known. In P. Tebt. III 824 a kerkouros of only 3.000 artabs is recorded. The smallest known kerkouros until the publication of Papyri Erasmianae II has a capacity of 2.000 artabs[3]. In the Papyri Erasmianae II five kerkouroi are mentioned with a capacity varying from only 500 to 900 artabs[4] very small ships compared with other kerkouroi.

It is striking that all the kerkouroi in this archive are very small. It can not be excluded that in this archive the term is not used for a special type of ship, but that it is used in a general sense comparable with ploion.

The naukleroi mostly carved on both sides of the bow of their ships a distinctive device (parasemon), a figurehead or another special emblem, so that their ships were identifiable. Two of the kerkouroi (P.Erasm. II 45 and 50) had no devices and are qualified as acharaktoi ("uncarved"). According to H. Hauben there are only a few examples of Ptolemaic boats which are expressively defined as anonymous[5].

KERKOUROI HALEGOI

Three of the kerkouroi (P. Erasm. II 25, 37, and 44) are called halegoi ("salt transporting"). Since in Egypt the salt trade was a state monopoly, salt ships must have been very common in Egypt. The name kerkouros halegos suggests that a special type of ship was used for salt transport[6]. Two of these salt ships have a capacity of 700 artabs. This small capacity is not surprising, since salt was not a bulk good and was not transported in large quantities. It is more striking that salt ships were used for the transport of state-grain. Probably in the Summer months July and August so much grain had to be transported that other ships were needed to transport all the state-grain.

Since here too the kerkouros is a small ship, what I said before is here applicable too. Possibly a ploion halegon is meant, a small salt ship.

KERKOUROSKAPHE

Twice (P. Erasm. 45 and 50) a kerkouroskaphe is mentioned, a rare combination of the words kerkouros and skaphe ("skiff"). Mostly the kerkouroskaphe is a smaller version of the kerkouros,a "kerkouros-skiff"[7]. P. Ryl. IV 576 (third century BC) mentions a kerkouroskaphe with a capacity of only 200 artabs and P. Lille I 22 (mid. second century BC) a kerkouroskaphe with a capacity of 300 artabs. The largest Ptolemaic kerkouroskaphe is mentioned in P. Sorb. inv. 110 a: 1600 artabs[8].

The capacity of this ship in P. Erasm. II 45 is not mentioned. The kerkouroskaphe in P. Erasm. II 50 has a very large capacity: 4.000 artabs. It is very surprising that of all the ships mentioned in P. Erasm. II the kerkouroskaphe has the largest capacity. These kerkouroskaphai were probably sea-going vessels, as we can read on the docket of P. Erasm. II 45, which uses the word nautikon ploion, sea-going ship. Most other kerkouroskaphai were used only on the Nile.

KONAUTHION

The Konauthion is a stranger in the midst of the other cargo ships. The name is neither Egyptian nor Greek. The only other occurrence of this ship is P. Hels. I 73. The loading capacity is not given in P. Erasm. II 43, but only the cargo that was loaded: 400 artabs.

PROSAGOGIS

In six loading orders the prosagogis is mentioned. This ship is only recorded in a few other papyri, such as in P. Lille I 21, where the prosagogis has a capacity of 3.500 artabs. The six prosagogides in P. Erasm. II (28, 38, 41, 46, 49, 53) all have a capacity of 2.900 artabs, which leads me to suggest that these ships were mass produced. Ship construction in the Graeco-Roman world was very complicated and wood in Egypt was scarce and expensive, and the costs of building a ship must have been very high[9]. It must have been cheaper to buy wood in bigger quantities and to built more ships at the same time. Another papyrus offers a point of departure. We know from P. Flor. I 69[10], an account of the second part of the third century AD that naupegoi ("shipwrights") and pristai ("sawyers") were working simultaneously on a boat. The sawyers cut frames and the shipwrights inserted frames in the hull. The shipwrights received seven drachmas a day and the sawyers eight drachmas. This account covers 15 days and in all 69 daily wages are paid to the shipwrights and 16 to the sawyers, a total of 611 drachmas. It is unknown whether in these fifteen days a ship was completed. Perhaps the shipwrights and the sawyers worked on more ships at the same time. Given the very high costs of wood and the good organisation of Ptolemaic Egypt I would expect that the authorities imported wood for more ships and put more men to work, so that the costs for building a ship could be lowered.

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NOTES

1. See F. Meijer and O. van Nijf, *Trade, Transport and Society in the Ancient World.* A Sourcebook, London 1992.
2. Cf. L. Casson, *Ships and Seamanship in the Ancient World*, Princeton 1972, 164.
3. Cf. P.J. Sijpesteijn, "Three new Ptolemaic documents on transportation of grain", *Chronique d'Egypte* 53 (1978), 110; the editor refers to P. Strasb. 563 (215 BC), in which the ship is mentioned.
4. P. Erasm. II; 500 artabs; P. Erasm. II 36:540 artabs; P. Erasm. II 33:700 artabs; P. Erasm. II 52:700 artabs; P. Erasm. II 40:900 artabs.
5. H. Hauben, "Le transport fluvial en Egypte ptolémaique. Les bateaux du Roi et de la Reine", *Actes du XVme Congrès de papyrologie*, Bruxelles (1978), 73.
6. Cl. Préaux, *L'économie royale des Lagides*, Bruxelles 1939, 249.
7. Cf. Casson, *Ships*, 166.
8. Cf. Hauben "*transport fluvial*", 72-73.
9. See H.-J. Drexhage, Preise, Mieten/Pachten, *Kosten und Löhne im Römischen Aegypten bis zum Regierungsantritt Diokletians*, Münster 1991, 112-118 and 329.
10. Published by L. Casson in "Documentrary evidence for Graeco-Roman shipbuilding (P. Flor I 69)", *Bulletin of the American Society of Papyrologists* 27 (1990), 15-19.

TWO MEN TO AN OAR IN THE SIXTH CENTURY BC?

A panel on the side of an Attic black-figure hydria in the Louvre (F 735: Fig. 1), dated in the first half of the sixth century BC appears to show, somewhat crudely but strongly drawn, a one-level oared warship with ten oars on the port side, a bow-officer, a rowing master (keleustes), a helmsman and four clear pairs of oarsmen; Williams in *Greek Oared Ships* (1968) p.86 rightly identifies five pairs inferring that the rowing master is standing in between the two members of a fifth pair in the middle of the ship and obscuring the view of the starboard member of the pair. The disparity between the number of oars (10) and the number of oarsmen (5) on the port side can be taken at once as the outcome of the usual exaggeration in ancient ship representations of the size of the figures compared to the size of the ship. This practice is so common at all periods that no examples need be given.

The picture on the hydria belongs to a group of three ship representations of the same fifty year period (600-550 BC), the other two being the Athenian ship arriving to rescue Theseus on the François vase in Florence (4209; Fig. 2), and Attic black-figure fragment in the Acropolis Museum in Athens showing the stern of a warship in the act of departure (Fig. 3). The ship in the hydria is somewhat crudely drawn and does not show clearly the details of construction, while the other two ships are finely drawn and most realistic in detail. All three pictures share a vigorous portrayal of action, in one case certainly of a mythological scene and in the other two very probably so but without any clue as to what the scene is.

Lucien Basch (in *Musée imaginaire de la marine antique* (Athens 1987) pp. 216-222) claims that the ship shown on the hydria panel represents the Argo, quoting Williams' remark (*GOS* p. 86) that "the painter" of the hydria "may be trying to characterise a mythical, obsolete ship such as the Argo". B then argues that, since in Apollonius's Argonautica (mid 3rd century BC) the Argo is manifestly a fifty-oared ship, a pentecontor, the 6th century painter was trying to explain (expliquer) the ship as a pentecontor rather than to depict her realistically (montrer); and, in consequence that we must take the clearly shown pairs of oarsmen as in each case really two pairs, i.e. four oarsmen on each bench or thwart, and also that the observer who sees on the panel four (possibly five) pairs of oarsmen is to conclude that there are really twelve pairs and one single oarsman on each side, making twenty-five a side, fifty in all. What is more, because in Apollonius

Herakles and Ankaios are exempted from the lot and unquestioningly allocated seats on the middle bench of the ship, the man standing up in the middle of the ship on the hydria panel is not the rowing master but Herakles showing off as a comic hero ("on comprend même pourquoi un personnage debout au centre du navire gesticule d'un air de matadore: c'est Héracles, sujet de plaisanteries pendant toute l'antiquité").

This last point was perhaps not made seriously; but it may be noted that whereas Hérakles could have been shown as a comic hero from the fifth century it would not have been wise so to portray him in the last decade of the first half of the sixth century at Athens since, as Boardman has shown, "the tyrant Peisistratus identified himself and his fortunes with Herakles". The main objections to B's proposal however are (i) from iconography and (ii) from the interpretation of Apollonius.

(i) The panel on the François vase shares with the hydria, its contemporary, an air of realistic vigour in its representation of Theseus's triacontor, and shows, also like the hydria, clearly drawn (and exaggerated in size), oarsmen plainly in pairs, some standing up, some remaining seated. No observer could doubt that this is a representation of a ship with one file of rowers on each side. Apart from any other consideration the mast, which has been lowered, is visible resting between members of the pairs. There is such a degree of descriptive realism in this picture, and in the Acropolis fragment where the helmsman, seated in a carefully depicted stern, is turning to bid farewell to someone on shore and above him another ship's officer is pouring the customary libation on departure (Thuc. 6.32.2) that it is difficult to deny a similar degree of descriptive realism to the painter of the contemporary hydria, and to believe instead that what we see in his work "really" represents something quite different.

(ii) The chief objection to B's proposal does however lie in his interpretation of the passage in Apollonius's Argonautica which describes the seating of the Argonauts in their ship and which he claims as support for his attribution of an a scaloccio oar arrangement (two men to an oar) both to Apollonius's Argo and, consequently, to the ship, as he claims, on the hydria.

The passage runs as follows (I 394-400): "When they had skilfully attended to the various items of gear, they first allocated among themselves the rowing benches (kleidas) by lot, two men occupying each one. But they reserved the middle one for Herakles and..Ankaios.. For them alone they left the middle bench (kleida), unquestioningly, not by lot".

There is no doubt whatever that here and throughout Apollonius's poem kleis, as B agrees, means a rowing bench, whatever it may mean in Homer. The word has the meaning "bar" which fits well with thwart. H. de Ville de Mirmont in his excellent translation with notes of Apollonius (Paris/Bordeaux 1892) quotes Vars *L'Art nautique dans l'antiquité* (Paris 1887) "Le kleis est une barre, une traverse, et les bancs de rameurs sont proprement les planches transversales (transtra) du navire. Dans Apollonius de Rhodes les kleides sont les bancs de rameurs et non les tolets" (tholepins). "Les tolets se nomment dans Apollonius hoi skalmoi".

Uncertainty about the meaning of kleis in Homer, if it remains, only affects the interpretation on the passage of Apollonius under discussion in so far as B uses the "Homeric" identification kleis - tholepin in his argument.

Since Apollonius uses skalmos consistently for "tholepin" (I 379, 392), and kleis consistently for rowing bench, it seems safe that when he says that the heroes allocated two men to each rowing bench by lot, and left the middle rowing bench to Herakles and Ankaios "unquestioningly, not by lot", he is speaking of a single file of oarsmen on each side of a pentecontor, as we should expect. The distinction made between Herakles and Ankaios on the one hand and the rest of the heroes on the other is that they "alone" were exempted from the lot (since as the strongest and heaviest pair they were obvious candidates for the middle bench). De Mirmont *op.cit.* p.200, notes: "Je crois que c'est par mesure de sécurité qu'on place le géant Héracles au centre du vaisseau". The Greek does not mean that Herakles and Ankaios alone were not, whereas the others were, members of a pair, as B proceeds to argue. It means that they alone were not subject to the lot in the allocation of benches because their weight automatically qualified them for the middle bench.

B claims that kleis is the part at each end of a bench which provides seating for the rowers and is so called because it is near the tholepin which Homer possibly called (but Apollonius certainly did not) kleis. The consequence is that, when Apollonius speaks of two men occupying one kleis, his meaning, in B's view, is that on each side two men occupied the end parts of each bench, except in the case of the middle bench where only one man on each side occupied those parts. Thus there were in his view, four files, two of thirteen and two of twelve oarsmen, fore-and-aft throughout the ship, making fifty oarsmen in all.

B's interpretation of Apollonius breaks down finally on the seating of Herakles and Ankaios. Apollonius says "for them alone they left the middle kleis". The noun kleis there is in the singular number, but the meaning, (seating on the part of the rowing bench near the tholepin), which B attaches to the word, requires two kleides, one at each end of the bench to accommodate the two heroes. He can hardly claim, as he would have to do, that in this phrase and not elsewhere kleis means the whole rowing bench. The only alternative is to interpret "the middle kleis as meaning one end only of the middle bench, but even the Argo could hardly be comfortable with the two heaviest men on one side of the ship. The singular number plainly demonstrates that the meaning of kleis throughout this passage is the whole rowing bench; and that in the Argo as described by Apollonius there are two, not four, fore-and-aft files of oarsmen, twenty-five men a side, as has always been supposed.

The consequence of the oar arrangement which B attributes to Apollonius's Argo is that, for the pairs of oarsmen which he envisages at one level on each side of the ship, he must choose one or other of the two systems used later in the Mediterranean, the a zenzile and the a scaloccio. He chooses the latter, with, in this case, two men pulling each oar, since it fits his idea of the ship on the hydria panel. B uses his interpretation of Apollonius to support the claim that the a scaloccio system was known in the early sixth century BC., appearing on the hydria panel. It would not, of course, be very surprising to find the a scaloccio system in Apollonius (although Apollonius is too good an archaeologist to attribute it to the Argo), since it was practised certainly in the larger oared galleys of his time. But in the case of the ship on the hydria panel such a discovery would be very surprising indeed since there is no indication of the use of that system until the beginning of the fourth century BC, two hundred years later. To antedate the system in Greek oared ships by 200 years is therefore a step of some importance in the interpretation of their representations and has needed careful examination.

The conclusion must be that the interpretation of the relevant passage does not support the attribution of an a scaloccio system to Apollonius's Argo. Even if it did, it would not firmly support the attribution of that system to the ship on the hydria panel since there is no firm reason to believe that the latter actually represents the Argo. Further, examination of the hydria painting and comparison of it with other sixth-century ship representations makes it extremely unlikely that it gives anything other than a realistic representation, apart from the usual exaggeration of human figures, of a one-level oared galley with one file of ten oarsmen on each side. She is an eikosoros (twenty-oared ship), a common type of small oared galley in the Homeric poems and later.

NOTE: On the Homeric use of the word kleis.

In *GOS* p. 52, against the authority of LSJ, I wrote: "The kleides at which the oarsmen sit in the Iliad and Odyssey are undoubtedly tholepins". The reason for this certainty was the observation on geometric ship pictures of tholepins in the form of hooks, and recognition that kleis often means a hooked object. Also, there is another word used in the Homeric poems for thwarts, i.e. *zuga* (which does not appear in Apollonius, as far as I am aware, with this meaning).

I now think, after experience of Olympias, that I was wrong in this identification. In the Odyssey when Alcinous is proposing (8 26ff) to send Odysseus back to Ithaca he bids the leading men of Phaeacia launch a new ship and man it, and he then tells the crew "after they have all well tied down their oars to the kleides" to come ashore and have dinner. I wrongly regarded this last operation as the same as "fitting the oars" (to the tholepins) "with leather loops" which is described as part of the preparation of a ship for sea at Odyssey 4 782. But I failed to notice that in the Phaeacian scene this preparation has been completed and the ship is left all ready for sea while the crew go ashore for dinner. At this stage it is necessary to tie the oarlooms down to the benches with the blades in the air to prevent them fouling each other as they trail in the water.

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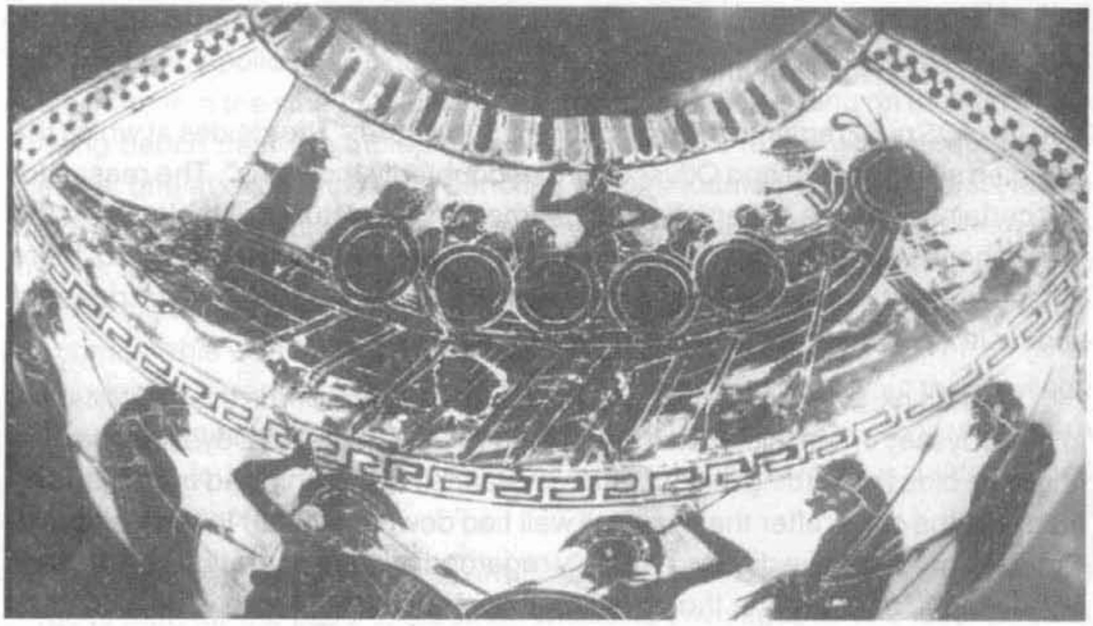

Fig. 1

Fig. 2

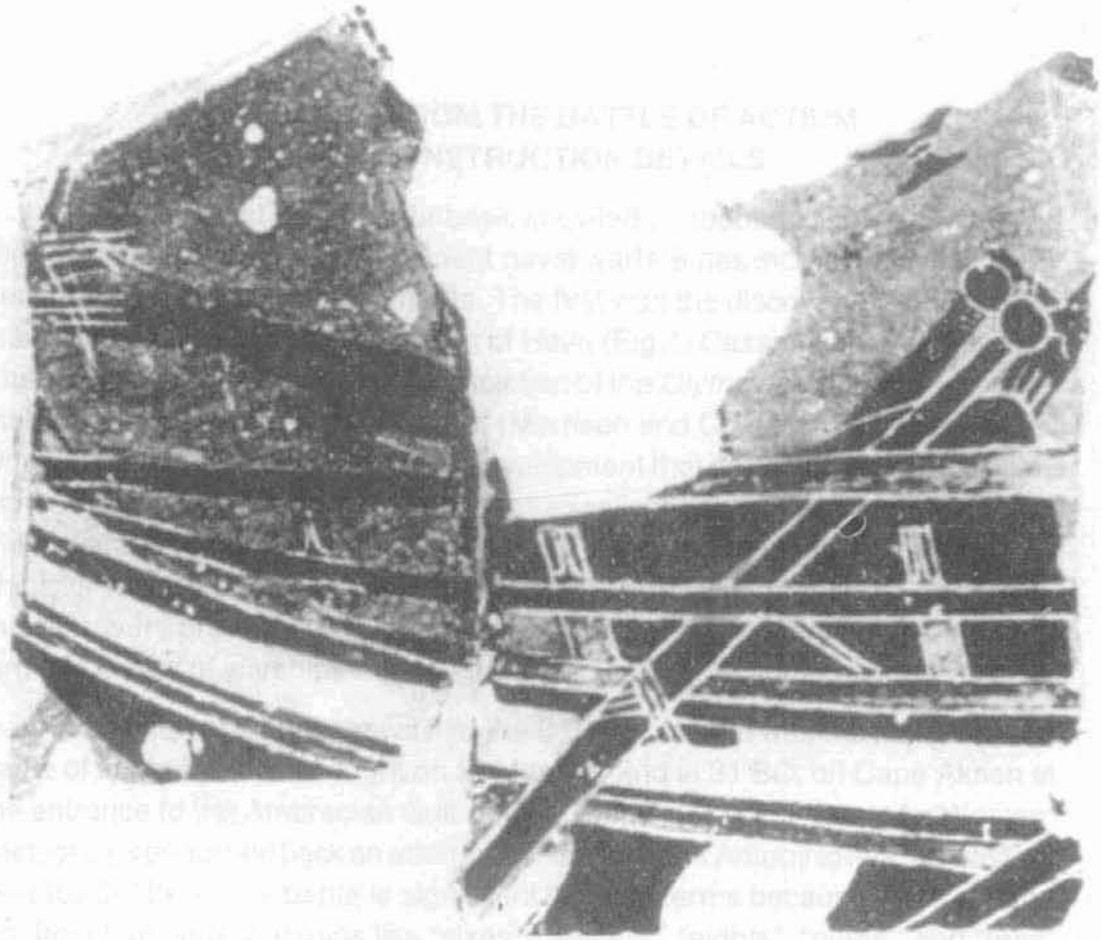

Fig. 3

POLYREMES FROM THE BATTLE OF ACTIUM
SOME CONSTRUCTION DETAILS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Now, let us consider the timbers inside the ram. J.R. Steffy has recently published a full analysis of these timbers, and has demonstrated how the ram was carefully designed and constructed to deliver the blow of its ship as it absorbed and transferred the shock of the ramming maneuver to the structural timbers of the ship's hull (Casson and Steffy, 1991, 6-39). This was accomplished by the careful merging of the ship's bottom timbers - the keel, bottom planks and wales - into the ramming timber and thus, into the ship's "warhead". The heaviness of the wales and ramming timber are critical elements in the correct functioning of this weapon, and for this reason, Steffy urges us to abandon the notion that warships built for ramming purposes were analogous to lightly constructed, modern rowing hulls. He calculates the weight of the Athlit hull as roughly one ton per meter of overall length and this is just for the hull (Casson and Steffy, 1991, 33). We might pause for a moment to consider the tremendous forces generated by a deliberate head-on collision between two 50 ton masses (a reasonable guess for the "fighting weight" of the Athlit ship) moving through the water at 7-8 knots. The moment of impact must have been frightening.

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

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

DIMENSIONS FROM SOCKETS.

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

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

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

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

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

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

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

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

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

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

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

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

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ILLUSTRATIONS

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

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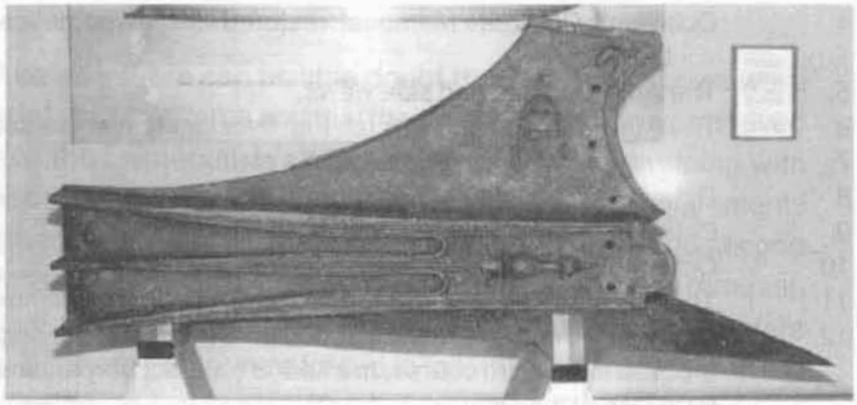
11. The Athlit ram: view of its interior with all the timbers removed.
12. Octavian's Campsite Memorial: socket 8 (note that the angles of the grooves in the third course, marked "3", are not perpendicular to the front face of the wall).
13. Comparative sizes of sockets 4, 8, and 13, plus a hypothetical



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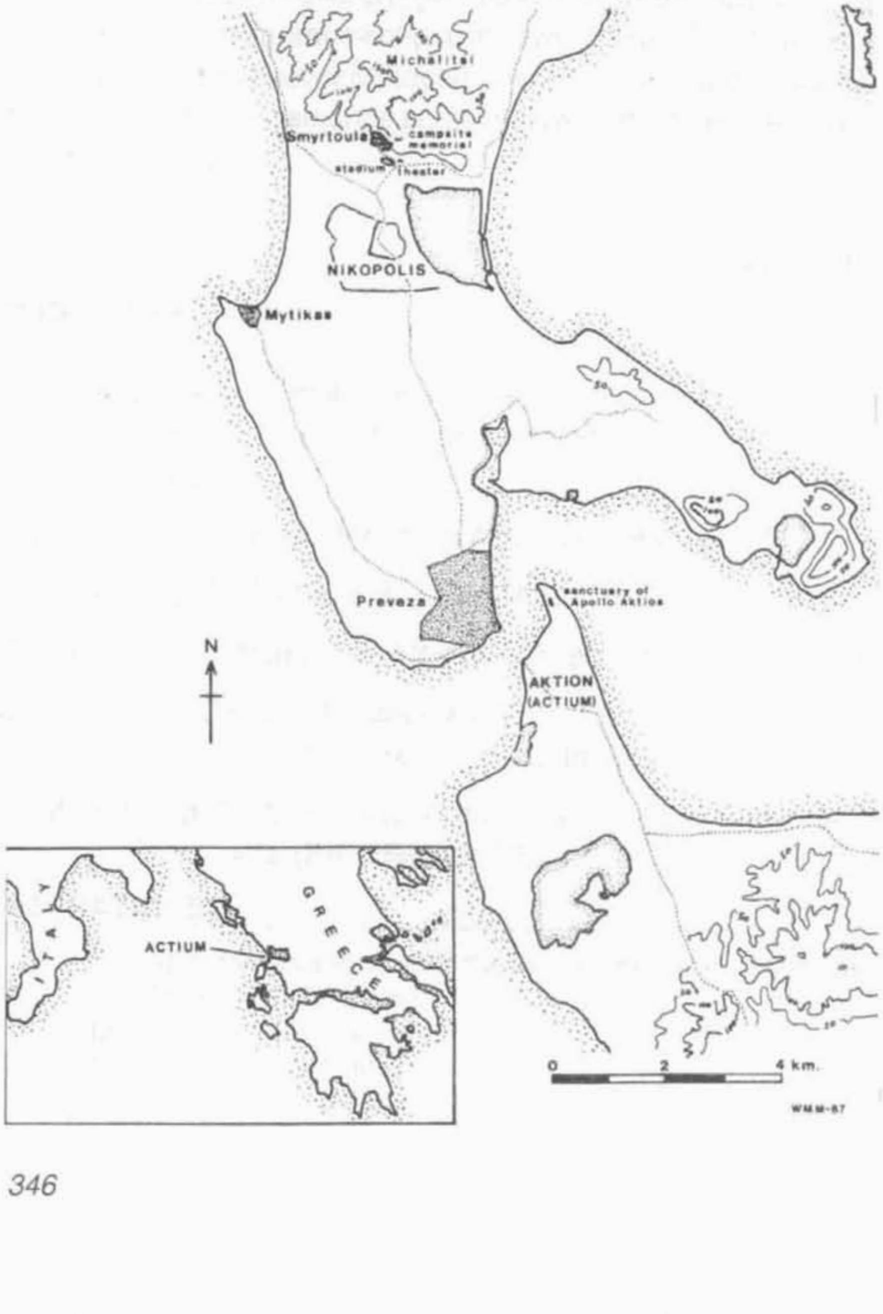
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Fig. 2

Fig. 3

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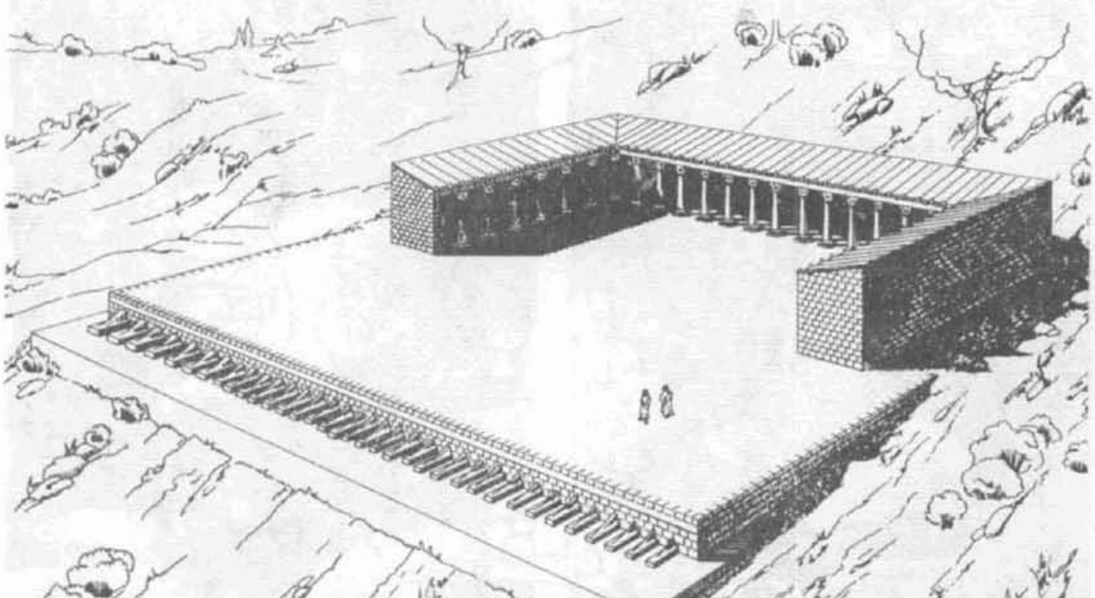

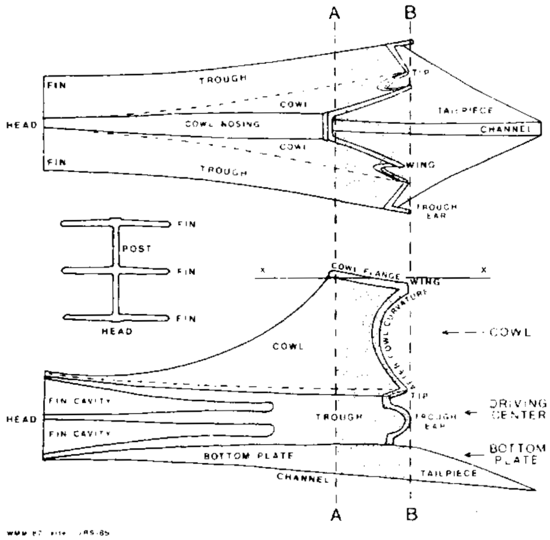

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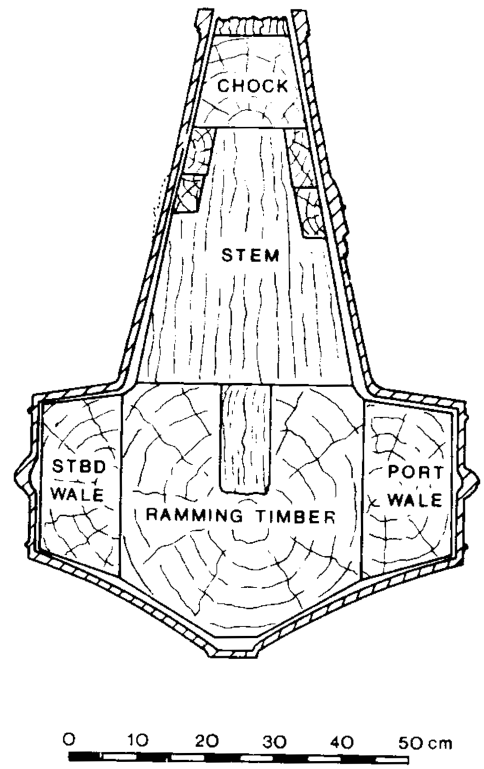

Fig. 6

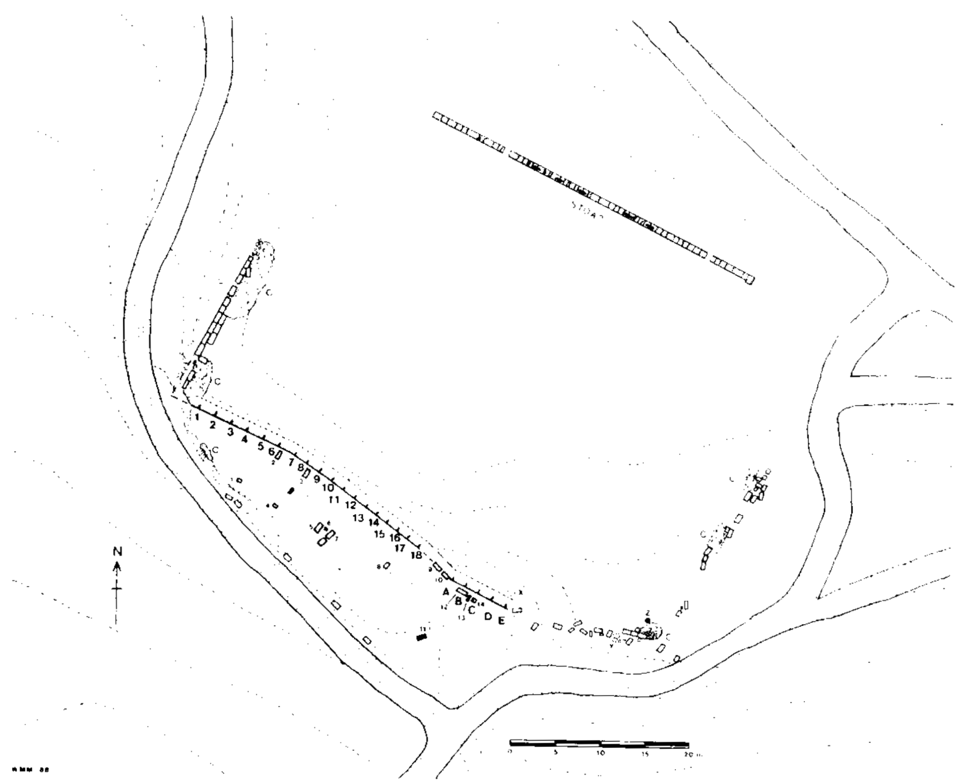

Fig. 7

Fig. 8

Fig. 9

Fig. 10

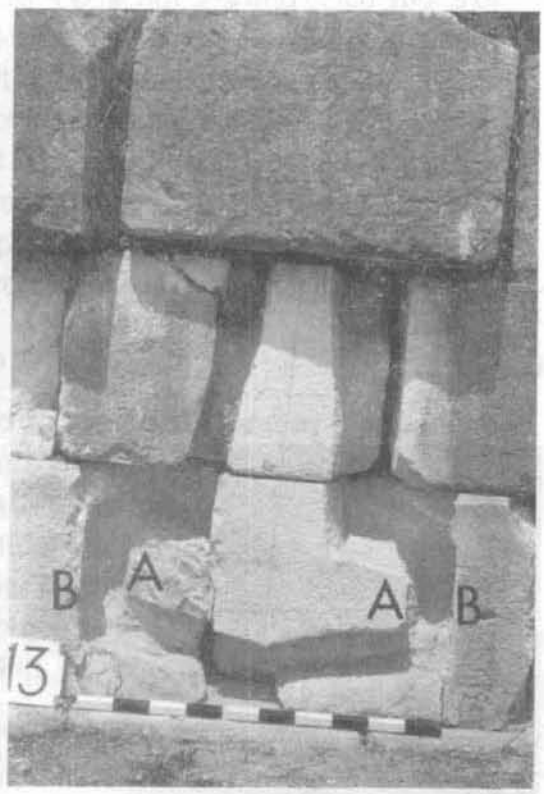

Fig. 11

Fig. 12

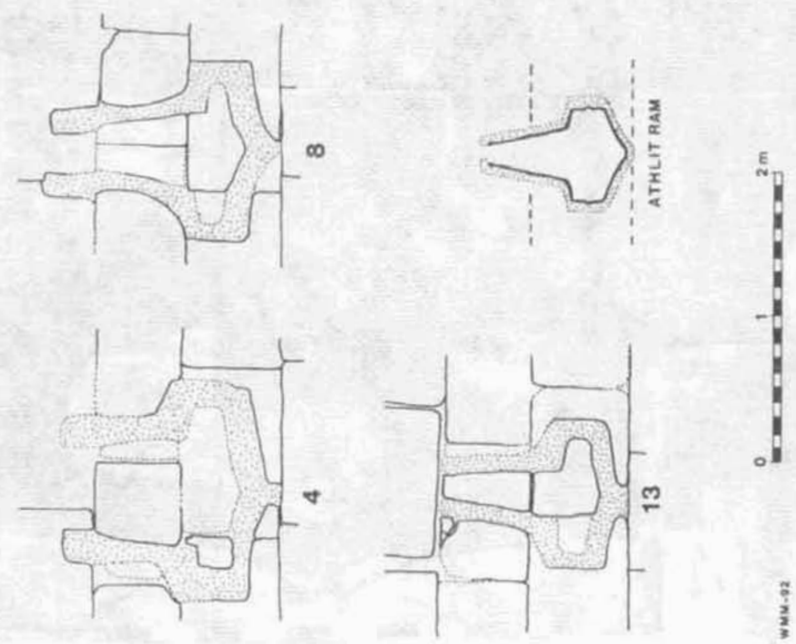

Fig. 13

THE RELIABILITY OF SHIPS' ICONOGRAPHY: THE THERAN MINIATURE MARINE FRESCO AS AN EXAMPLE

1. INTRODUCTION

The purpose of this paper is to examine whether the depiction of ships during the Bronze Age are accurate representations of vessels of this time, in other words, if they can be used for quantitative or diagnostic purposes. The Theran Miniature Marine Fresco was chosen because of three main reasons:

1. It is a very well known painting, having been frequently reproduced and extensively studied.
2. It appears not to be subject to the usual constraints of limiting substrates, such as pottery, seals, ring-stones, etc.
3. It has been praised for its exactitude, reliability etc., and presumably bound to be free of the related major sources of error.

The discussion is based on Prof. Gillmer's descriptions and calculations of the most intact vessel in the fragmented fresco which appeared in a recent publication (1989, p. 129ff.). As Gillmer writes: "We are convinced of the artist's reliability by the objects we recognize, each painted correctly" (p. 130). Which prompts him to remark a little earlier that, "It is time to put more confidence in the finest form of expressive Minoan art, their fresco painting" (p. 129). Although one appreciates the generosity of sentiment expressed, it seems clearly desirable to test a little this reliability, before too much confidence is placed on it.

2.1 THE THERAN MARINE FRESCO FRIEZE

This truly magnificent mural was found during the 1972 excavation season at Akrotiri by S. Marinatos and his co-workers, in what was first called the West House and later the House of the Fisherman (Marinatos 1974; Doumas 1978 and 1980). The miniature style fresco depicts among other things seven major and seven minor ships, judging from the number of persons on board, in what has been called and could very well be, a ceremonial flotilla, a nautical festival, a victorious procession, a joyful regatta, etc (Fig. 1α-β).

Most major ships in the fresco were found badly fragmented with many parts missing or beyond recovery. One of the major ships, however, the third from the left, usually referred to as ship A, was found remarkably intact with only minor pieces missing, and as it may be expected the other ships were reconstructed on this model (Fig. 2). As already mentioned the following discussion is based on Gillmer's description and calculations pertaining to the intact vessel, with additions and dissensions as found necessary.

2.1.1. Structure and dimensions

The ship is shown on the starboard side moving from left to right as one faces the fresco. "The hull profile shows a distribution of body volume which is concentrated towards the stern" (Gillmer 1989, 130). That is to say, a ship whose center of volume and presumably of gravity is aft rather than forward of the midship line. The impression is of a ship that sits well on the sea, that travels light. This concentration of volume aft causes the stern to rise more steeply than the bow, that is to say, the radius of the keel line of the stern is shorter than that of the forward (stem) line.

What is noteworthy is that this feature is present in all vessels, both large and small, something which is apparent on even a casual inspection of the frieze. This appears to be a significant part of the identity of such ships of this and later times, while the profile configuration is most important in establishing its cross-sectional body distribution.

There seems to be little doubt that these LBA I Theran ships portrayed in the fresco bear some kinship in hull configuration to Egyptian vessels. A comparison with the almost 1000 year earlier Khufu ship certainly encourages this thought. Gillmer believes, however, that this was simply the result of "state-of-the-art" in shipbuilding for this time in the East Mediterranean basin, and presumably not the result of copying from either side, since there are discernible differences that indicate a local Aegean development (see below).

This configuration recognized by the sternward concentration of volume, a sailor, shipwright or designer would describe as "fine forward with a good broad run aft", and Gillmer calls it a classical one. "It is a concept that shipwrights understand and control for proper and practical reasons". (1989, 130-1). One of these reasons is that with a hull swinging sharply upwards at the stern, the helmsman occupying the traditional and necessary platform for steering control would have good lateral visibility. Another reason is that this type of hull would ride more comfortably and steer more easily. A third is that the broad aft deck gives ample room for quick sail-handling by the crew, particularly important in areas of fast changing winds and treacherous coasts.

Having established the nature of the hull and the reasons which made it necessary, it is important for calculation purposes to find and draw the waterline in the fresco profile of the ship, which is not shown in the mural. "This line was simply determined by locating the water surface level where the paddlers' blades seemed to be properly immersed. The true waterline must be close to this". A logical suggestion, within the limitations of what is "properly immersed" - Gillmer acknowledging this uncertainty by saying that the waterline must be "close to this". His very next statement, however, that "the leading paddlers forward seem to have their blades immersed slightly deeper than the others in graduated order", so that "this conforms to the style of multiple in-line paddling as opposed to rowing where the crew remove and dip their blades sequentially", is open to question.

Assisted by the discovery that in the Ulu Burun, Kas, shipwreck the mortise and tenon fastened side planks begin in a centerline timber which might have functioned as an embryonic keel (Bass 1984), Gillmer develops the midbody sections of the ship so that as the planks rise towards both ends, they meet in a "V" form ridge instead of the old Egyptian spoon shape, which appears to justify his previous claim of an exclusively "Aegean form". However, the existence of even an embryonic keel in the Ulu Burun shipwreck, may well signify that this type of ship was not an exclusive Aegean form, but one favoured all over the East Mediterranean basin at the time, even if one has to exclude Egypt (but see Hornell 1943, 28 & 30 for a different view of Egyptian ships).

After establishing the profile of the ship and with the number of the oarcrew clearly visible from the 21 paddles, the space required for each member of this crew to work in comfort taken as the usual 90 cm, and the relationship of overall-length to length-at-the-waterline for this type of ship is a ratio of about 1.4-1.5, Gillmer calculates the following dimensions from three conventional projections that provide a basis for dimensional criteria and limited analytical hypotheses:

Overall length,	24 m
Length of waterline,	16,2 m
Draft of water,	1,0 m
Beam extreme,	5,0 m
Beam on waterline,	4,2 m
Displacement,	24 tons
Height of sternpost ab. w/1,	3,5 m
Mast height,	9.6 m
Sail height, ave.,	4,4 m

Sail width, ave.,	14	m
Sail area,	61,5	sq. m

Based on these dimensions, Gillmer calculates and examines several coefficients, which help show what kind of a ship this is not only from the fresco profile, but also from the viewpoint of performance.

Displacement-length, 157.1
Sail area-displacement, 7.19
Prismatic coefficient, 0.48

The displacement-length ratio states that this is a light ship built for speed. Modern highly efficient ocean racing vessels range from 150-190, old war galleys and clipper schooners always measured less than 200, while the average merchant ship and cargo vessel hovered around 500.

The sail area-displacement coefficient, however, is by comparison exceedingly low. This is not surprising for Gillmer. With a single low-aspect sail on a low mast, this simply helps to "indicate the practicability of operating cautiously in the seasonal winds of this sea, at the same time being able to seek shelter easily while partially beaching sternward in shoaling water". The low prismatic coefficient in combination with the steering blades well aft, means that the vessel was easily and highly maneuvrable. One should also emphasize here the presence of an oarcrew and their considerable number: the vessel portrayed is no simple sailing craft, whatever else it might have been.

2.1.2 The position of the oarcrew

As previously mentioned, Gillmer observes that the leading paddlers forward seem to have their blades slightly deeper immersed than the others in graduated order. This is not borne out by the ship on the fresco. The first seven paddles appear indeed to be immersed deeper, but only in relation to the keel line of the ship which curves already upward at this point, not in relation to the waterline which would be the only way the previous claim could stand. But even if it were so, all other paddles appear to end on the keel line and there is certainly no graduated order.

An even more serious objection may be expressed towards the statement that this slightly deeper immersion appears to conform to multiple in-line paddling. "The sequence of immersion begins forward and moves aft following an elongated wave of progression". This is such an incredibly difficult exercise, requiring split second timing by each crew member separately, in contrast to simultaneous paddling, that it is seriously doubted if 42 men could succeed in accomplishing it, never mind manage to keep it up for any length of time. Besides, given the parallelism of the blades, if the artist wished to portray simultaneous paddling, how else could he have shown it? For these reasons, the previous suggestion of "an elongated wave of progression" cannot be accepted.

However, Gillmer has correctly identified the propulsion method portrayed in the fresco as "paddling". The visible arms, their hold of the blades, the angle of the arms with the paddles, clearly show the end of a paddle stroke. In accordance with this observation, Gillmer, a naval architect, and Gilkerson, an artist, have shown in drawing number 11 of Gillmer's publication (Fig. 3), a realistic portrayal of such paddlers (Gillmer 1989, 138). The question is, what are paddlers doing on board a ship built for speed? There is hardly any doubt that paddling in these circumstances is the most inefficient method of human propulsion imaginable.

Paddling an Inuit kayak or an Amerindian canoe is one thing. In such cases a paddler who knows how to steer at the same time as he paddles can attain considerable speeds on water. But this is mainly because these vessels weigh something between 7 and 25 kg. The Theran ship weighs 24 tons according to Gillmer's calculation above (hydrostatic law states that the weight of a floating object is equal to its liquid displacement), which works out to something over half a ton (571 kg) per paddler for an empty ship, or over 22 times the previous maximum. It is not that the Theran ship could not be propelled by paddling, but rather that it will move so slowly as to completely nullify the pains taken to build for speed. What sense does this make?

To attain any kind of efficient propulsion through human effort it is necessary "to put one's back into it" as the expression goes. This means to pull an oar with one's whole body, preferably by swinging it around an immovable fulcrum (tholepin). But this necessitates turning one's back towards the bow and facing the stern. This is how all fast ships propelled by human effort moved, from ancient triereis to old war galleys to modern racing skiffs. This is exactly what is shown on another ship of the fresco (Fig. 4), the "rowed boat" as it is called (e.g. Morgan Brown 1978) in front of the "Departure Harbor". This is what contemporary Aegean fishermen do to row a heavy boat in relative comfort. But when they have to face the direction of movement for the purpose of careful navigation, they invariably stand up in order to throw their body weight into the push they deliver to the oar. Rowing with only the arms is not only inefficient but extremely tiring for any protracted effort. Also, paddlers have to provide for the fulcrum. This is done by pushing at the top and pulling at a lower point of the paddle, for a very ineffective output for anything but the lightest vessels such as kayaks and canoes. So what are these paddlers doing on board a ship obviously built for speed?

Gillmer does not raise the question here, for he has done so previously (1975, 324). The point has been also raised by other scholars in the past, such as for example, S. Marinatos (1974, 51), Casson (1975, 7), Tilley and Johnstone (1976, 286), and very aptly by C. Morgan Brown in a paper discussing the ship procession in the miniature fresco (1978, 629ff.). Comparing the efficiently rowed ship in front of the Departure Harbor, she adds that, "the crew of the large ships face the prow making hard work of their journey by paddling. They are cramped together leaning uncomfortably over the gunwale in their effort to reach the water with oars which are too short for the freeboard of the hull. The method of paddling they have to adopt is unnatural, even for special harbour manoeuvres" (631).

This is unquestionably true. But this observation appears to imply that aside from the method of propulsion, i.e., paddling, what is obviously "wrong" with the process portrayed is the length of the paddles, "too short for the freeboard of the hull". This is also evident from the comment which follows the one quoted immediately above: "The type of craft for which these short paddles would be suitable can be seen in the Arrival Harbour [....] The small two-man boat is being paddled in the conventional fashion — the men push the water back while kneeling on thwarts".

Here one must question first of all that the men are kneeling on thwarts. The man at the prow may very well be standing with his legs apart and knees somewhat bent as a standing paddle stroke may require, while the man at the stern could very well be seating on a thwart, which would give him better control of his legs than if he were kneeling, for a more powerful paddle-stroke. But the main point of interest here is the length of the paddles. The paddles shown are certainly short for the freeboard of the hull, but longer paddles would not be more useful or more efficient. There is a definite limiting relationship between the spread of the two arms holding a paddle, usually 50-60 cm, and the total length of the paddle, ranging from about 140 to 170 cm, for a ratio of just above 1:2 to just over 1:3. Smaller ratios, i.e. longer paddles, make paddling progressively more inefficient, as it may be readily gathered from a consideration of the forces active during a paddle-stroke and the mechanics of levers.

However, what one sees in the case of Ship A of the Theran fresco, and particularly in the drawing of the paddlers over the gunwale by K. Eliakis reproduced in Morgan Brown's paper (no. 7), is a general ratio of about 1:5, and in the case of the first paddler shown in the drawing, a ratio of perhaps as small as 1:6 (Fig. 5). This is not merely an inefficient ratio, but a downright absurdity. At 570 kg per paddle at the very least (based on the displacement of an empty ship) and such a ratio, the ship would hardly move at all, save if she were lucky enough to have the current flowing in the direction of her destination.

Perhaps at this point one may pause and ponder if too much is not being asked of a mere miniature fresco. This is the usual thing in such circumstances. As long as an illustration supports one's point of view, no amount of extracted detail or the extent of the accuracy portrayed are ever questioned; but the moment the evidence ceases being supportive, it is scholarly custom to stop and reflect on the imponderable. The case in hand unfortunately, seems particularly obdurate.

Thus, the illustration of the rowed boat before the Departure Harbor previously mentioned, is drawn to perfection at the beginning of the rowing stroke, and one can virtually feel the tension at the shoulders, as the backs of the rowers are already slightly curved by the effort. The paddled boat from the Arrival Harbor shows again the drawing of a master, the paddle-stroke advanced but not quite at the end, the ratio of the hand-spread to the total length of the paddle at about 1:3 or just a little more (Fig. 6).

In fact, it is the finer details which show how well the artist knew his subject. So in the two-man paddled boat above, the man at the bow is a little more advanced in his stroke, which is very frequently the case in reality, since the man at the stern has to steer the boat as well by turning and dragging his paddle in the water, which means that he often has to catch up with the man at the bow. Besides, as all experienced paddlers know, it is the business of the man at the stern to adjust his stroke to that of the man in front, never the other way around, since the man at the back can watch his companion without particular effort. This is beautifully portrayed here. But then what about the previous absurdity of 1:5 or even 1:6 ratios for Ship A and probably similar ratios for the other large ships shown in the fresco?

Morgan Brown wrote that paddling was an old-fashioned method of propulsion for the time of the fresco (1978, 613), which it certainly was. As a consequence, one would not normally expect to see this method used with massive sea-going ships, "especially when the superior technique of rowing was evidently known". But by comparing the Theran fresco with a depiction of paddling from Weserkaf's (or Userkaf) Vth Dynasty temple at Saqqara, and the LBA I age of the frieze, she concludes that, "At the time of the fresco, the occasional use of paddling ships in

Egypt was restricted solely to those in processions belonging to specific annua festivals when the old-fashioned method recalled tradition in a manner so typica of such occasions. It seems likely that a similar deference to tradition is being displayed here, for the entire character of the ships suggests that this is no ordinary naval venture".

All of which is distinctly probable of course, save for the rather disturbing absurdity of portraying men trying to move with paddles held at 1:5 and 1:6 ratios, a ship which easily gave each paddler a weight of 600 kg. This in the midst of otherwise very knowledgeable and even sensitively drawn bodies in movement, showing the tension expected from such rowing or paddling. The answer cannot be that the artist didn't know better, because this artist certainly did. Besides, why is the rowed boat from the Departure Harbor, a boat of medium size between Ship 1 and the paddled boat, not shown with paddles as well? It seems more than likely that this is the result of a certain "artistic convention", but which has little to do with the tradition mentioned above by Morgan Brown.

Some artists paint what they see. Others portray what they know. Some no doubt illuminate how they feel, while others have sketched only what they imagined. Many must have belonged to more than one of the above categories, and all must have taken liberties with their subjects. There is certainly no doubt about the liberties taken by the artist of the Theran marine fresco frieze. Aside from the obvious depiction of the sail in a fore-aft position instead of athwartships, a necessary convention in the circumstances, his portrayal of the paddlers "leaning uncomfortably over the gunwale" (Morgan Brown 1978, 631) and holding paddles in such a way that no propulsion was really possible, is certainly one such example. Whatever the artistic tradition or convention portrayed here, the artist knew only too well that what he was depicting here was patently false, in the sense that the ship he showed could not be propelled in this manner. His other portrayals of the rowed and paddled boats leave no doubt whatever about his knowledge. So why did he choose to execute an image he knew to be false? A deference for tradition is hardly an occasion for falsifying the present and actual. Thus Gillmer and Gilkerson in their drawing no. 11, show the paddlers prominent on board, as they certainly must have been, and the ratio of the hand-spread to the total length of the paddle is barely over 1:2.5, as one would expect for even half-effective paddling (Fig. 3). Whatever other liberties Gillmer and Gilkerson have taken, their portrayal of paddlers and paddles is certainly realistic. Why couldn't the BA artist of the Thera fresco do the same thing, considering his obvious accomplishments in the domain of realism, and the fact that there are no constraints imposed by the medium here, as there are for example in the engraving of seals or ring-stones.

The reason seems fairly obvious. Portraying the paddlers full-bodied on the deck as Gillmer and Gilkerson have done would have completely obscured the important personages shown as passengers on board, sitting in ample comfort two by two, facing each other in the central booths for perhaps more amiable companionship. The artist knew that he could not possibly depict the crowd of paddlers and the exalted guests, officers, officials, or whatever the honoured passengers were, all on the same level as a realistic portrayal would have required. Something had to give. Thus the artist decided, no doubt with the full encouragement of his noble patron whose house he had been hired to decorate, that the paddlers could be relegated to somewhere below deck, in order to allow the depiction of the passengers. But since there was only one deck, the paddlers would have to double over reaching for the water, not because this was necessary as Gillmer and Gilkerson show in their drawing, but simply because this would help clear the deck of all encumbrances. This is called an artistic convention in painting and helps create one more class of artists, the ones who painted what their patrons wished. The question is, what other liberties might this particular artist have taken?

2.1.3. The length of the ship

Unfortunately, there are other matters which cast grave doubts on the reliability of the fresco. For example, as previously mentioned, Gillmer calculates the total length of the ship as about 24m. But one cannot possibly miss the fact that the length occupied by the crew is less than half the total length, and in fact these two dimensions bear a ratio of about 3 to 7, that is

$$\text{Length of crew} / \text{Length of ship} = 3/7$$

Now if one assigns the customary 90cm per paddler for the part occupied by the crew, then

$$\left.\begin{aligned}\text{Length of crew} &= 21\text{X}0.9\\ &= 18.9\text{m}\end{aligned}\right\}$$

But if the length occupied by the crew is 18.9m, it is simple calculation from the first equation to show that the total length of the ship is closer to 44m, rather than the 24m calculated by Gillmer, and the corresponding weight per paddle considerably greater. Put in another way, if the total length of the ship is 24m as Gillmer calculates, substitution of this figure in the first equation gives a length occupied by the crew of 10.3m, which will give each paddler barely half a meter of space. Needless to say there would have been a lot of bumping between hands holding paddles and the backs of the men in front, since a man's arm is normally longer than half a meter, and the intervening space must also accommodate a man's upper body, as well as working space. Needless to say, if the total length of the ship, based on the length by the crew, is not 24m but closer to 44m, all other calculations shown by Gillmer are wrong.

3. CONCLUSION

The question is, if one of the most "realistic" and "reliable" paintings of BA ships, a painting moreover not subject to the usual distortions imposed by the substrate, could be so unreliable as has been shown, is it possible to place any confidence on iconographic analysis based on selective reliability of far more constrained illustrations on pottery, seals or ring-stones, and on any quantitative values obtained as a result?

But then why should art be reliable? Or for that matter, concerned with measurements and accurate representations? This is the methodology and object of engineering and technical drawing, not art. No one expects a modern artist to be concerned with any of these things; but their BA confreres are invariably counted upon to conform to scholarly expectations. It is true that modern scholars have often not much else to go on. But this is no reason to saddle BA art and artists with 20th century scholarly preconceptions, anxieties and problems. The need for information is real of course; but is a need fulfilled under these conditions worth scholarly consideration and discussion?

It must be clear by now that the author does not think BA artists have taken liberties with their subjects, since the object of art is not and never has been accurate representation; it is modern scholars who have taken liberties with the BA artist's work. One can certainly agree with Gillmer about the fine quality of the painting. And although one can feel a great deal of sympathy for his sentiments expressed in the phrase, "It is time to put more confidence in the finest form of expressive Minoan art, their fresco painting" (1989, 129), one has to wonder in view of the above, if the expressed generosity does not unduly saddle BA artists, with the qualities of accuracy and reliability that are simply not their own.

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ACKNOWLEDGMENTS

I wish to thank my husband for first exposing me to the joys and agonies of sailing and for many invaluable discussions and suggestions.

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ILLUSTRATIONS

1a-b. Marine Fresco
2. Ship A
3. Gillmer's no. 11
4. Rowed boat (Morgan's no.4)
5. Drawing paddlers, no. 7 in Morgan
6. Paddled boat (Morgan's no. 5)

Fig. 1a

Fig. 1b

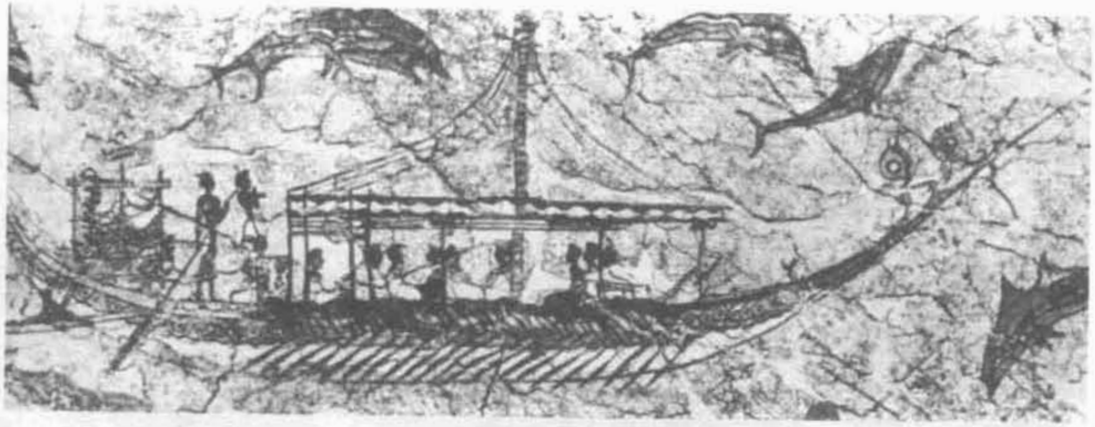

Fig. 2

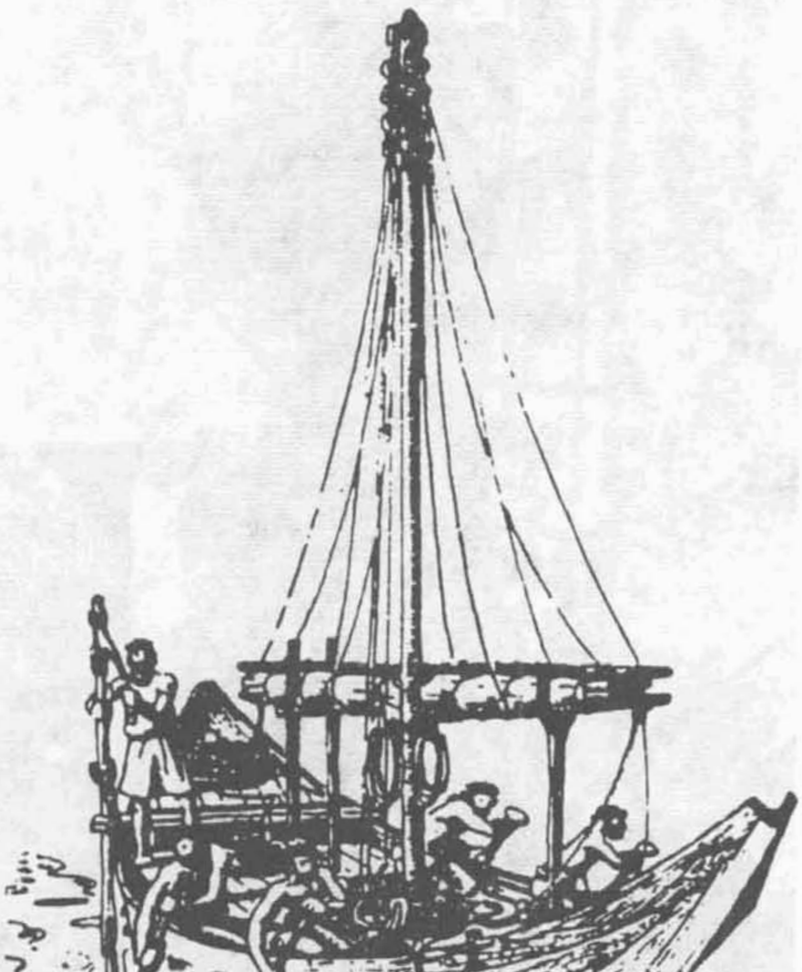

Fig.3

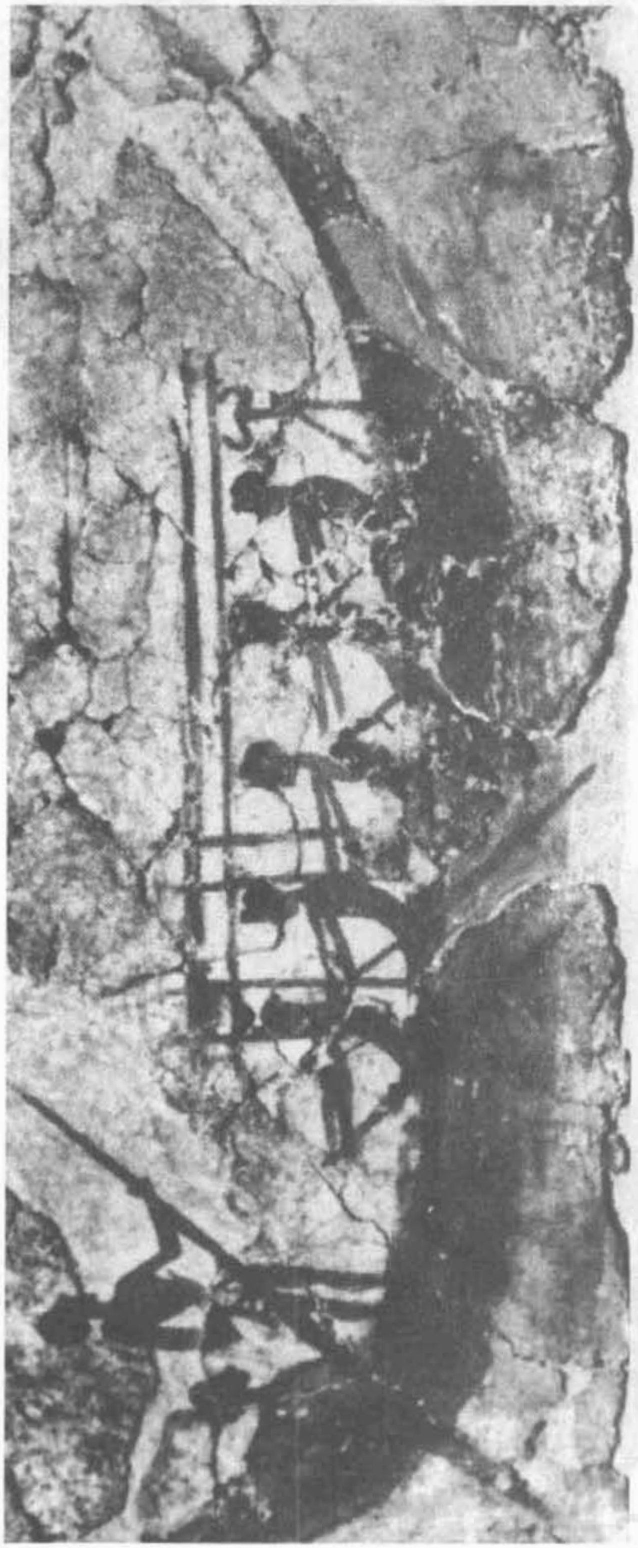

Fig. 4

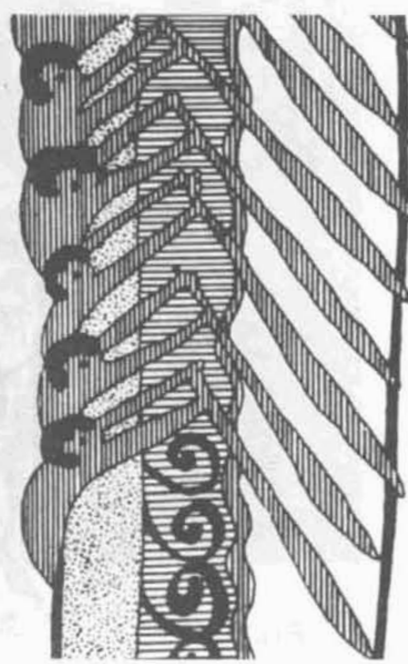

Fig. 5

Fig. 6

SHIPS IN HOMER'S EPIC WORKS

Homer's epic works marked the beginning of European literature. They are an inexhaustible source of wisdom and inspiration, of undying importance to the cultural history not only of Europeans, but of mankind as a whole. In addition, Homer's epos is also a source for history. Owing to our expanding knowledge through other domains of science, this written source can be re-read many times and it may reveal legitimate variants to existing solutions in history, which appear to be unexpected at a first glance.

The Iliad and The Odyssey are known to have been collected and ordered in the court of the Peisistratidae in Athens in the 6th century BC. However, it has also been established that the grammarians who studiously copied the epic works at that time, observed to the utmost the authenticity and even the archaic nature of the language, style and terminology of the poems. This has allowed experts on Homer to claim with a high degree of certainty that the two poems were created before and during the 8th century B.C. However, the poet narrates about events that took place much earlier, notably about the Trojan War in the 13th century B.C. and about the time after it until the 8th century B.C. Thus, in spite of the "stopped" time in the two poems taken separately, the two of them represent time in a vertical scale, i.e. there exists a sequence of actions and of events, moreover in the so-called "dark ages" for the ancient history of the Aegean world. In other words, Homer's epos has gathered and preserved a part of the real history of this civilization between the 13th and the 8th century B.C. shrouded by myth.

The aim of the present work is to shed light on these dark ages by comparing what Homer said about shipping during the period in question with what is known from archaeology. My noble intention is to try and disperse the fog of the myth in discovering the historical truth.

The aim formulated necessitated to review several problems briefly, with a view to greater clarity and convenience in our work:

1. Oars and oarsmen
2. Mast and sail
3. Navigation of the ship
4. Anchors

The information extracted from Homer's epic works in this way allows to make internal cross-sections of the mythological evidence and to come to interesting observations.

Oars and oarsmen.

The ship with oars and oarsmen appeared even in Book I of the Iliad. Having been forced by the gods to return the captured Chryseis, Agamemnon gave orders for a good ship with twenty men on board to be launched[1]. The Catalogue of Ships mentions that the oarsmen or seamen (the term is the same ἐρέτης) are archers[2] In this case they number 50, on another occasion - 120[3]. After a quarrel with Agamemnon, Achilles intends to take his ship and his men back home rowing[4]. When there is no wind, the sailors row, but with a fair wind they can take a rest happily[5]. In The Iliad Homer refers to the ships as having many oars, using the term πολυκλήις[6], which suggests that this was a ship with many pins to which the oars were attached.

In The Odyssey, too, rowing was the principal way for moving these ships[7]. The ship of Telemachos has twenty oarsmen[8], similar to the ship which the candidates for Penelopeia's hand wished to make an attempt on Telemachos' life[9]. The ship offered to Odysseus when he was sailing from the island of the Phaiacians had "two-and-fifty... best oarsmen"[10]. The oarsmen in these ships are seated in rows, on benches one behind the other[11]. The oars are attached to the boards of the ships by means of leather straps[12]. Undoubtedly, Homer identified the ships in The Odyssey as ships with oars (νῆες ἐπήρετμοι[13]).

It is interesting to note the cited information about the way of rowing: the oarsmen being seated on benches. As Thucydides explains[14], the ships in Homer's epic works had no deck. The seats for the oarsmen were actually parallel benches from one board to the other, on which the oarsmen sat facing the stern. This is how they formed one series for each board. It is the only position in which rowing while the sailor is seated could be effective. This type of rowing is more efficient than the "canoe"-type paddling: facing the bow and paddling with a short paddle in the seamen's hands, which was practised in the pirogues in the Aegean basin from the 3rd to the middle of the 2nd millennium B.C[15]. It is also important that the oars were attached to the pins by means of leather straps tied in knots. Such pins can be seen to this day on traditional fishing boats. They are short wooden pins hammered vertically into the board. This mode of attaching the oars to the boat preceded the Corinthian innovations in the 8th century B.C. which subsequently spread to Greece in the 7th and 6th centuries. One of these was the new method of fixing the oar to the ship: through round holes in the board, in which the oars were lying and rotating during rowing[16].

The size of these ships is determined by the number of the oarsmen. In the Iliad they are 20, 50, 100 and 120, while in The Odyssey they are only 20 and 52. It seems that the notion from The Iliad about mythical gigantic ships with 100 or 120 oarsmen acquired a more realistic form. The relatively small size of these ships is suggested by the numerous cases when they were easily taken out to the land, even if there was no special need of this[17]. The sailors of these ships were simultaneously oarsmen and warriors. This was noticed even by Thucydides[18]. Rowing as the principal way of ship navigation was used when the ship was sailing off, when there was no wind and when the ship was coming to lie along the wharf.

Mast and sail.

Agamemnon's ship from Book I of The Iliad has a mast and a sail; the mast was fixed with ropes, while the sail was hoisted when the wind was fair[19]. As was mentioned already when the oars were discussed, the sailors in the sea could rest only when the wind was fair.

This information is more detailed in The Odyssey. When a fair wind started blowing, the wooden mast was hoisted, fixed with ropes and then the sails were unfurled using leather straps[20]. The two ropes of the mast are taut towards the bow and towards the stern[21]. The sail is taken in when the ship enters the harbour[22]. When Odysseus was building a raft, it becomes clear that the mast had a cross-yard as well[23]. The existence of this yard confirms that a sail was indeed used with this mast, because without it the sail would not have been taut under the thrust of the wind.

There are numerous references to masts and sails in The Odyssey[24].

It is important that in both poems this type of sail belonged to the ships with oars discussed earlier. There is no specific reference to ships with sails only or with oars only. Even though no details have been given about the shape and size of the sail, it is clear that it was of a particularly elaborate configuration, if it had to rely on fair winds. No manoeuvring was possible with this sail, and likewise it was impossible to travel at an angle against the wind.

The term used in ancient Greek texts for a ship's sail is ιστίον, usually in the plural. However, it is obvious that these ships had only one functional sail, if they had only one mobile mast with two supporting ropes and one yard.

Navigation of the ship.

In The Iliad there is only one reference to the helmsman of the ship[25]. This indisputably suggests that independent navigation existed. All the more that when a ship sailed, it must have had a helmsman and some system for steering.

Some information about this steering system can be found in The Odyssey, where a famous navigator was said to have been a skilful helmsman with the oar, too[26]. Odysseus fled from the ship by going down the stern oar[27], i.e. the steering system consisted in an oar lowered from the stern to some depth in the sea. It looked like a tail and served for navigation. This is why in all cases the helmsman is always standing on the ship's stern[28].

The steering oar was the first and the least sophisticated steering system, which existed throughout the Middle Ages as well. It was a compulsory element for ships using sails as well.

Anchors.

There are two references to ship anchors in The Iliad. The first case concerns the lowering of the anchor in the harbour[29], while the second case refers to the lifting of the anchor before the ship sails off[30]. In both cases the term εὐνή, meaning "stone, bed", has been used. It is different from the classical ἄγκυρα. Actually, the anchor was made of stone, and because the stone was flat, it rested on the sea bottom.

When Odysseus went to the Cyclops, he discovered such a good wharf that it was even unnecessary for the ship to cast anchor or to be tied to the shore[31]. In that case the poetic exaggeration can be understood from the context of the poems, though something else is important: the term εὐνή was used to denote "anchor", the same term being used in The Iliad to denote a stone anchor. The term ευνή is also used when Telemachos' ship cast anchor in a bay in Ithaca, before he went to the city itself[32].

In The Odyssey there are two other cases[33] where anchoring of ships is referred to, but in neither case the term for anchor has been used. In one of the passages the ship is said to be riding at roadstead, while in the other case the term for anchor rope - δεσμός - has been used. In this poem, too, the term ἄγκυρα is not used. This means that ships with sails and oars in Homer's epos used stone anchors only.

From everything stated so far, it becomes clear that the ships in The Iliad and in The Odyssey navigated with 20 to 50 oars and with a rather simple sail, hoisted onto a mobile mast which was fixed by means of a bow rope and a stern rope. These ships were steered with a stern oar, and they used stone anchors. According to Thucydides, they were built in the old piratic fashion, as during the Trojan War[34]. In addition to food for the crew, these ships carried other cargo as well - usually looted. Their sailors were both oarsmen and warriors, the captain was their commander as well. These were universal ships for piracy, war and trade.

Homer has designated these ships everywhere with the term νηῦς (pl. νῆες). However, in the Odyssey there is the notion of yet another ship, albeit only for the sake of comparison. It was a flat-bottomed cargo ship - φορτίς[35]. This type of ship was not unknown in the Aegean world. As suggested by the studies[36], it appeared in the 10th century B.C. images along the coasts of Asia Minor, in the 9th century B.C. images from the Island of Crete, and then in Greece. The design and construction of this ship are different and they are a function of its purpose: to transport cargo. This ship navigates mainly with sails, because large distances cannot be covered with oars only. Consequently, a new type of ship was discovered in The Odyssey, which seems to have been unknown in The Iliad and epoch it reflected.

It is known that Alcaeus[37] from Lesbos was the first to use the term ἄγκυρα, which was towards the end of the 7th century B.C. The meaning of the new word for "anchor" is "anchor, support", i.e. it is perceived in the sense of an anchor with one or with two arms. This anchor was made of wood, with a stone or lead transverse stock.

The appearance of a new type of anchor indispuitably speaks also about the *appearance of the new type of ship for Greece. In my opinion, the new ship was the φορτίς from The Odyssey. If this is so, then the fact that the term ἄγκυρα is* lacking in Homer's epos, means that when it was created (before and during the 8th century B.C.), the ships specialized for trade only were not yet very widespread in the Greek world. And when Alcaeus used the term at the end of the 7th century B.C., that meant that the novelty in shipping and in the economic life of the Hellenic ethnic community had already been completely accepted. In other words, the time from the 8th to the end of the 7th century B.C. was a period of propagation and of acceptance of the trade ship in the Greek world, being also a period when active and regular sea trade started. The compiler Strabo[38] adds to the picture by stating that ἄγκυρα was invented by the Scythian Anacharsis. It is obvious that Anacharsis simply stood for the name of a culture-hero from a non-Greek ethnic cultural community, therefore it is pointless to seek in what century Anacharsis invented the two-arm anchor. Rather, the information may be associated with the appearance of the new type of sailship in the 10th century B.C. in Asia Minor, and probably in the Western Black Sea area as well[39].

The archaeological dating of the stone anchors[40] from the Eastern Mediterranean and from the Western Pontic coasts refer them generally to the second half of the 2nd millennium B.C. If it is applied to the ships with sails and oars of the νηῦς type, which have the same stone anchors as well, it proves that these were indeed the ships from the Trojan War in the 13th century B.C.

The appearance of the other type of ship - with sails - for the time being in the 10th century B.C. and its gradual propagation into the Greek world, was reflected in The Odyssey in the 8th century B.C. The merchant ship with sails φορτίς took over the trade functions of the universal ship with sails -νηῦς. Then the ship with oars and sails remained for military need only, and hence it developed some new military properties: speed and manoeuvrability. According to Thucydides' narrative[41], this happened first in Corinth in the 8th century B.C. when the penteconters, the improved variant of Homer's ships, appeared for the first time. These ships were considered to have been the vessels with which the Great Greek Colonization was performed. A logical question arises: what kind of anchors did they have? The most plausible answer seems to be: ἄγκυρα, because more sophisticated ships needed sophisticated anchors as well, and such anchors had already been invented. Thus, it seems that the Greeks profited from the more frequent occurrence of merchant ships by borrowing the two-arm stone or lead stock in order to apply it in their innovations in the ships and to disseminate it together with the Great Greek Colonization.

Conclusion

In conclusion, the following may be stated briefly:

1. Ships in Homer's epos were of the all-purpose type (piracy, war, trade) and were of the νηῦς type. These ships were with oars and sails, and they sailed in the second half of the 2nd millenniun B.C. until about the 8th century B.C. They had stone anchors of the εὐνή type.

   Thus, the dating of the stone stocks from the Eastern Mediterranean should be extended to the 8th century B.C. This type of conclusion is also suggested when the stone anchors from the Western Black Sea regions are examined[42].

2. A new type of ship (φορτίς) became known in Hellas in the 8th century B.C. It was for transporting cargo, especially for commercial need. It was from this ship that the Greek penteconters, and later the trieris, borrowed the more sophisticated anchor of the ἄγκυρα type.

   Thus, the dating of the appearance of the wooden anchor with stock in the eastern part of the Aegan basin would be transferred back in time from the 7th to the 10th century B.C. as has been proved for the Western Black Sea coast[43], for the Western Aegean coast - at least to the 8th century B.C.

3. If the proposed hypothesis about the direct connection between the merchant sailer φορτίς and the wooden anchor with arms ἄγκυρα is confirmed in the future as well, it would support the idea that The Odyssey reflected most generally the time from the 10th to the 8th century B.C. whereas The Iliad reflected the time from the 13th to the 10th century B.C. i.e. while The Odyssey praised the birth of a new age, The Iliad sang about the glory of a retreating age. Both ages are linked by the ships with oars and sails using stone anchors - the ships in Homer's epic tradition.

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NOTES

1. Il. I, 308-309 (Paul Mazon; Amais-Hentze).
2. Il. II, 718-720.
3. Il. II, 510.
4. Il. IX, 358-363.
5. Il. VII, 4-6.
6. Il. VII, 87-88; VIII, 239; XIII, 742.
7. Od. VI, 269; IX 73, 99, 103-104, 179-180, 471-472' XII, 146-147, 168-172; XI, 125, 639-640; XV, 549-553; XVI, 353 (Victor Bérard).
8. Od. I, 280-281; II, 212.
9. Od. IV, 669.
10. Od. VIII, 35, 48.
11. Od. IV, 578-580; IX, 103-104; XIII, 76, 21-22.
12. Od. IV, 782; VIII, 37, 53.
13. Od. IV, 559; V, 141.
14. Thuc. I, 10, 4 (Budé).
15. Basch, L. *Le musée imaginaire de la marine antique.* Athènes, 1987, p. 77-84.
16. Chamoux, F.La civilisation grecque à l'époque archaique et classique. Paris, 1963, p. 164-173.
17. Il. I, 485-486; II, 150-151 IX, 43-44; 358-363; 680-681; VIII, 500-501.
18. Thuc. I, 10, 4.
19. Il. I. 432-436; 477-486.
20. Od. II, 420-426; XV, 289-291; IX, 77-78.
21. Od. XII, 409.

22. Od. III, 9-11; XV, 496-498.
23. Od. V, 254.
24. Od. IV, 360-362; 577-579; 781; XI, 1-8; XII, 402.
25. Il. XXIII, 315-317.
26. Od. III, 279-283.
27. Od. XIV, 350.
28. Od. II, 416-418; V, 255; XII, 152; XV, 285.
29. Il. I, 432-436.
30. Il, XIV, 75-78.
31. Od. IX, 137.
32. Od. XV, 497-498.
33. Od. IV, 780-785; XIII, 96-101.
34. Thuc. I, 10, 4.
35. Od. V, 249-250; IX, 321-323.
36. Basch, L. *Op. cit.*, 159-190.
37. Alcaeus. apud Heracl. Alleg. 5 (*Lobel-Page*).
38. Strabo. 7, 303 (Maineke).
39. Basch, L. *Op. cit.*, 159-190; Porozhanov, K. On the dating and belonging of stone stocks found along the Bulgarian Black Sea coast. -*MPK*, 3, 1988, 33-38 (in Bulgarian); Porozhanov, K. Sur l'apparition du bateau à voile du littoral thrace de la mer Noire. - In: *Tropis II*, Ship construction in Antiquity. Second International Symposium. Delphi, 1987. Athens, 1990, 277-281.
40. Dan E. McCaslin. Stone Anchors in Antiquity: Coastal Settlements and Maritime Trade Routes in the Eastern Mediterranean ca. 1600-1050 B.C. Göteborg, 1980. *Studies in Mediterranean Archaeology*, vol. LXI, 51-52; Porozhanov, K. Dating of stone anchors with holes from the Bulgarian Black Sea region - achievements and problems. - *Archaeology*, 1989, no 1, 6-13 (in Bulgarian)
41. Thuc. I, 13.
42. Porozhanov, K. Dating of stone anchors (op. cit.).
43. Porozhanov, K. On the dating and belonging (op. cit.).

THE ENIGMA OF THE LONG PLANKS PREDYNASTIC BOATS ON THE UPPER NILE

A. Abstract: The most common type of boat in the iconographic repertory of Egyptian Predynastic boats, whether from vase painting, rock drawings, or small size models, is that of a long canoe with as many as fifty paddlers. In more detailed depictions it is clear that two cabins, of shrine type, were located all over the beam of the boats, one behind the other - sometimes even connected by a bridge at their second storey's level. The context of most of these iconographic documents is burials; and the religious ceremonial character of these vessels is quite obvious. Yet there is no reason to believe that the daily riverine vessels of the Amratic and Gerzaean people of the Nile valley were of a different type. This notion creates some difficulty: the type of the hull is undoubtedly fashioned by long timbers, sewn at both ends, with flat floor (much like the later, Papyriform, Royal ship of Cheops). Keeping in mind that this basic hull-form is the one which characterizes the earliest depictions from Upper Egypt, one might wonder how such a hull, so typical for long plank vessels, could originate in a geographical area where no possible source for such timber was available. The only possible source for long timber logs for the Nile valley could have been the Levantine coast of the Mediterranean (as it was all through the Dynastic era). Yet the type is known from Lower Egypt and the Delta region only in the later phase of the Predynastic era. In other words, the part of the Nile Valley which is farthest away from any known source of long, straight tree logs is the one that nourished water vessels characterized by this very type of timber for its construction from the earliest beginnings.

One probable explanation for such a contradiction might be found in the geographic provenance of the civilization that used such boats before its members entered the Nile Valley.

B. The iconographic documentation is the only source of information we have for the type of boats that fared on the Nile during the late prehistoric era. This time-period is known as the Amratian and Garzean phases, the last two in the general Predynastic era in the Nile Valley, covering, probably the better part of the fourth millennium B.C. At that period the people of that area had developed a highly complicated agricultural society, based on ever developed central organisation that controlled public works such as irrigation channels, fortified settlements, military units and international trade in mineral ores, luxurious commodities and probably even timber logs and olive oil (Kantor 1965:6). Towards the mid 4th millennium the so-called Garzean culture of upper Egypt intensified these foreign trade connections and developed some kind of feudal-like society, which was controlled by a relatively small group of high class privileged people of foreign origin who mastered the mass of peasants (Derry 1956; Emery 1961:30-31). The rich and densely populated valley of the upper Nile thrived and expanded its political and cultural grasp both toward Nubia in the south (Williams 1980) and toward the people of the so-called Maadian culture in the north, at the Delta region (Hoffman 1979: 149). Such activities demanded an ever intensified nautical activity on the Nile, and judging from the central place river crafts took in Gerzean art, boats were everywhere in the daily life of the communities. Depictions of boats are to be found as a major theme in Rock-drawings outside the Nile valley proper, in upper Egypt, Nubia and even toward the Western desert (Engelmayer 1965; Hofmann 1979:243-8; Winkler 1938:26-7, 35-9). Yet, the main source is the hundreds of painted jars from burials in the Nile valley itself, ranging from Amratic to Late Gerzean period, on which boats are the main decorative feature in most cases (Petrie 1921). In some of these graves there were also clay and wooden models, usually of small, simple boats, that add for us the missing third dimension of the paintings and rock-drawings. The funerary context of most of these iconographic documents seems to be a limiting factor, because in most cases the depicted water craft is clearly of some kind of ceremonial and religious function (Baumgartel 1960: 144-149). Yet, judging from types depicted in rock-drawings and from the close resemblance in hull construction of ceremonial and utilitarian dynastic boats, one might take the available illustration as a relevant source for reconstructing the technical and typological features of the riverine crafts of the predynastic Nile Valley. The most common type of a boat among these painted vases is the so-called "Boomerang shape" (Basch, 1987: 57-60; Kantor 1944: 115; and see Fig. 2). Most of the painted vases depicting this type were found at the upper part of the Nile valley. This is particularly true for the earlier Gerzean and all of the Amratic specimen (S.D. 35-42, and see Petrie 1920, 1939; Landström 1970:12;Figs. 4-11). The features of that type of boat which are common in all the vase paintings are:

1. A shallow curved hull of sided with an even width from end to end. The bow and terns are terminated diagonally, with their upper part shorter than the bottom end.

2. The superstructures consist of two cabins, sometimes connected by a bridge-like passage (see e.g. Fig.2: A,D,E,). The cabins are depicted with twin "Ears", or arched top poles and their sides covered with mats. In some cases one of the cabins attached to the back of the after one (Fig.2:B) or in front of the fore one (Fig.2:A), or both (Fig.2;e,d).

3. In most cases there is a vertical pole behind the after cabin, topped by a sign. In some cases this sign was omitted (Fig.2:A.c.), and at least in one case there are two different ones on the same boat (Basch 1987: 44, Fig.66). These signs were considered to be protosymbols of Egyptian nomes (Newberry 1914). The claim was that some of these signs of the Pharaonic era, are mostly of nomes of the Delta region. This notion is questioned by later scholars who have pointed out to the missing signs, the double signs on one boat, the fact that depiction of boats with different signs were found in the same burial and the geographical discrepancy between the location of these burial (and rock drawings) and the area suggested for these nomes (Basch 1987: 43, n.4). So, it seems as if the notion that the religious and ceremonial context of these boat depictions is prevailing one might consider these signs as symbols of various deities (Baumgartel 1947: 13, 72).

4. A prominent feature in all the depictions of this type is the tree branch which is placed in a special device at the prow of the boats. This type of decoration was depicted in all the earlier specimen, and became less consistent and more schematic in later, Ptorodynastic depictions. Whether this type of symbolic decoration points out towards some Mesopotamian influence (Arkell 1959; 52-3), or the more convincing arguments for Ethiopian origin (Larsen, 1957), there are no reasons to follow the notion that these branches initiated the use of sails in Egypt (Basch 1987: 49). The more convincing proto-sails can be found among the later Gerzean depictions of a mat fixed on a vertical pole (Landström 1970: 13, Fig. 14), or the hides fixed on a cross form and a pole, as shields (?), depicted on the wall painting from the brick tomb at Hierakonpolis (Quibell and Green 1902, Pl.XXV) and the painted vase for Naqada (Fig. 3).

5. The last device which is shown in most depictions is of a "Broom" (Fig.2: A,B,L.) or a kind of knotted rope, loosely dingled down from the prow (Bowen 1960: 120, Fig.2). The overall repertory of this device might be

considered as a purifying one, keeping the sacred barge, or boat, off any possible floating impurity during its ceremonial sailing.

Most of the depicted boats have multitude of what seems to be oars, usually divided into two groups, leaving the central area between the cabins free. Having no indication for rowing in the Nile Valley prior to the fifth Dynasty period (Clowes 1932: 16) it is quite clear that these oars were used for paddling, as in canoes (Kantor 1944: 118). The grouping of the oars might not indicate an artistic convention of depicting the paddles of two sides of the boat (Clowes 1932: 15), or for better clarity of the scene (Kantor 1944: 119-121). There is at least one depiction that shows the oars of both sides in more accurate way (Fig. 4). Judging also from one of the earlier depictions (Fig. 2:L) it is quite clear that the oars were used by the paddlers only along the free area foreword and behind the cabins, which would fill the entire breadth of the boat (and see the depiction of a bird-eye view of Amratic boat at Landström 1970: 12, Fig.4).

The paddling technique is clearly depicted on the painted linen from El Gebelein (c.f. Bass 1972, 27, Fig.7, and Fig. 5 hereby).

Finally, though this "Boomerang shape" type is characteristic for most of the Gerzean vase painting form Upper Egypt and the only clearly defined type depicted in rock-drawings and painted pottery of the earlier, Amratic era, there are two later iconographic sources for this type. The first one is the painted brick wall from the tomb 100 in Hierakonpolis (Quibell and Green 1902, pl.III), where of six depicted vessels five are of this type (Fig.2:A). It is interesting to note that though this iconographic source is few centuries later than that of the Amratic era (Fig. 2:L), they do no differ much, both in their hull-shape and the upper structures. Unlike the depictions from the painted vases which seem to show only divine figures of deities, this wall painting describes human figures on the boats, probably in more realistic scale. If this is the case the actual length of the white boats from Hierakonpolis was as much as 30m and their height just over 1.5m. The other Protodynastic iconographic source is the famous Gebel el Arak knife (Bénédité 1916). This flint blade knife has a carved handle which was made of hippopotamus tusk, decorated on both sides in an elaborated protodynastic fashion (Fig.6). On one side there are various wild animals, typical to the mountainous region of both sides of the upper Nile area, including hunting dogs. This side is crowned by a typically Mesopotamian antithetic scene of a hero, with a helmet or hairdress of Sumerian type, controlling two lions.

On the other side there are pairs of combatants fighting each other, with maces, clubs and sticks. All human figures are dressed and look like typical predynastic inhabitants of the Nile Valley. The lower part of that side depicts two groups of boats, with drowning people in the area between them. The two boats of the upper group have been studied and discussed by many. Their close resemblance to boats depicted on contemporary Mesopotamian cylinder seals of Gemdet Nasr style, combined with the antithetic motif on the other side led scholars to consider the decoration as a symbolic depiction of an ethnic, political, or cultural conflict between the two main cradles of civilisations at birth (Emery, 1961:38-9). Others saw it as an indication for ever growing Mesopotamian influence in protodynastic Egypt, coming from the north, via Syria and Palestine (Helck 1962:6-9). Kantor, in her thorough study (1965: 6-17), have tried to incorporate the scenes and motifs within a sequence of sea borne connections between Mesopotamia and the Upper Nile valley via the Red sea, the Indian Ocean and Wadi Hammamat (see Fig.1), starting from sporadic indirect maritime voyages in the Amratic and early Gerzean periods and columinating to a more direct and steady borrowing at the later Gerzean and Protodynastic eras. Lately there was an attempt to re-read these intrusive Mesopotamian elements and to see the Gebel el Arak knife decorations as a depiction of a culture combat between the culture of the Upper Nile (represented by the lower group of boats) and the People of the Delta region, as a phase on the way for a political unification (Hoffman 1979: 340-344). Basch (1978:60) suggests that the Mesopotamian boats on the knife represent the invading "Dynastic Race", which were West semitics that entered Egypt through the Delta. The lower group includes three boats of the same type and double cabins as the "white" boats from Hierakonpolis, though much shorter and with an additional device that looks like a bovine head at the prows of two of them, replacing the traditional branches.

C. Three dimensional models of predynastic boats are not many. Of dozen, or so, found in burials of the period, five are clearly of the "Boomerang Shape" type. The earliest, which is dated to the Amratic, or Early Gerzean era is now at the museum of Berlin (Fig.7). It is composed of two parts, with one end (the prow?) made separately and lashed to the hull after the model was baked. The shape of the hull is symmetric, with two cross benches at either pointed end. Yet, at one side (the prow?) there is additional cross beam, behind the bench, with two narrowing slots towards the boat's tip. Judging from other depictions these slots might been used for insertion of prow branches. There is painted area at midship, similar to the intercabins one on the side of the largest boat from Hierakonpolis

(Fig. 2: A). It is characteristic to the type that the sides of the model are not pointed or tapered off, but somewhat broader than the sides of the midship. The floor is flat and the section is of a U-shape. The length/breadth ratio is 5/1, much smaller than the estimated 12/1 ratio of long riverine canoes.

The next group is of three small clay models found at Naqada and presently on display at the Ashmolean Museum in Oxford (Fig. 8). All three are rather crude flat bottom hulls, similar in shape to the former one, except for one detail - the upper part of both ends had been trimmed, so as to give them a triangular profile, of which the point is the continuation of the curved line of the bottom (see Fig. 6: B).

The last model is one made of wood, from the museum of Cairo (Fig.9). It is similar in shape to the group from Naqada, but much slender, with length/breadth ratio of about 11/1.

All these models represent two facts that should be added to the data about the characteristics of the "Boomerang shape" predynastic boats derived from the paintings and rock drawings: one is the fact that the bottom of that types hull was flat and its cross-section of a U or rather (inverted π) shape, as it kept being in all Egyptian wooden water crafts till the end of the Old Kingdom.

The second and most unusual feature is the adhered sides of the boats on both ends. This unique feature cannot typify canoes that had been derived from a Monoxyle pirogue (Landström, 1970: 12-16). It has only one constructive logic - the adhered (swen or stitched) side boards were made of planks, long enough and properly fastened to each other in order to enable the needed curvature. Such a curvature would hardly fit a prototype made of unsewn logs, such as in log rafts (Kapitän, 1987).

D. The Prototypes of the "Boomerang Shape" Boats should had been fashioned by building materials with the affinities of long, flexible wooden planks. Such a conclusion is carefully suggested by Basch (1987: 57, n.19). Yet, if one would take two boards of thin wood and sew them face of face at both ends for about 15% of their total length at each side, and then hold each side in one hand and push inside (and a little upward); the exact replica of a "Boomerang Shape" boat will be produced. One has to cut and shape a spearhead form for the floor, which would maintain the proper curvature of the model, in order to complete the replica.

The question is "how come"?

How come that the typical boat for the upper Nile from the earlier phase

of water transportation at that region is characterized by building materials that could not be found there, or even in other nearby areas? From the above described iconographic depictions we know that these "Boomerangs Shape" boats were slim, long canoes, not broad enough for rowing, but paddled in regular canoe propulsion fashion. Such type of a canoe must have been formed along water courses where long, straight tree trunks where at hand, and saws of quality fits for the task were manufactured, in order to cut planks from the tree. Having the offsprings of that alleged prototype depicted at Nubia and Upper Egypt early in the 4th millennium B.C. indicates either:

a. There were long, straight tree trunks along the upper Nile at that period, or sometimes earlier.

b. The people of that region came to settle there, from elsewhere bringing with them the tradition and the technical know-how for long plank boats. They most had immigrated from a place where this type of boat would fit the available building material and nautical practice. At their alleged place of origin they must have had saws big enough for slicing tree trunks. This type of saw could had been made of metal, but not as an exclusive choice. The archaeological finds from the prehistoric (Neolithic) settlements of the Nile valley and the Western Sahara include flint saws of size and finesse that might did the job. There was also the alternative of using a composite tool, a saw made of microliths inserted along a bone or stick of hardwood, much like the Neolithic sickles (see e.g. Emery, 1961, pl. 40).

Having no remnants of conifers or other long, straight tree trunks at the vicinity of the Nile valley since the beginning of the Holocene we have to consider the other explanation. This is backed by ideas of many scholars who would look for highly cultural immigrants that allegedly entered the Nile valley during the late 5th and early 4th millennia B.C., triggering the technical and social evolvement of the Amratic and Gerzean cultures and eventually facilitated the unification of Egypt under the Pharaonic regime. Some would consider these invaders to be of dolichocephal race (Negroid? Indo-Arian?) that is documented in Gerzean burials of nobelties in Upper Egypt (Derry 1956). Others would question the validity of anthropomorphic data for such a case and would follow the Mesopotamian connection (Emery 1961: 40; Kantor 1965: 14-17). The antidiffusionists, such as

Renfrew and Kemp would serve for Hoffmans claim for "Almost local" fertilizing immigrants from the "almost farmers" of eastern Sahara (the western desert) and the highlands of the Red Country (Hoffman 1979: 303-5). More problematic in terms of accessibility is the theory about Nubia and even Ethiopia (Adams 1984; Larsen 1957). It is true that there is resemblance between some Gerzean decorations and the aloe plant of Ethiopia (see e.g. Fig.3), but the cataracts and the distances would make it hard to bring down timbers from the Blue Nile. There is also no good geographical candidate for the combination of trees and water courses in East Africa that might evolved the alleged prototype for the "Boomerange Shape" boats.

Eastern Mediterranean provenance is quite tempting one, particularly so since we know of Byblus and the Cilician coasts as the prime sources for timbers into Egypt since the beginning of the Dynastic era. This hypothesis (Basch 1987: 60; Kapitän 1987) cannot be accepted because of two main reasons:

a. If this type of boat and the people to whom it belonged would have had come to the Nile valley from the north, how come we find their material culture and nautical tradition in the southern part first (and exclusively so for at least half a millennium)?

b. The technological idea of using canoes for maritime, or riverine transportation was never known in the Levant and would hardly be suitable for its coastal topography.

The last geographic region to be considered as a candidate for being the place of origin for the alleged prototype of the "Boomerang Shape" boats might be looked for in the west, the southern part of the Sahara, lake Chad and further to the West, in the region of the Upper Niger.

As farfetched as it appeared at first, there are score of clues and similarities that make this potential provenance a probable one:

a. During the time period of the early Holocene (7.000 - 3.000 B.C.) the southern half of the Sahara was much more humid than now. Geomorphological and paleoclimatological studies made a strong case for perennial rivers flowing from the high, rocky plateaus of central Sahara, south to the Greater Lake Chad, south-west to the Great Bend of the Niger, and east, from the Tibesti plateau toward the Nile (Fig. 10). A series of oasis in the Western desert were then incorporated, as agricultural areas within a Park-Savannah landscape (Butzer 1975; Hoffman, 1979: 221-243).

b. There is archaeological evidence to indicate that pastoral societies actually fared for long distances over the southern line of oasis, from Hoggar, via Tibesti, Gilf Kebir and Nabta, to the upper Nile Valley (McHugh 1971).

c. There are several similarities between certain traditions of the Pharaonic culture of the Nile Valley and the sub-saharan cultures of the area west of Lake Chad, such as Burnu, Mali and Songhai (Wainright 1949). Among those are the Matrilinear inheritance system and the tradition of ceremonial procession by water, carrying the late chieftains to their afterlife across the river or the lake. As intriguing as such a theory may be, and still in need for much more substantial data to support it, the west African venue is to be tried seriously (Fig. 11).

E. The Earliest Boats in the Southern Mediterranean and the adjacent Aegean archipelagos seem to be somewhat relevant to that enigma of long plank boats on the Nile, from both the conceptual point of view of nautical engineering and from striking similarities in "subsidiary" features. Whether it was a long raft (Kapitän, 1987) or a monoxylos (Basch 1987: 78) that was the early prototype of the lead models from Naxos, they represent a long plank type of a vessel. Basch makes reason in pointing out the revolutionary difference between the two types of canoes when it comes to their usage on high seas (op.cit.). In any case, the tapering raised end of these boats, and their construction by three lead tongues, fixed together in a U shape cross-section, are very much the same concept of engineering as the one we saw in the "Boomerang Shape" boats from Predynastic Egypt (Fig.12).

The group of engraved depictions of boats on the "poëlons" of frying pans from Syros and other Cycladic islands, are of the same general prototype, though with some additional features. The issue of the horizontal prolongation at their lower ends is beside the issue of this paper, but the almost vertical post of the other end and its dingled mat-like device can be compared with the upright prow of the black boat from the painted tomb in Hierakonpolis (Fig. 13) and the water-puring device depicted on many of the "Boomerang Shape" boats (see, e.g. Fig. 2: A.L. and Basch 1987, Fig. 78). It seems as if the zigzag decoration along the sides of some of the "poëlon" boats (Fig. 14: 3,4) might indicate that their boards of planks were sewn by ropes, much like the technique characterized the boats from the Nile Valley.

One might argue against drawing historical conclusions from imaginary iconographic resemblance, but there is still a conceptual paradox: how come long canoes were the type representing the nautical tradition, at least in its archaistic, ceremonial context, of the Cycladics, with no remnant of an out-rigger which would be mandatory, if one would attempt sailing on high seas? How come such typically riverine craft is the prototype of the later Greek Longboats (Basch 1987:81). These boats are far from being primitive and would represent continuous technical development in nautical engineering over many centuries (op.cit.). Yet one may wander where this tradition began?

There are many aspects of Lybian diffusion and even actual artifacts in Neolithic and Early Minoan Crete, as well as on the Greek mainland (see, recently, Bernal 1991: 95-99 for an update summation and bibliography). In the Biblical "Table of Nations" (Genesis, 10) it is Egypt which was the ancestor of the Cretans, from which the Philistines were descended (10,14). All originated from Ham the primeval father of the African nations.

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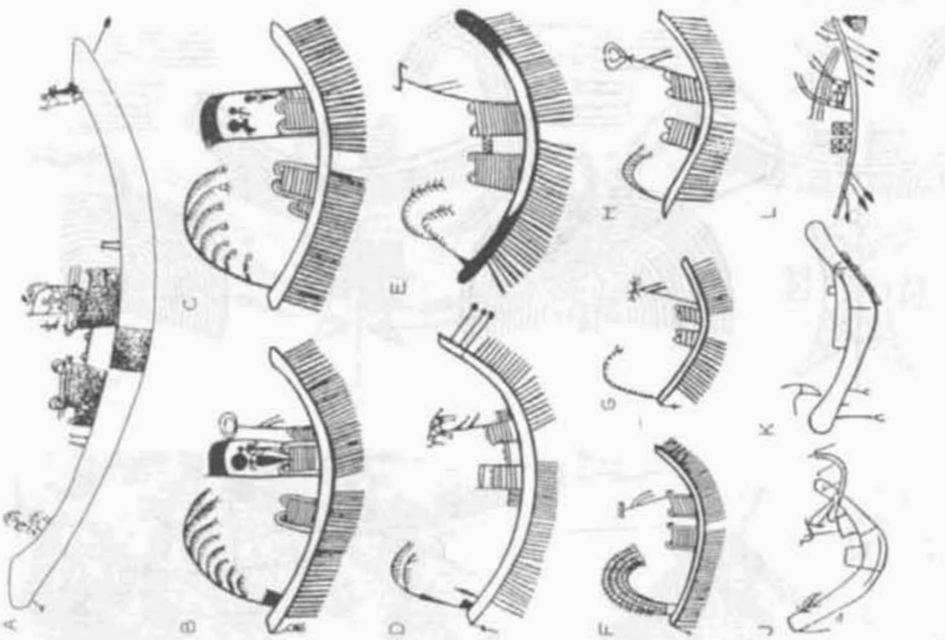
ILLUSTRATIONS

1. Map of Egypt, showing the distribution of important prehistoric sites (after Kantor, 1965, Fig. 1).
2. Various representations of Predynastic "Boomerang Shape" boats from Upper Egypt (after kantor 1944, Fig. 3).
3. The decoration of a Gerzean painted vase from the collection of the University College in London (after Bowen 1960, Fig. 4).
4. Rock-drawing of a Gerzean boat from Wadi Abbad in Upper Egypt (after Basch 1987, Fig. 102).
5. The Gerzean boats from the El Gebelein linen cloth (after Bass, 1972, Fig. 7)
6. The decoration of Gebel el Arak knife handle (after Emery 1961, Fig.1).
7. A model of Amratic boat at the Berlin Museum (after Göttlicher and Werner, Taf. VII).
8. Three clay models of Gerzean boats from Naqada (after Basch 1977, Fig. 95).
9. Wooden model of Gerzean boat from Cairo Museum (after Landström, 1970, Fig. 20).
10. The impact of changing climate. Schematic diagram of changing landscapes in Upper Egypt since the Acheulean (after Hoffman, 1979, Fig. 5).
11. Contemporary sailing canoe on the Niger, carrying agricultural products and propelled by square sail near its bow.
12. Lead model of a canoe from Naxos, now at the Ashmolean museum in Oxford (after Basch 1987, Figs. 155,156).
13. The Black Boat from the painted brick tomb at Hierakonpolis (after Bass 1972, Fig.6).
14. Selection of boat depictions from Early Cycladic frying pans.


A
B
C
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K
L

FIG. 2


MERIMDE
Fayum
ABUSIR EL MELEQ
HARAGEH
MAADI
EL OMARI
GERZEH
MATMAR
MOSTAGEDDA
BADARI
HEMAMIEH
QAU EL KEBIR
RAQAQNA
MAHASNA
ABYDOS
HU
AMRA
ABADIYEH
NAQADA
BALLAS
GEBEL EL ARAK
ARMANT
GEBELEIN
HIERAKONPOLIS
ABU ZEDAN
Wadi Hammamat
RED SEA
First Cataract

FIG. 1

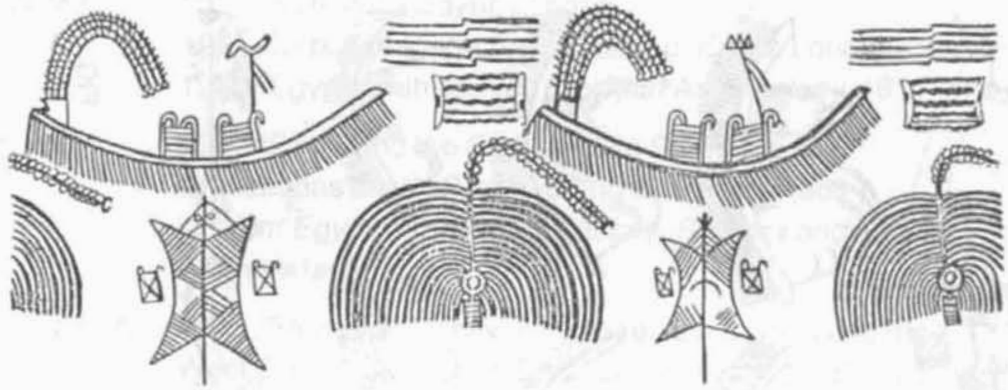


FIG. 3

FIG. 4

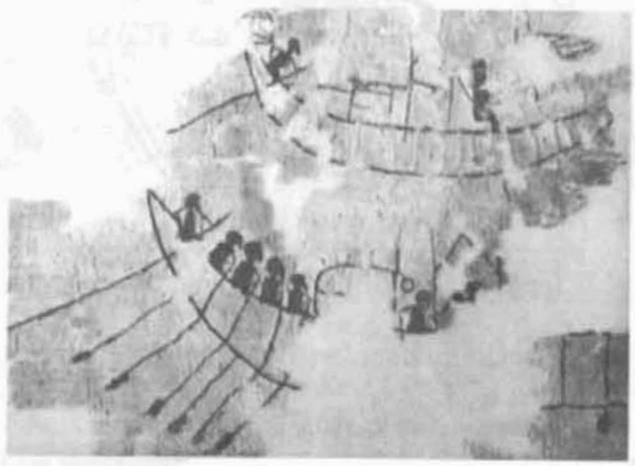


FIG. 5

FIG. 6

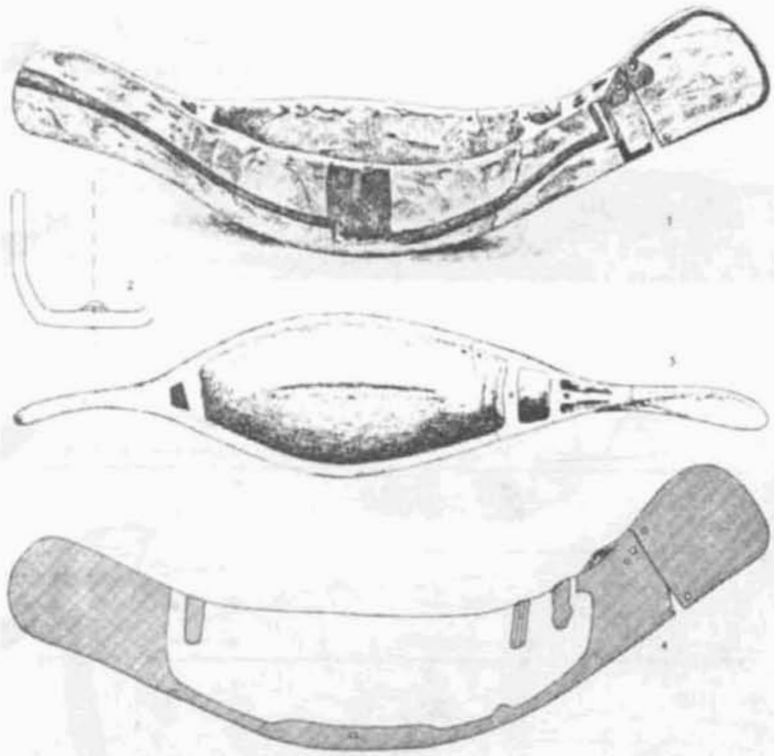
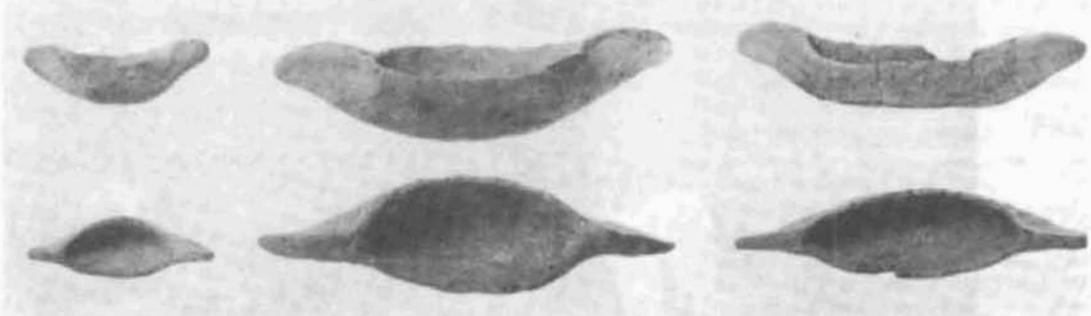


FIG. 7



A B C

FIG. 8

FIG. 9

FIG. 10

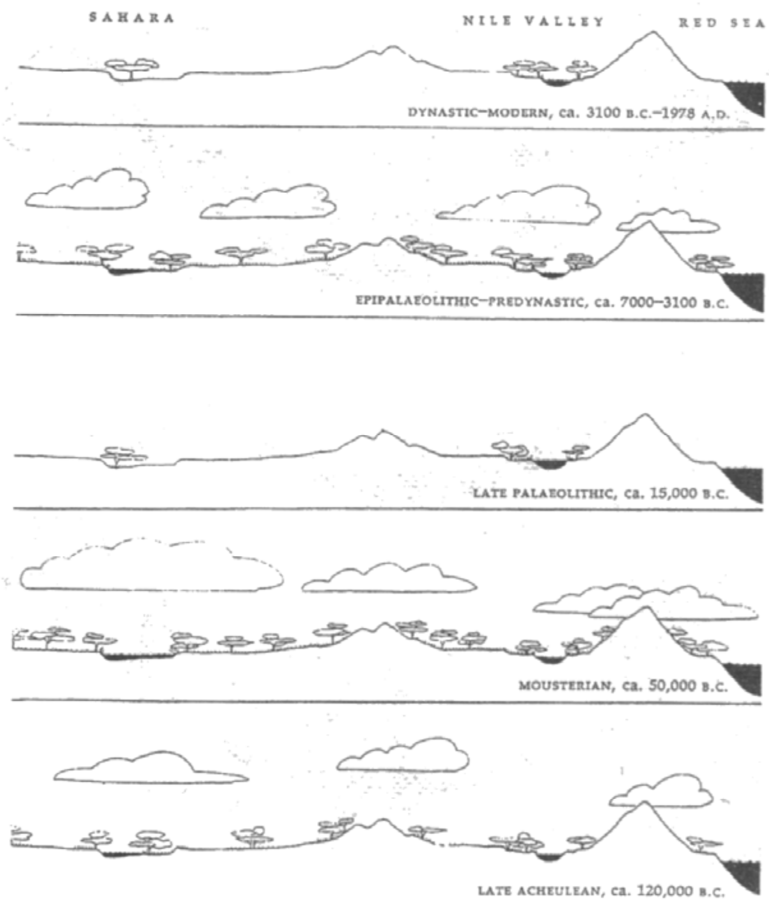

SAHARA
NILE VALLEY
RED SEA
DYNASTIC–MODERN, ca. 3100 B.C.–1978 A.D.
EPIPALAEOLITHIC–PREDYNASTIC, ca. 7000–3100 B.C.
LATE PALAEOLITHIC, ca. 15,000 B.C.
MOUSTERIAN, ca. 50,000 B.C.
LATE ACHEULEAN, ca. 120,000 B.C.

FIG. 11

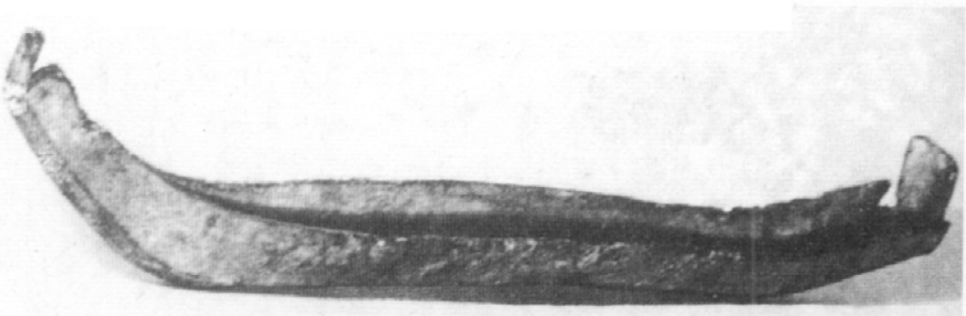


FIG. 12

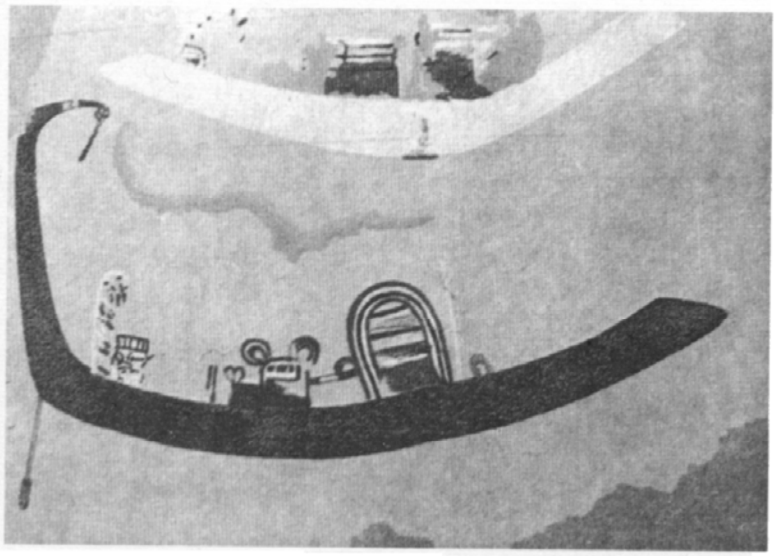
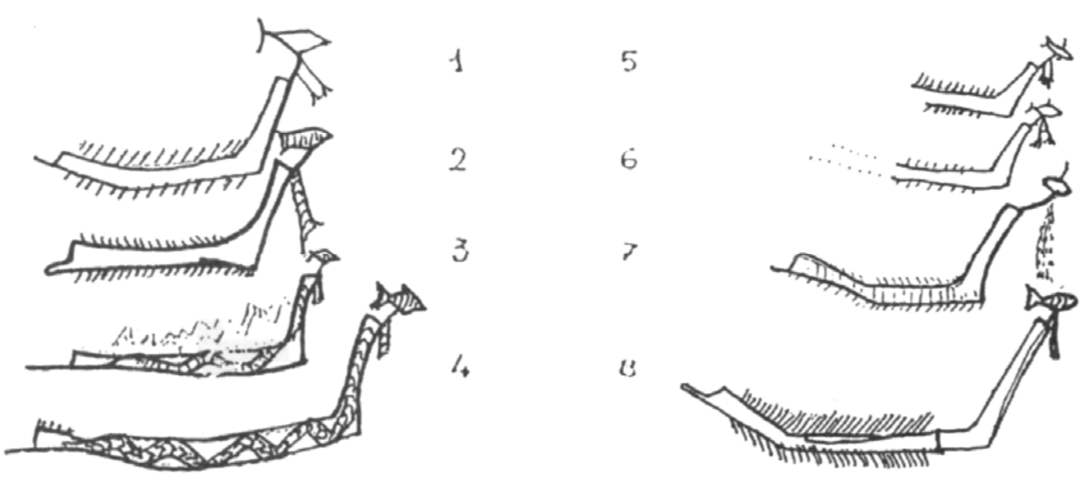


FIG. 13

FIG. 14



INVESTIGATION INTO THE HULL OF WRECK B (THE "POZZINO") IN THE GULF OF BARATTI - LIVORNO - ITALY

The remains of the boat lie on the seabed in two separate sections, from 20 to 30 cm apart, with one partly over the other.

The first section includes the keel, both extremities of which are visible, to which, are attached at the prow end the garboards and part of the second strakes. The group of timbers lies at an angle of 40° leftwards.

The second section includes the remains of the left side, and a large part of the skeleton and the remains of the inner planking are firmly attached to it. The section lies horizontally on the sea bottom and covers the first section for more than 6 metres. The break and the superimposition of the two sections are due to the original shock and not to a rotting process. The edges of the broken sections are in an excellent state of preservation. The tenons are cut clean and many of the nails in the frame are pulled out. Evidently the boat opened up as it hit the seabed, or else the shock that caused the sinking was so violent as to separate it into two parts.

Analysis of the various parts of the craft.

INNER PLANKING: Among the large quantity of stray timbers which are inside the craft, many, to judge from the way they were shaped and the manner or their nailing, must have belonged to the inner planking and the movable timber ledging, whilst a considerable number are still clearly *in situ*. The inner planking that is still in position includes movable planks laid longitudinally to the centre line of the ship, from 1 to 2.5 metres in length, 18 to 23 cm in width and 3 to 4 cm thick. Towards the centre of the boat they are held in position by two half-round ceilings, of 6 cm in diameter, which are fixed to the frames by slender copper nails.

The central timber ledging includes movable planks laid crosswise to the ship's centre line and with an unvarying length of 70 cm, except for those at the far end of the stern which have a trapezoidal shape and whose length diminishes to 30 cm. Their width is 20 cm and their thicness 3. Some of them exhibit small holes to facilitate their removal.

Among this timber ledging, to the left of the line of the keel, and at a point corresponding to frames 44 and 40, there is a rectangular hole bounded by small planks which are nailed to the floor timbers: this hole gives access to the bilge. The reinforcing planks show clear signs of having had some splintess removed with an axe, and the bilge had an outer cover of lead which was not nailed down. The bilge in question was for collecting water and a pump has probably been removed from it.

SKELETON: The keelson, which measures 14.5 cm in width and is 6 cm thick, is visible at the extremities of the hull, whilst in the centre it is hidden by the timber ledging. It has some small holes, one of which is situated towards the prow end and measures 6 X 8 cm and two towards the stern of more or less similar dimensions. To stern it has become detached from the frames and it is somewhat corroded. In at least one case it lies inside a notch of 1 cm in depth which was made in a frame, and it is held in position there by a wooden lock pin which has a copper nail running through it.

Of the first frames of the prow only the floor timbers have been preserved: two of these timbers have the watercourse in a central position and so are not connected to the keel, the third is flat but no nails are visible. The other three discovered in the prow area are very thin, rectangular in section (height 8.5 cm, width 7.5 cm) but not fashioned in conformity with the frame of the classical period.

The first of them consists of the floor timber (length 100 cm, height 22 cm, width 8 cm) which is fixed to the keel by a copper nail and to the keelson as described before. The 1st futtoks are butted to it and they are fixed to the planks by a wooden lock pin crossed through by a copper nail which enter it from the outside and is beaten back.

The radiographic investigation of a fragment of frame 44 has allowed us to determine that the copper clamps found in the bottom of the wreck and coming from the upper surface of the frames are nothing but bent-back portions of the nails which reinforce the wooden lock pins that join the frames to the planking: due to the effect corrosion, these have taken on a symmetrical shape so as to allow them to be mistaken for objects complete in themselves.

The other two prow frames have the same dimensions and positioning but the butting between the floor timber and the 1st futtock is not visible and all the signs are that they were hewn out of a single trunk of residual length 265 cm.

The frames visible to stern are laid in two different ways: the smaller ones (56 X 8 cm) are perpendicular to the keel while there are two bigger ones which were fashioned in such a way that they could be positioned with a marked sterward inclination. One of these is *in situ* and is apparently part of a single piece consisting of floor timber and knee, of which only the right hand one has been damaged by teredo. The other one has strayed and consists of floor timber and right-hand knee hewn from a single timber and has a scarf joint for joining to the left-hand knee which is *in situ* joined to the side. Neither of the two is joined to the keel but only to the outer planking by wooden lock pins reinforced by long beaten-back copper nails.

The intervals between the frames which are perpendicular to the keel are from 16 to 18 cm: and the positioning of the two unusually shaped stern frames gives the impression of a long tapering forward thrust.

OUTER PLANKING: The garboards are broadly trapezoidal in section, with a curved inside surface. They are from 18 to 20 cm wide and 5 cm thick. They have mortises which are 6.5 cm wide and 5 cm apart: towards the prow they are connected to the keel and to part of the second strakes.

The planks are from 20 to 22 cm wide to prow and from 16 to 18 to stern: their thickness is a constant 4 cm and they are smeared with vegetable resin on the inside.

The mortises are 5 cm wide and 0.5 cm in thickness and they are spaced apart from 5 to 7 cm in the prow and are displaced along the width of the planks: they occur in greater concentration in the stern and they are placed over each other at least two points.

The tenons are trapezoidal and positioned in the mortises with great precision. Some have two lock pins and in some instances the lock pins have copper nails through them.

A stray fragment of planking, whose original position is not known, displays a slanting mortise which is longer than normal and extends into half the thickness of the planking itself, a clear indication of the planking having been replaced.

At the far stern end the planking terminates with a slanting cut and has mortises in the short side also: it is clear that this is the point where the side of the boat terminates and that the joints were for union with the sternpost.

The hypothesis of a square stern which was first put forward cannot yet be excluded although the latest findings prompt us to greater caution.

KEEL: In the last two metres of the prow the keel becomes a great deal thinner finishing up only 4 cm thick at the head whilst its unchanging dimensions are: height 17 cm, width 18 cm with the rabbets 3 cm deep. On the other hand to stern the dimensions are height 17 cm, width 14 cm with the rabbets 3 cm. At both the extremities the mortises are 5 cm and they take tenons 0.5 cm thick. They are spaced out from 5 to 7 cms. The keel is unvariably trapezoidal in section and despite the fact that no traces of any fixing of the posts remain we may surmise that the prow was of cut-water type on account of the progressive tapering of the keel and the total absence of upward curvature.

LEAD COVERING: All the hull below the water line was covered with a lead sheeting of little less than a millimetre in thicness and nailed down with the classical large-headed small copper nails of square section. At the very end of the prow the sheeting increases conspicuously in thickness until it reaches 7 mm, as if it was a reinforcement to substitute the cut-water ram.

PIECES OF WOOD OUTSIDE THE GROUND PLAN OF THE CRAFT: Towards the prow end, under the side and unconnected with it there are a small beam, a plank and a half finished trunk of 12 cm diameter. It may be that the prow was reinforced from the outside but it is not a case of double planking for the keel has only a single rabbet.

Under the left stern side and not connected to it there are two beams, one of which is rectangular in section and may be a corner of the stern of a part of the rudder, and the other of which is rounded in section and has a square joint at one extremity (the other extremity is not visible) and its bark still on it: we are probably dealing here with a "soufflage". Under the side, about 80 cm from the keel, there is a second beam similar to the aforementioned and under that there is a large plank with two small joints and this may be the remains of the blade of a rudder or planking from the right side which slipped down during the shipwreck, or else a part of the superstructure. There are even more pieces of wood of some substance under the step of posidonia roots and there may be pieces of sternpost amongst them.

SHIP'S EQUIPMENT: Inside the craft there were some objects belonging to the ship's equipment amongst which a block and some metallic concretions.

The block lay between the keel and the ship's side, under a frame, evidently having ended up there during the shock of the sinking. It is formed of its main part which is made of a wood of yellowish colour measuring 14 X 18 X 9,2 cm and is hollowed out like a snatch-block in which is inserted a wheel of dark wood 7 cm thick and 14 cm in diameter. The extremity towards the wheel has a cog and there are several notches and channelings in the main part. It is a fixed tackle attached to the hull which can be used for the manoeuvring of the mast and sails, for a loading hook or even for the rudders.

Two of the concretions were X-rayed but with little success since numerous fragments of lead sheeting were enclosed within them.

The first one, recovered in 1989, is 30 cm in length, and contains the imprint of an iron bar bent into the shape of a ring at one end, curved asymmetrically, and brooken off at the other end, as if it were a hook which had been severely deformed by traction and flattening.

The second one is bigger (160 cm) and also contains pottery and wood fragments. It lay across the line of the ship about 4 m from the prow. The calk is of a rectangular piece of iron with a mean section of 3 X 10 cm and it is sufficiently visible in X-ray to determine that it is the shaft of an iron anchor.

CONCLUSION

The remains of the wreck lie on the seabottom for a full 12 metres in length and a little less than 3 metres in width. They may therefore be attributed to a boat of some fifteen metres, of elegant shape, with a cut-water prow, an extended and somewhat raised stern, and built not far from its place of sinking. It was certainly driven by sails (the small hole on the keelson towards the prow is sufficient to hold a small detachable mast) but there are not enough indications to exclude oars as a means of propulsion.

The external planking is markedly robust in nature and had already undergone repair, and this contracts with an essential, light inner skeleton: in this respect it does not conform to the classical rules of construction technique.

As has already been suggested (see Tropis III) we may venture the hypothesis that it is a local craft built for purposes only with difficulty demonstrable outside the sphere of supposition.

The wreck, which is dated in the second half of the second century B.C., was investigated by the Soprintendenza Archeologica Toscana during three seasons of excavation work in 1982, 1989 and 1990, which were carried out under the scientific direction of DRS Francesco Nicosia and Antonella Romualdi and the technical direction of underwater archaeologists Dr. Enrico Ciabatti and Dr. Edoardo Riccardi.

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CAPTIONS

1. The Gulf of Baratti during rough seas from the necropolis of Populonia.
2. Fragment of a wooden statuette (4cm).

3-5. Chest of metal vases and wooden containers for spices or cosmetics, during excavations.

4. One of the stones found amidst the cargo and probably lost by the Urinatores.

6. The 5th floor timber connected to the left side and the keel, with the garboards, moved by about 20 to 30 cm.

7-8. The extremity of the prow.

9. Plan of the prow.

10. The run of the keel.

11. Mortises in the garboard at the prow end.

12. Frames.

13. Radiography of a frame with clinched copper nail.

14. The keel towards stern.

15-16a. The left side towards stern and the keel.

16b. View from above with the frame from a different angle.

17. Plan of the stern section.

18-19. Photomontage. The complete plan.

20-21. The pulley block found in the stern.

22. The type of ship.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

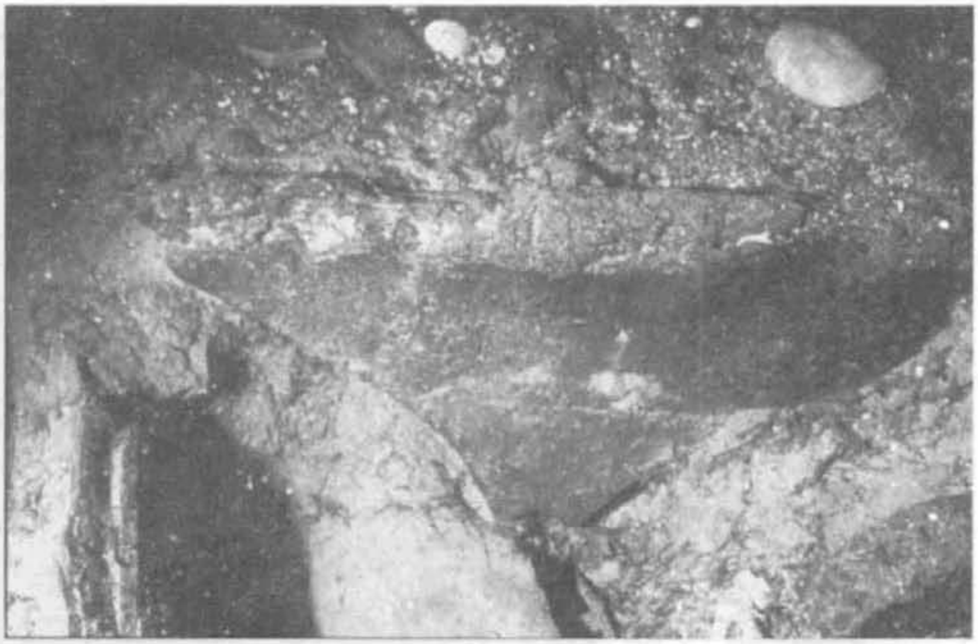
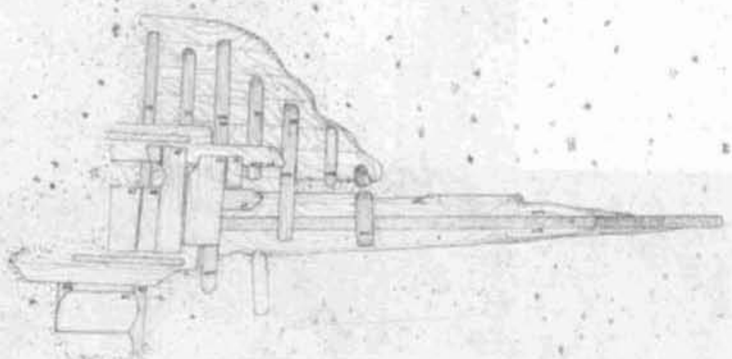


Fig. 6

Fig. 7

Fig. 8

Fig. 9



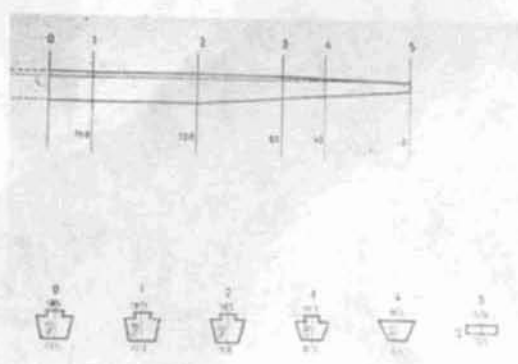


Fig. 10

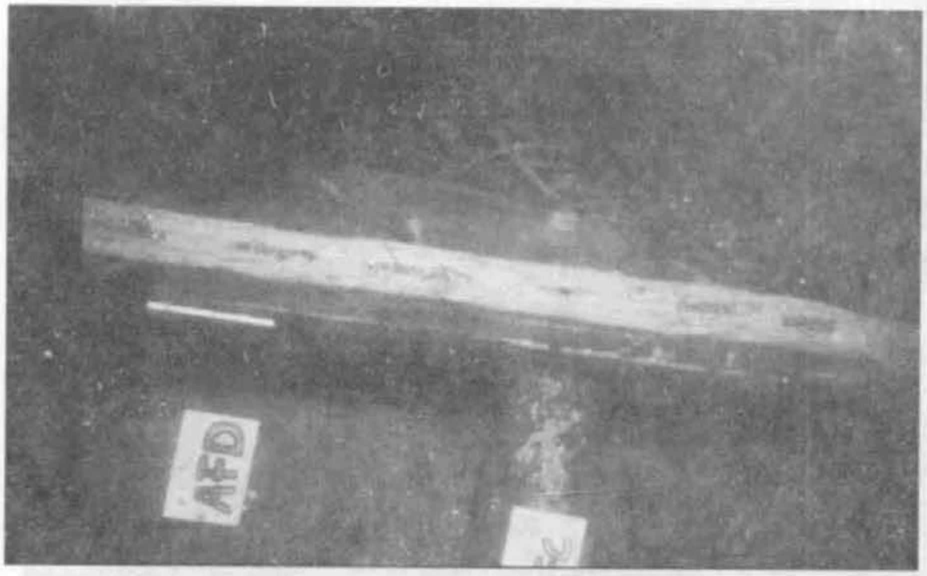


Fig. 11

Fig. 12

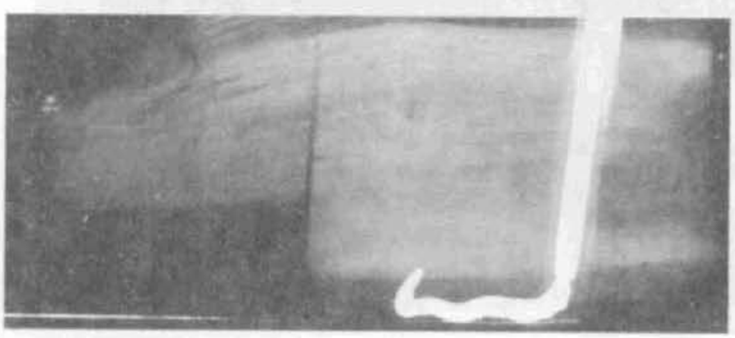


Fig. 13

Fig. 15

Fig. 14

Fig. 16a

Fig. 16b

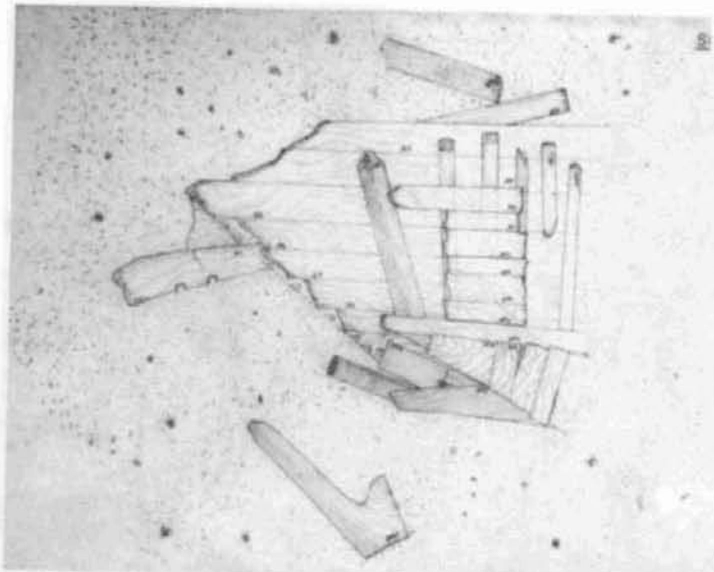


Fig. 17

Fig. 18

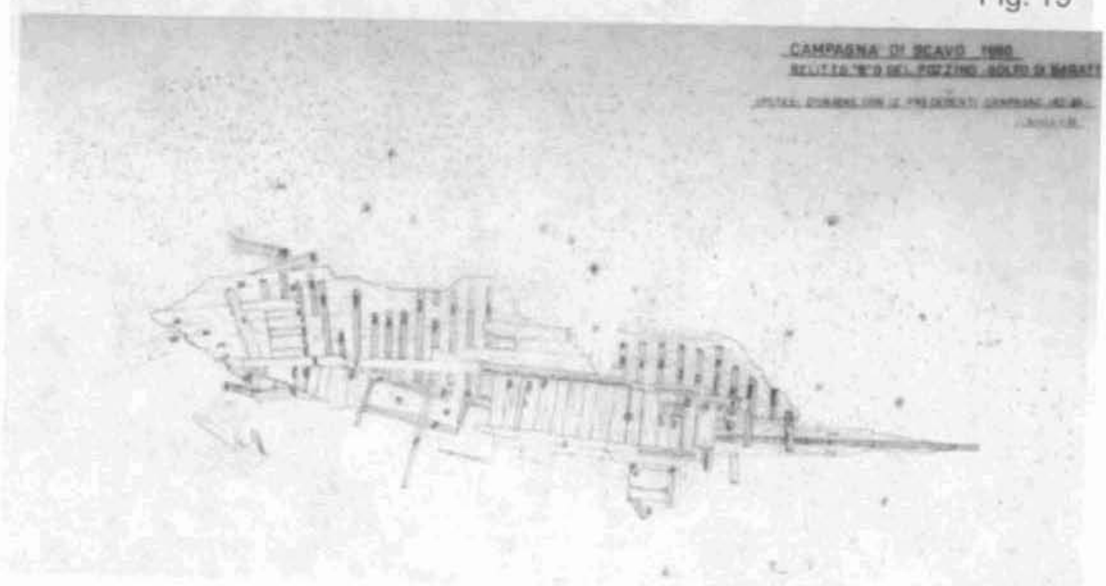


Fig. 19

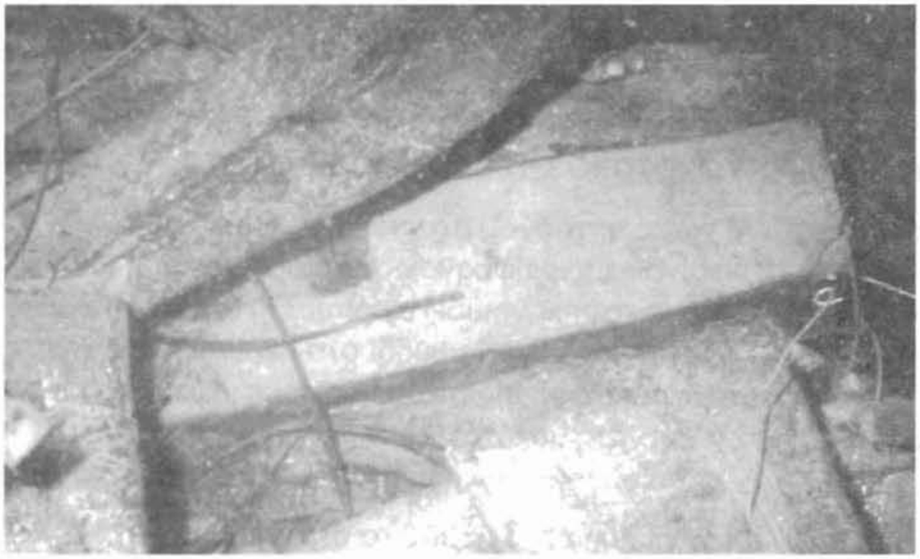


Fig. 20

Fig. 21

Fig. 22

ΑΠΕΙΚΟΝΙΣΕΙΣ ΠΛΟΙΩΝ ΣΕ ΤΟΙΧΟΓΡΑΦΙΕΣ ΣΤΟ ΝΑΟ ΚΟΙΜΗΣΗΣ ΤΗΣ ΘΕΟΤΟΚΟΥ ΚΑΛΑΜΠΑΚΑΣ

Σε μια επίσκεψή μου στα μοναστήρια των Μετεώρων τον Απρίλιο του 1985, παρατήρησα σε τοιχογραφίες απεικονίσεις πλοίων, οι οποίες παρουσιάστηκαν στο III Συμπόσιο Ναυπηγικής στην Αρχαιότητα, που πραγματοποιήθηκε στην Αθήνα στο Ίδρυμα Ευγενίδου από 24-27 Αυγούστου 1989. Στην ίδια επίσκεψη, παρατήρησα επίσης τοιχογραφίες με απεικονίσεις πλοίων και στο Ναό της Κοίμησης της Θεοτόκου στην πόλη της Καλαμπάκας, οι οποίες αποτελούν το θέμα της σημερινής παρουσίασης.

Στην αρχαιότητα στη θέση της σημερινής Καλαμπάκας, βρισκόταν το Αιγίνιο. Στο Μεσαίωνα η πόλη λεγόταν Σταγοί και κατά την τελευταία περίοδο της Τουρκοκρατίας (ΙΗ' αιώνας) πήρε το όνομα Καλαμπάκα[1].

Οι Σταγοί που αναφέρονται ως Επισκοπή από 9ο μ.Χ. αιώνα[2] είχαν καθεδρικό Ναό την Κοίμηση της Θεοτόκου, ο οποίος βρίσκεται στο κέντρο περίπου της σημερινής πόλης. Η σημασία του Ναού αυτού για τη βυζαντινή και μεταβυζαντινή τέχνη είναι πολυσήμαντη.

Για το Ναό της Κοίμησης της Θεοτόκου δεν έχει γραφεί ειδική μελέτη. Όσοι σε μελέτες τους για τα βυζαντινά μνημεία ανέφεραν τη Βασιλική της Καλαμπάκας, τόνισαν τον άμβωνα που υπάρχει στο μέσο του κυρίως Ναού[3] και για το λόγο αυτό θεώρησαν ότι το μνημείο ανήκει στους παλαιούς χρόνους[4] ή βασιζόμενοι στα αναγραφόμενα στο Χρυσόβουλλο του Αυτοκράτορα Ανδρόνικου[5] θεώρησαν το Ναό ως κτίσμα του ΙΓ' αιώνα[6] ή πολύ προγενέστερο[7].

Η βυζαντινή Βασιλική της Κοίμησης της Θεοτόκου ανηγέρθηκε στο χώρο παλαιοχριστιανικού Ναού που καταστράφηκε[8]. Ο σημερινός Ναός είναι Βασιλική βυζαντινών χρόνων 30Χ13μ., που χωρίζεται σε τρία κλίτη, έχει δυο νάρθηκες, δηλαδή εσωτερικό νάρθηκα ή Λιτή και εξωνάρθηκα. Κατά μήκος του νότιου κλίτους εκτείνεται ανοικτή στοά. Το μέσο κλίτος της Βασιλικής είναι ψηλότερο.

Οι μεγάλες επισκευές του ναού έγιναν το 1573, οπότε ολόκληρος τοιχογραφήθηκε εκ νέου[9]. Ιδιάζον στοιχείο της Βασιλικής της Καλαμπάκας είναι ο χωρισμός των κλιτών με τοίχους, τρόπος που απέχει από τη συνήθη εναλλαγή πεσσών και κιόνων που παρατηρείται στις μεσαιωνικές και παλαιοχριστιανικές Βασιλικές.

Ο αρχιτεκτονικός ρυθμός του ναού είναι της τρίκλιτης Βασιλικής, του ανάμικτου τύπου από ελληνιστικά και ανατολικά στοιχεία· έχει δηλαδή το υπερυψωμένο και φωτισμένο μέσο κλίτος, το νάρθηκα και το τρίβηλο των ελληνιστικών Βασιλικών, τους θόλους και την έλλειψη των υπερώων των ανατολικών[10]. Ο τύπος αυτός των Βασιλικών είναι χαρακτηριστικός για τις βυζαντινές Βασιλικές της δεύτερης χιλιετίας και απαντάται σε σειρά μνημείων της βόρειας Ελλάδας[11].

Μεγαλύτερες ενδείξεις για τη χρονολόγηση της βυζαντινής Βασιλικής της Καλαμπάκας παρέχουν οι πολύτιμες τοιχογραφίες που διασώθηκαν και διατηρήθηκαν σε καλή κατάσταση στο βόρειο τοίχο του διακονικού του ναού. Η τεχνοτροπία τους μαρτυρεί ότι είναι έργα προγενέστερα της τελευταίας αναγέννησης του 13ου και 14ου αιώνα. Δεν έχουν ούτε την κίνηση ούτε την ιδιάζουσα πλαστικότητα των προσώπων και ενδυμάτων της παλαιολόγειας ζωγραφικής. Από τις λεπτομέρειες της τεχνοτροπίας γίνεται φανερό ότι τα λείψανα αυτά της αρχικής ζωγραφικής της Βασιλικής της Καλαμπάκας είναι έργα του ελληνιστικού κλάδου της ζωγραφικής του τέλους του 11ου ή το πολύ των αρχών του 12ου αιώνα.

Ο υπόλοιπος ναός τοιχογραφήθηκε εκ νέου, σχεδόν ολόκληρος, το 16ο αιώνα, όπως φανερώνει γραπτή επιγραφή πάνω από την πύλη του εσωνάρθηκα που λέει τα εξης:

Ο πανσεβάσμιος και θείος ναός ούτος της υπεραγίας δεσποίνης αγίας ημών Θεοτόκου και αειπαρθένου Μαρίας ιστορήθη διά συνδρομής και εξόδου παρά του θεοφιλεστάτου Επισκόπου της αγιωτάτης επισκοπής Σταγών κυρίου Ιωάσαφ ομού δε και μετά τιμιωτάτων κληρικών και αρχόντων: Παχώμιος Ιερομόναχος, Σταμάτιος ιερεύς και οικονόμος, Γεώργιος ιερεύς και σακελλάριος, Δημήτριος ιερεύς και σκευοφύλαξ, Ιωάννης ιερεύς και σακελίων, Γεώργιος ιερεύς και κλησιάρχης, Παναγιώτης ιερεύς και χαρτοφύλαξ, Γεώργιος ιερεύς και καniστρίσιος, Χριστόφορος ιερεύς και Ιερομνήμων Στεφάνου Ιωάννου και φίλου.

Ιστορήθη δε και δια χειρός καμού του αμαρτωλού Νεοφύτου
μοναχού του Κρητός. Υπάρχου υιός και του Θεοφάνους μοναχού,
αρίστου αγιογράφου, όστις την επίκλησιν Μπαθήχας, ομού δε
και μετά του Κυριαζή τω ιερεί τω όντι εκ της αυτής χώρας.
Αρχιερεύοντος δε του πανιερωτάτου Μητροπολίτου Λαρίσσης
Κυρίου Δανιήλ
εν τω ζπά ινδ. ά και ετελειώθη μηνί Αυγούστου ιε' (7081=1573).

Η πληρέστατη αυτή επιγραφή καθορίζει τον ακριβή χρόνο των τοιχογραφιών, αναφέρει τα ονόματα των χορηγών ιερέων με τα αξιώματα και τους τίτλους τους και τα ονόματα των τριών ζωγράφων που ήταν κληρικοί και Κρήτες, από τους οποίους ο Θεοφάνης που αποκαλείται Μπαθήχας (Μπαθάς) θεωρείται άριστος αγιογράφος. Πρόκειται για τον θεοφάνη Στρελίτζα ή Μπαθά[12] που κατά το έτος 1527 τοιχογράφησε το καθολικό του Μοναστηριού του Αγίου Νικολάου Αναπαυσά[13] και κατά τα έτη 1535 και 1546 εργάστηκε στις Μονές Μεγίστης Λαύρας και Σταυρονικήτα στο Άγιο Όρος. Τη σχέση των ζωγράφων Μετεώρων και Αγίου Όρους γνωρίζουμε και από το σύγχρονο του Θεοφάνη Φράγκο Κατελάνο, που διακόσμησε το παρεκκλήσιο του Αγίου Νικολάου στη Μονή Μεγίστης Λαύρας (1560) και το νάρθηκα του Καθολικού της Μονής Βαρλαάμ Μετεώρων (1563).

* * *

Η θάλασσα και η θαλασσινή ζωή δεν είχαν σπουδαία θέση στη βυζαντινή ζωγραφική[14], αν και τα όρια του Βυζαντίου τα καθόριζε η θάλασσα και οι περίοδοι ευημερίας και κατάπτωσής του είχαν σχέση με αυτή[15]. Στις τοιχογραφίες, τις εικόνες και τις μικρογραφίες, η θάλασσα είναι μια επιφάνεια με κυματιστές γραμμές πυκνά και ρυθμικά βαλμένες για να παραστήσουν τον κυματισμό της. Τη ζωντανεύουν ψάρια και καράβια, όπου το απαιτεί η εικονογραφία της παράστασης. Τα θαλασσινά θέματα είναι λιγοστά, παρμένα από την Παλαιά και την Καινή Διαθήκη. Η Δημιουργία, η Κιβωτός του Νώε, το πέρασμα της Ερυθράς, η θαύμαστή αλιεία, ο Χριστός επιτιμών τους ανέμους, η θάλασσα στη Δευτέρα Παρουσία[16]. Σε τοιχογραφίες και εικόνες με τη Δευτέρα Παρουσία, μια από τις πιό χαριτωμένες μορφές που ξεκουράζει από τα διάφορα τέρατα είναι η προσωποποίηση της θάλασσας[17]. Στα νερά, ανάμεσα σε μεγάλα ψάρια και τέρατα που ξερνούν ανθρώπινα μέλη, κάθεται επιβλητική στη ράχη ενός τέρατος 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.

Οι δυο τοιχογραφίες με απεικονίσεις πλοίων στη Βασιλική της Καλαμπάκας βρίσκονται στη Λιτή (εσωνάρθηκα) του Ναού. Η πρώτη απεικόνιση (εικ. 1) βρίσκεται στην πρώτη ζώνη του βόρειου τοίχου. Η τεχνοτροπία της είναι της Κρητικής Σχολής, έργο του γιού του Θεοφάνη Στρελίτζα ή Μπαθά Νεόφυτου και χρονολογείται το έτος 1573. Στην απεικόνιση παρατηρούμε αλιευτικό πλοιάριο που οδηγείται με τεράστιο κουπί σαν πηδάλιο, όπως όλα τα πλοιάρια των ποταμών και λιμνών. Δυο από τους επιβαίνοντες προσπαθούν να ανασύρουν το γεμάτο με ψάρια δίχτυ, ενώ τρίτος προσπαθεί να βοηθήσει με κουπί που κρατεί από το πλατύ του μέρος. Το πλοίο στη βυζαντινή εικονογραφία συμβολίζει την εκκλησία και τα ψάρια τους "προς αλιείαν" εθνικούς[18]. Ο Χριστός προσκαλεί τους μαθητές του να γίνουν "αλιείς ανθρώπων[19]"

Τα ναυπηγικά στοιχεία του σκάφους δεν είναι λεπτομερή. Πλώρη και πρύμνη είναι το ίδιο υψωμένες, η κουπαστή διακρίνεται ολόγυρα στο πλοιάριο, όπως και η αρμολογία των μαδεριών του περιβλήματος. Πρόκειται προφανώς για τη σκηνή της "θαυμαστής αλιείας", η οποία είναι συνήθης στην ιστόρηση των ναών[20].

Αν συγκρίνουμε την παραπάνω σκηνή με απεικόνιση στο Ιερό Βήμα της Μονής Μεταμόρφωσης (Μεγάλο Μετέωρο) Μακεδονικής τεχνοτροπίας (εικ. 2) με θέμα "βάλετε εις τα δεξιά μέρη του πλοίου το δίκτυον"[21] και άλλη απεικόνιση από την ίδια Μονή (εικ. 3) με θέμα "η άγρα των ιχθύων"[22] που έχει φιλοτεχνηθεί από άγνωστο εκπρόσωπο της Κρητικής Σχολής που μπορεί να είναι και ο Θεοφάνης, θα παρατηρήσουμε ότι στην πρώτη, αλλά πολύ περισσότερο στη δεύτερη απεικόνιση τα πρόσωπα και τα ναυπηγικά χαρακτηριστικά του πλοιαρίου είναι παρόμοια με την απεικόνιση στη Βασιλική της Καλαμπάκας, πράγμα το οποίο μας οδηγεί στο συμπέρασμα της ύπαρξης "ανθιβόλων"[23].

Η δεύτερη απεικόνιση είναι η πρώτη παράσταση της δεύτερης ζώνης του δυτικού τοίχου και φέρει την επιγραφή: "επετίμησε τω ανέμω και της θαλάσσης" (εικ. 4). Η απεικόνιση παρουσιάζει τη σκηνή που ο Χριστός καταπαύει την τρικυμία[24]. Ένα πλοίο βρίσκεται στην τρικυμισμένη θάλασσα. Οι μαθητές του Ιησού γεμάτοι φόβο μήπως καραποντισθούν από τη δυνατή τρικυμία, προσπαθούν να ξυπνήσουν τον Ιησού και τον παρακαλούν να τους σώσει. Ο Ιησούς σηκώνεται στη μέση του πλοίου και αφού επετίμησε τη θάλασσα, έγινε γαλήνη. Η σκηνή είναι συνήθης στις απεικονίσεις ιστόρησης των ναών και περιγράφεται στην Ερμηνεία της Ζωγραφικής Τέχνης (Οδηγό Ζωγραφικής) του

Ιερομόναχου Διονυσίου εκ Φουρνά[25]. Ο Διονύσιος, "αγιογράφος ακμάσας περί τα μέσα του 18ου αιώνα, συνέταξε το περί ου ο λόγος βιβλίον, παραλαβών εξ αρχαιοτέρων ερμηνειών του 16ου και 17ου αιώνος σχεδόν άπαν το υλικόν επαυξήσας αυτό τη βοηθεία ενός των μαθητών του, Χίου, Κυρίλλου ονομαζομένου"[26].

Συγκρίνοντας την παραπάνω απεικόνιση με μικρογραφία από Βυζαντινό Ευαγγέλιο του XI αιώνα που βρίσκεται στην Εθνική Βιβλιοθήκη των Παρισίων[27] με το ίδιο θέμα κατάπαυσης της τρικυμίας από τον Ιησού (εικ. 5), παρατηρούμε ότι και στις δύο απεικονίσεις τα πανιά των πλοιαρίων είναι όμοια με επί πλέον πανί σε σχήμα ημικύκλιου επάνω από το πανί στην απεικόνιση του ναού της Κοίμησης της Θεοτόκου. Παρόμοια με την απεικόνιση στη Βασιλική της Καλαμπάκας είναι η απεικόνιση πλοιαρίου σε χειρόγραφο της Πατριαρχικής Βιβλιοθήκης Ιεροσολύμων (εικ. 6), στην όποια μορφή σκάφους και σχήμα πανιού παρουσιάζουν ομοιότητες[28].

Στο πλοιάριο που απεικονίζεται στη Βασιλική της Καλαμπάκας, φαίνεται καθαρά το πρυμναίο πηδάλιο, η υπερυψωμένη πλώρη και τα άλλα ναυπηγικά και ναυτικά στοιχεία του (ιστός, πανιά, εξαρτία, αρμολογία περιβλήματος, κουπαστή κ.τ.λ.), αντί του πηδαλίου με δυο κουπιά στην πρύμνη και του καμπυλωτού σχήματος του σκάφους, που παρουσιάζονται στις δυο άλλες απεικονίσεις.

Επίσης σε απεικόνιση πλοίου σε τοιχογραφία της Μονής Αγίου Νικολάου Αναπαυσά στα Μετέωρα (εικ. 7), που έγινε από το Θεοφάνη Στρελίτζα ή Μπαθά πατέρα του Νεόφυτου και κυριότερο εκπρόσωπο της Κρητικής Σχολής, παρατηρούμε τα ίδια ακριβώς ναυπηγικά και ναυτικά στοιχεία όπως και στην απεικόνιση της Βασιλικής της Καλαμπάκας.

Σε ένα μωσαϊκό του 12ου αιώνα από τον Άγιο Μάρκο της Βενετίας (εικ. 8) έχουμε απεικόνιση πλοίου παρόμοια με της Βασιλικής της Καλαμπάκας και της Μονής Αγίου Νικολάου Αναπαυσά Μετεώρων. Στην απεικόνιση του μωσαϊκού φαίνεται το πηδάλιο με τα δυο κουπιά και προφανώς το θέμα της σκηνής είναι το ίδιο (ο Χριστός καταπαύει την τρικυμία), αφού ο Χριστός φαίνεται στην πρύμνη να καθοδηγεί τους μαθητές στο χειρισμό των ιστίων.

* * *

Συμπεράσματα:

Από τις παραπάνω περιγραφές μπορούμε να καταλήξουμε στο συμπέρασμα ότι οι απεικονίσεις αποδίδουν τύπους καραβιών της εποχής και δεν έχουν φανταστικό σχήμα, η μορφή τους είναι απλή, αλλά ορισμένα χαρακτηριστικά είναι φανερά, όπως η χρήση μοναδικού ή διπλού πηδαλίου, τριγωνικού ιστίου κ.τ.λ. Ορισμένα από τα στοιχεία αυτά μας οδηγούν με βεβαιότητα στον επηρεασμό των ζωγράφων από δυτικά πρότυπα[29].

Το ερώτημα που προκύπτει είναι από που οι ζωγράφοι εμπνέονταν για την απεικόνιση των πλοίων. Ίσως η προσωπική εμπειρία να χρησιμοποιήθηκε από μερικούς που επισκέπτονταν διάφορους τόπους και λιμάνια[30]. Δεν θα πρέπει να απορρίψουμε τη χρήση εγχειριδίων (sketch-books), στα οποία τύποι πλοίων και περιγραφές ναυτικών σκηνών από την Αγία Γραφή είχαν αναφερθεί και εικονογραφηθεί, όπως η ερμηνεία της Ζωγραφικής Τέχνης του Ιερομόναχου Διονυσίου εκ Φουρνά. Περισσότερο πιθανό, φαίνεται οι ζωγράφοι να χρησιμοποίησαν και τα δυο, προσωπική εμπειρία, εφόσον συνήθιζαν να ταξιδεύουν από τόπο σε τόπο και τύπους πλοίων και ναυτικές σκηνές, τις περιγράφές των οποίων έβρισκαν σε εγχειρίδια βιβλία (sketch-books).

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20. Ιωάννης Ευαγγέλιον ΚΑ' 1-9 "... βάλετε εις τα δεξιά μέρη του πλοίου το δίκτυον και ευ-

ρήσετε..."
21. Ιωάννης, Ευαγγέλιον ΚΑ' 6.
22. Ιωάννης, Ευαγγέλιον ΚΑ' 11.
23. Ανθιβόλιον εκ του αντιβάλλω και ανθίβολον, κοινά αχνάρι. Η χρήση του είναι γνωστή από τους αρχαίους για τη ζωγραφική, όχι μόνο στους τοίχους, αλλά και σε αγγεία, πινάκια κ.τ.λ. Μιχαήλ Χαριλ. Γκητάκου, Ο εν ελαιώνι των Μεγάρων Βυζαντινός Ναός του Σωτήρος Χριστού σελ. 56, εν Αθήναις 1953. "Ανθίβολον ήτο είδος υποδείγματος σχεδίου δια την ζωγραφικήν, κοινώς αχνάρι, το οποίον εχρησιμοποίουν και οι αρχαίοι δια την ζωγραφικήν επ' αγγείων, πινακίων, τοίχων κ.α. Ελαμβάνοντο δε είτε απ' ευθείας εκ της πρωτοτύπου εικόνος είτε εκ παλαιοτέρου ανθιβόλου. Μετά την επάλειψιν τούτου δια καρβούνου ετίθετο επί του κονιάματος, επί του οποίου απετυπούτο το εν σχεδίω δια πολυχρώμων ή δια λεπτών γραμμών (αποτελουμένων εκ συνεχών οπών δια λεπτής βελόνης) εικόνισμα. Μετά τούτο επηκολούθει η δια του χρωστήρος επεξεργασία της αγιογραφίας, η οποία εν γενικότητι διετήρει τον αρχικόν τύπον, αλλ' εν τη εκφράσει διέφερε συνήθως τούτου, δημιουργούσά τι το ίδιον, το νέον, το μη εκ πιστής απομιμήσεως αντίτυπον, αλλ' εμφαίνον την καλλιτεχνικήν δύναμιν και ικανότητα του ζωγράφου, μη καταδικάζοντος δια της εργασίας του εις στασιμότητα την τέχνην δια της δουλικής προσηλώσεώς του εις το αρχικόν, αλλ' ωθούντος διά της συμβολής του ταύτην εις πλουσίαν γονιμότητα". Μιχαήλ Χαρ. Γκητάκου, Η εν Σαλαμίνι Ιερά Μονή της Φανερωμένης σελ. 50-51, εν Αθήναις 1952. Βλέπε και: 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. 51-55, Αθήναι 1926. Διονυσίου του εκ Φουρνά, Ερμηνεία της Ζωγραφικής Τέχνης υπό Α. Παπαδοπούλου-Κεραμέως σελ. 7-10, εν Πετρουπόλει 1909.
24. Ματθαίος Ευαγγέλιον Η' 23-27. Μάρκος, Ευαγγέλιον Δ' 36-43. Λουκάς, Ευαγγέλιον Η' 22-25.
25. Διονυσίου του εκ Φουρνά, Ερμηνεία της Ζωγραφικής Τέχνης υπό Α. Παπαδοπούλου-Κεραμέως, εν Πετρουπόλει 1909. Η περιγραφή της σκηνής βρίσκεται στη σελίδα 92: "Ο Χριστός επιτιμών τοις ανέμοις και τη θαλάσση. § 27. Θάλασσα ταραγμένη και μέσον πλοιάριον αρμενίζον και ο Χριστός εις την πρύμνην κοιμώμενος· και ο Πέτρος και ο Ιωάννης επάνωθεν αυτού, έχοντες προς αυτόν απλωμένα τα χέρια μετά φόβου· και ο Ανδρέας κρατών το τιμόνι του πλοιαρίου και ο Φίλιππος και ο Θωμάς λύοντες τα άρμενα· και πάλιν ο Χριστός εις την μέσην του πλοιαρίου απλώνων τα χέρια κατά των ανέμων και επιτιμών αυτών· και άνωθεν εις τα νέφαλα οι άνεμοι φυσώντες εις τα άρμενα".
26. Παντελής Ζωγράφος, όπ. παρ. σελ. 49. Αθήναι 1926.
27. Bibliothèque Nationale, Evangiles avec peintures Byzantines du XIe Siècle, tome I numéro 66, Paris n.d.
28. Κώδικας Τάφου 14 της Πατριαρχικής Βιβλιοθήκης Ιεροσολύμων.
29. Μανόλης Χατζηδάκης, Η Μεταβυζαντινή Τέχνη (1453-1700) και η ακτινοβολία της, Ιστορία του Ελληνικού Έθνους τόμος Ι σελ. 420 και 422, Εκδοτική Αθηνών Α.Ε. χ.τ. χ.χ.
30. Μανόλης Χατζηδάκης, όπ. παρ. σελ. 420-422, Εκδοτική Αθηνών Α.Ε. χ.τ. χ.χ.

ΕΙΚΟΝΕΣ

1. Τοιχογραφία με τη "θαυμαστή αλιεία" στην Κοίμηση Θεοτόκου Καλαμπάκας.
2. Τοιχογραφία με τη "θαυμαστή αλιεία" στη Μονή Μεταμόρφωσης Μετεώρων.
3. Τοιχογραφία με την "άγρα των ιχθύων" στη μονή Μεταμόρφωσης Μετεώρων.
4. Ο Χριστός "επιτιμά" τους ανέμους. Τοιχογραφία από την Κοίμηση της Θεοτόκου.
5. Ο Χριστός καταπαύει την τρικυμία από Ευαγγέλιο της Εθνικής Βιβλιοθήκης

στο Παρίσι.

6. Απεικόνιση από κώδικα της Πατριαρχικής Βιβλιοθήκης Ιεροσολύμων.
7. Ο Χριστός καταπαύει την τρικυμία. Τοιχογραφία από τη Μονή Αγίου Νικολάου Αναπαυσά στα Μετέωρα.
8. Παράσταση σε μωσαϊκό από τον Άγιο Μάρκο της Βενετίας.


FIG. 3


FIG.4


FIG. 1


FIG. 2

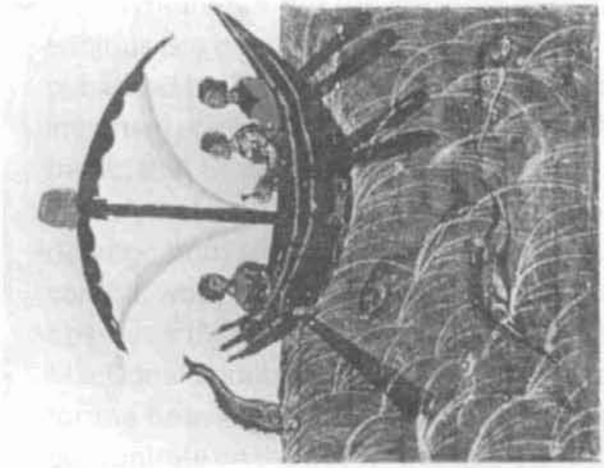

FIG. 6

FIG. 8

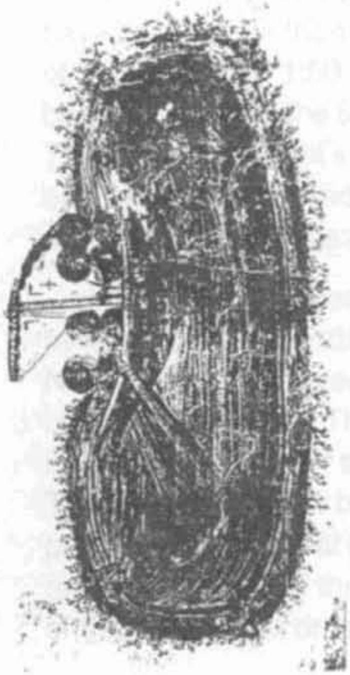

FIG. 5

FIG.7

PORTAGE OF SHIPS ACROSS THE ISTHMUS

Whether or not the ancients hauled merchant ships (ὁλκάδες)[1] over the Isthmus is a question that probably never will be answered satisfactorily. A note published by R. M. Cook puts the evidence succinctly in line. Among the more important points Cook makes are that the *Diolkos* was used primarily for commercial traffic, that Strabo's πορθμεῖα may have been particular types of transportable vessel, that the *Diolkos* was probably not a commercial success, that potential of damage from stress prohibited transport of loaded vessels and that vessels, if carried, would have moved separately from their cargo. Most importantly, Cook observes that a ship's weight was the critical factor.[2] In another note, B. R. MacDonald doubts that ships were carried at all and that the *Diolkos* was used for the heaviest cargoes, namely marble and timber.[3] Cook's latest thoughts concentrate on the cost of transport and the advantages of a paved track over an earthen road.[4] Although I cannot concur with all of Cook's conjectures, I will try to elaborate on his discussion.

The Isthmus is a narrow neck of land, about 6 kms. across between the Greek mainland and the Peloponnese and rises to a minimum of 80 m. above sea level at its crest. The *Diolkos*, the paved road way which in antiquity described a serpentine path as it exploited the shallowest grade over the Isthmus, cannot have been longer than 8 kms and its average grade, therefore, was in the range of 1:38 (2.7%) to 1:50 (2%). Excavated portions of the *Diolkos* reveal it to have been built early in the 6th century and plausibly the work of the tyrant Periander. The width of the built surface ranges, along the 450 m. excavated, between 3.6 and 6.0 m. It is scored by the wheels of transport vehicles whose wheelbase averaged 1.5 m. across. On either side of the paved portion were earthen roads.[5]

Historical sources mention five successful and one unsuccessful attempt, by naval forces, to portage warships over the Isthmus between 428 and 30 B.C.[6] Niketas Oryphas, revealing his familiarity with ancient literature, effected a sixth crossing in A.D. 881.[7] The question that arises is: were the admirals commemorated by historians for their enterprise or for their achievement of the commonplace? The answer, surely, is both. The admirals accomplished a manoeuvre infrequently performed but of great military advantage. On the other hand, small vessels were regularly treated in this fashion for profit by a large group of Corinthian minor entrepreneurs: ox drivers and small shipowners.

In considering the question whether ships were moved across the *Diolkos,* Aristophanes' use, as a simile, of the Corinthians' frequent portage of ships should not be neglected;[8] for if ships were only rarely or never transported, there would be no humour in his lines. Still less should the explicit testimony of Pliny and Strabo be ignored.[9] If Strabo's use of υπερνεωλκουσιν refers to merchant ships (ολκας) or trolleys used for moving ships (ολκους), the conclusion that vessels were regularly moved on the *Diolkos* is inescapable. It is evident that these vessels were not large and that weight, as Cook rightly observes, must have been the overriding consideration.

A recent reconstruction of a replica of a trireme, a vessel designed to be beached or hauled up shipways, and occasionally carried over great distances, permits us to estimate the upper weight level that on five attested occasions was transported over the *Diolkos.* The trireme Olympias, reconstructed by J. S. Morrison and J. F. Coates, measures 37 by 5.5 m. Her displacement in the water, fully equipped and manned, is in the range of 45 tonnes and when beached and stripped of crew and equipment, but still carrying ballast, she weighs 26 tonnes.[10] If in 217 B.C. Philip's slightly larger vessels were sent around Cape Malia because they were too large to be portaged, then the triremes were close to the upper level to weight tolerance.[11]

A number of Greek and Roman trading ships have been recovered by archaeological means. The excavated remains suggest that merchant vessels were deep and broad in relation to their length and resembled the modern *perama.*[12] Archaeological and epigraphic data show that the largest cargo ships rarely exceeded 1000 tonnes capacity, that the average ship carried only about 130 tonnes and that ships up to 200 to 350 tons were unremarkable. A second class of vessel is represented by a find on the shore of the sea of Galilee. The 1st century a.C. Kinnaret boat is not only smaller in all respects, but is flat bottomed and tapers towards the stern, unlike the larger merchantmen. The boat had no deck and is considered to have been a fishing vessel, but is of a size and shape used in the Late Medieval period for transport and trade on internal waterways and for short-haul sea ventures.[13] A better idea of size and weight of various small cargo ships can be gained from the following table:[14]

Ship	L (Metres)	W	Total	Load (Tonnes)	Weight
WAR					
Olympias	37	5.5	45	19	26
CARGO					
Antikythira	30?	10?	130?	100?	30
Yassi Ada	20	5	72	52	20
Serce Liman	15	5	43	28	15
Kyrenia	15	4.5	41?	26?	15?
SMALLER VESSELS					
Kinnaret	9	2.5	20	10	10

The unloaded weight of the smaller cargo vessels in most cases is well within the limits for hauling suggested above; conceivably vessels the size of the Yassi Ada wreck and smaller could have been transported empty with little difficulty. Large fully laden cargo ships cannot have been transported, for all except the very smallest were too heavy. The stresses, not only on the walls of the vessel but also on the trolley carrying it would have been massive. Furthermore, any attempt to move a broad vessel (5-10m.), on a narrow cart (1.5 m.) would result in a top-heavy load courting a potentially expensive disaster. On the other hand, small, simply-rigged coasters of the size of the Kinnaret boat, which were perfectly suited to short haul Aegean voyages, fall well within the transportable range even when carrying a full cargo. The Kinnaret boat has a beam dimension (2.5 m.) that would have fit neatly on a trolley with a 1.5 m. wheelbase. Its estimated loaded weight (20 tons) manageable on the *Diolkos* if carefully laden to avoid structural damage. Strabo's πορθμεῖα may well have been barges or boats of similar size and weight to the Kinnaret boat.

Let us digress to consider land transport of goods. Most if not all commercial loads were hauled on a waggon by oxen or carried in panniers by mules or donkeys. Pulling a load, oxen could work for 5 hours a day covering between 7 and 11 miles.[15] Traditional wisdom considers the ancient ox to have been smaller than the modern and that on a level earth road a yoke could pull in the range of 0.6 tonnes. On a paved road, the friction was considerably reduced permitting a corresponding increase in load; it is estimated that the load drawn by a team of horses increases from between 0.6 tonnes on an unimproved road to 2 tonnes on a metalled surface. Reasonably, a pair of oxen on the hard surface of the *Diolkos* could be expected to haul a comparable load.[16] The Olympias would therefore have required as few as 13 yokes of oxen when empty, the Yassi Ada 10 yokes and the Kinnaret 5 yokes.

Except in dead calm, unloading at the termini of the *Diolkos* would, at best, have been awkward in a light swell and impossible in a heavy sea. No trace of breakwaters, which would have mitigated this process, have been found at either end of the *Diolkos.* As has already been observed by a number of commentators, cargoes were unloaded at Lechaeum and Kenchreai. Merchandise due for inland markets within the hinterland of the port were taken off by ox-cart and pack animal, probably in loads of less than one tonne. However, it is difficult to envisage whole cargoes being transported by road to the port on the other gulf. On an earth road, a 52 tonne cargo of wine amphoras would involve in the region of 90 cartloads. If taken from Lechaeum to Kenchreai, this train would first have to move southwards until it arrived at the coast road near the walls of Corinth before turning east. The trip takes almost three hours on foot, by loaded waggon the journey would be closer to five; a full day's work for the animals which would then need food, water and stabling. If the ports of Corinth were as busy as one suspects, the transhipment by this means would have involved hundreds of carts and oxen and add considerably to the cost of a cargo, especially given the expense of land relative to sea transport.[17]

A pair of alternate solutions present themselves: the cargo could be transferred at one of the major ports to lighters or barges of the size of the Kinnaret vessel which would then sail to the *Diolkos*, be hauled across and from there either proceed to the opposite shore and be reloaded or act as the carrier to the cargo's ultimate destination or smaller ships could be unloaded at the terminus of the *Diolkos* on a calm day and be hauled separately from their cargo. In the first instance, the haulage, on a low friction surface, of the same cargo of 52 tonnes of wine would perhaps require as few as 50 yokes of oxen which would take only about two hours for the job and have more than enough time for a return trip. In the second case, the requirement would be fewer yokes still, involving only about 35 yokes for cargo and ship.

The financial advantage of the *Diolkos* is easily demonstrated. If one assumes, as does Cook, a set charge of 1.5 Drs per ton per mile,[18] then the tariff for haulage over the 4.34 miles of the Isthmus would be little over half that to take it between Lechaeum and Kenchreai. If the charge was set at so much per yoke per day,[19] the efficiency differential of low over high friction roads would increase the ratio to nearly 1:6. This advantage would be of great benefit to the traders in bulky but low priced commodities like timber, but less so those dealing in small but expensive items like truffles or perfume.

In conclusion, it is possible to envisage transport of smaller vessels and their cargoes over the Isthmus on a regular basis making the haulage business at Corinth a profitable one. The *Diolkos* was certainly used enough to be repaired and maintained; the western terminus was rebuilt early in the 4th century and the paved surface shows areas patched with spolia perhaps from the sanctuary at Isthmia.[20] The only constraint, however, is the size of vessel.

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NOTES

1. Ὀλκάς, -άδος, ἡ. see Hdt. 3.135, 7.25, 137; Thuc. 6.44, 7.7; Xen. *Ath.* 1.20.
2. R. M. Cook, *JHS* xcix (1979) 152-3.
3. B. R. MacDonald, *JHS* cvi (1986) 191-5.
4. R. M. Cook, "A Further Note on the Diolkos", in *Studies in Honour of T. B. L. Webster, I* 1986 65-7.
5. N. M. Verdelis, Ath. Mitt., lxxi (1956) 51-59; *idem. Ath. Mitt.* lxxiii (1958); *idem. Praktika* (1962) 136-141; *idem. Praktika* (1962) 48-50; *idem. ILN* ccxxxi (19 Oct. 1957) 650; J. Wiseman, *The Land of the Ancient Corinthians* (Göteburg 1978) 45-6. The road was excavated by Verdelis who uncovered two streches at its westward end. On the south side of the canal a docking area, now much eroded, was found along with about 250 m. of paved road. On the north side, within the army camp, a further 200 m. was excavated. The road varies in width from 3.6 to 6.0 m. Traffic on the paved portion was clearly one-way, but counter flow traffic could occupy the earthen road on either side.
6. Thuc. viii 7-8; Polybios iv 19.77-9; Polybios v 101.4; Corinth viii 2 31; Dio Cassio Li 5.2.
7. George Phrantzes 1.33.
8. Aristophanes, *Thesm* 647-8. "ἰσθμόν τιν' ἔχεις, ὤνθροπ' ἄνω τε καὶ κάτω τὸ πέος διέλκεις πυκνότερον Κορινθίων".
9. Strabo 8.2.1 "ὁ δ' Ἰσθμὸς κατὰ τὸν δίολκον δι' οὗ τὰ πορθμεῖα ὑπερνεωλκοῦσιν ἀπὸ τῆς ἑτέρας εἰς τὴν ἑτέραν θάλατταν". Pliny, NH IV.10 "Corinthiacus hinc, illinc Saronicus apellatur sinus, Leceae hinc, Cenchreae illinc angustiarum termini, longo et ancipiti navium ambitu quas magnitudo plaustris transvehi prohibit.
10. J. S. Morrison and J. F. Coates, *An Athenian Trireme Reconstructed*, 1989, 20, 68.
11. Cook, *JHS* n. 16.
12. P. Throckmorton, "Romans on the Sea" in G. Bass ed. *A History of Seafaring*, London 1972, 65-86.
13. M. Bonino, "Lanteen Rigged Medieval Ships. New Evidence from Wrecks in the Po Delta (Italy) and Notes on Pictorial and Other Documents" *IJNA* 7 (1978) 9-28 for the Logonovo boat;

14. J. S. Morrison; Kyrenia; P. Throckmorton for the Antikythera ship; J. R. Steffy "Reconstruction of the 11th century Serce Liman Vessel" *IJNA* 11 (1982) 13-24 this ship is estimated to have weighed 15 tonnes without cargo; *idem.* "The Kinneret Boat Project II. Notes on the Construction of the Kinneret Boat", *IJNA* 16 (1987) 325-9; G. F. Bass and F. H. von Doorninck, *Yassi Ada I* 1982 p. 86.
15. A. Burford, "Heavy Transport in Classical Antiquity", *Economic History Review* 13 (1960) p. 9.
16. A. W. Skempton, "Canals and River Navigation before 1750" in Singer, G. *et. al. A History of Technology* 1957, 438-470; P. S. Bagwell, *The Transport Revolution from 1770,* 1974, p. 13. These figures are similar to those cited by Cooks' advisors, R. M. Cook, "A Further Note" n. 13.
17. R. Duncan Jones, *The Economy of the Roman Empire,* 1982, 366-9 puts the relative cost at 28:1.
18. Cook takes his charges from Burford p. 15.
19. See Burford, p. 14 for a table of charges based on *IG* ii2 1673.
20. Wiseman, pp. 45-6.

RAMMING TRIM OF SHIPS

Introduction

In the discussions of sea battles in Antiquity as they are published in the literature, it is most often implicitly assumed that the aim of a ramming attack was always to damage the planking of the ship of the enemy to the extent that she would make water so rapidly that she could not be kept afloat. Depending on the amount of ballast she carried, she would either sink to the bottom or continue to drift in a waterlogged condition. Left out of these discussions was the possibility that sometimes the purpose of the ramming attack could have been to cause the enemy's ship to capsize, which would have put her out of action instantly.

The mechanics of capsizing as caused by ramming is quite simple in principle. If the rammed ship is hit by the ram of her opponent, the hull starts to roll around a longitudinal axis; the vertical distance between the point of ramming impact and the rolling axis multiplied with the value of the impetus of that impact defines the impetus couple, which, during the short time it acts on the hull, imparts a certain amount of kinetic energy to it. Its effect is counteracted by the righting moment. In general, the righting moment first increases with increasing angle of heel, then reaches a maximum between 30° and 60°, and finally decreases steadily. If the kinetic energy imparted to the rolling hull is large enough to heel it over to the position where the righting moment is zero, the ship capsizes. The treatment in the following sections focusses on the position of the rolling axis upon impact, and on some passages in the literature where the option of capsizing by ramming may usefully be considered in their interpretation.

It might explain why it was sometimes mentioned that the ramming impact was delivered abover the waterline, apparently intentionally, and why sometimes ships appear to have foundered immediately after having been engaged by the enemy. It must immediately be added, though, that the descriptions of such battles which have come down to us are seldom sufficiently detailed that one may attribute with certainty the loss of a ship to one cause or the other. Nevertheless, it is obvious that in the interpretation of the description of an engagement leading to the loss of a ship, capsizing as a result of a ramming attack has to be included amongst the potential causes, even if it was not customary to do so in the past.

Rolling axis upon ramming

In 1879 Sir Horace Lamb published his classic handbook "Hydrodynamics", which treats the mathematical theory of the subject. One of its topics is what happens when a cyclinder submerged in a fluid is submitted to the application of an exterior force aimed at its centre; the results were obtained on the basis of potential theory. That theory does not take into account the effect of viscosity, so the mechanical effect of the application of a force "F" is an acceleration "a" of sideways displacement which is resisted only by the inertia of the sumberged cylinder. For this reason it is well suited to an elementary treatment of the effects of ramming, which is initially resisted primarily by inertia and not by viscosity.

Lamb could express his findings in the form of a simple formula,

$$F = (M+M') \times a,$$

or, in his own words: "This result shows that the whole effect of the presence of the fluid may be represented by an addition M' to the inertia per unit length of the cylinder [M']`. Earlier, he had defined M': "Let M'... be the mass of fluid by unit length of the cylinder". The result is valid to a high degree of approximation to any gently tapering, i.e. spindle-shaped, submerged body. Other cross-sectional shapes, in particular those obtained by the addition of fins or skegs to the body, may substantially alter this result quantitatively, but without invalidating the principle that the effective inertia of a body is increased by it submersion in a fluid.

Because of the mirror symmetry of the initial conditions in the cross-sectional plane, the result may be applied readily to a floating cylinder or a spindle-shaped body of which the waterline is at the level of its centre. To the intertia of the cylinder must be added the masses of the fluid which the submerged half-cylinder displaces. As the upper half does not displace any fluid, its shape is irrelevant to the problem, but now the resultant force caused by the pressure of the fluid on the submerged lower half no longer passes through the centre of the cylinder, but through a point which coincides with the centre of buoyancy (CB) of the submerged part. For a half-cylinder, the location of that point is calculated without difficulty as being below the waterline at a distance of: $4R/3\pi$, or $0.414 \times R$, R being its radius.

If we apply this finding to a vessel of which the shape of the submerged part is approximated in this manner, it is clear that one must add to the inertia due to the mass of the vessel itself the mass of water displaced by the hull in order to obtain the total inertia which it exerts when it is subject to a ramming impact. Moreover, the inertia is no longer concentrated in the centre of gravity (CG), as when the hull is dry, but the inertia due to the mass of the displaced water concentrated in CB causes the centre of inertia (CI) to shift to an intermediate position. According to Archimede's rule the two masses are equal, hence the position of the centre of inertia (CI) is exactly halfway between CB and CG. For most ships CI is located near the waterline (WL). The case that the force "F" acts on the hull at the level of CI which is just below WL is illustrated in the accompanying diagram (Fig. 1). Obviously, the force "F" could be applied by an enemy ramming the hull.

If the ramming impact is on the level of CI, as in the diagram reproduced in Fig. 2b, the hull will be displaced without rolling, but if the force is applied above that level (Fig. 2c), the hull will begin to roll to the left, i.e. away from the attacker, and if it is below the level of the CI it will start to roll to the right, towards him (Fig. 2a). Clearly, the latter may be dangerous to the attacker; it is an effect he will try to avoid or to minimise. If the purpose of the ramming attack is to sink the opponent by piercing the hull of this ship, it is most effective to ram on the level of CI, provided CI is not too far above WL. Even if the rammed ship started sinking, she would often not founder immediately; there might be time for the marines and rowers of the attacked ship to try to board the attacker and overwhelm her crew. This tactic of desperation was frequently attempted, and sometimes it was successful; instances of it are mentioned by Herodotus (VIII.90.2) for the battle of Salamis (480 BC), and by Diodorus Siculus (XIII.15.4) for the battle in Syracuse harbour (413 BC): "Often men whose own ships had been shattered leaped on their opponent's vessels, and by slaying the defenders or pushing them into the sea became masters of their *triereis*".

If the victim had been rammed below CI, and rolled towards the attacker, that would not only help men on her deck to jump over, but it could also cause damage to the superstructure of the attacking ship. A few secondary small rams, the *proembolia* (Fig. 3), were often fixed above the main ram, the *embolon*. One encounters this features from the Late Geometric period (*c.* 700 BC) onwards all through Antiquity (Basch, 1989). Its function must have been to prevent damage to the own ship. We know from the literature that the ram and the *proembolion* were both sheathed in bronze. Archaeological finds—none of them, unfortunately, published with proper excavation data—confirm this. The rams of Athlit and Bremerhaven (Fig. 4a) are such sheaths or rams. The small bronze "ram" in the Fitzwilliam Museum in Cambridge with the additional protective sheathing of the stem attached to it (Fig. 4b) probably belonged to a *proembolion*. The only reasonable earlier interpretation is that it was the ram of a model ship (Basch, 1987), but as it was found on the bottom of the sea off Tunis, that does not seem very likely. A possible combination of the bronzes from the Fitzwilliam and Bremerhaven museums as a *proembolion* and an *embolon* of a ship of the Samian type is presented in Fig. 5.

The rather low level of CI opened the possibility of an alternative and probably more effective mode of attack. Causing an opponent to capsize by ramming above CI must have been attractive to an attacker, as it amounted to instant disablement of the enemy, if not annihilation. In addition it was a relatively safe mode of attack, because damage caused by the ramming impact to the attacker himself, e.g. loss of the ram, would probably be located above the waterline. But to obtain capsizing of the enemy it was not a sufficient condition to ram well above the level of CI; an additional requirement was that the kinetic energy of the attacking ship exceeded the energy necessary to heel over her victim beyond the critical angle at which the righting moment is zero.

The attacked ship could try to prevent capsizing by using her oars, but that would only be effective if the oarsmen ceased rowing. The first stage of the *diekplous* mode of attack involved sweeping away the opponent's oars (*parasyrein tous tarsous*) on one side —as Wallinga (1982) emphasizes— and that would not only immobilize the ship, but also make it impossible to thwart rolling of the ship towards the side where the oars were swept away.

A consequence of the requirement that the attacking ship must possess sufficient kinetic energy is that a light vessel might not be able to cause a heavy opponent to capsize, but that an appropriately trimmed heavy ship could inflict that on a lighter opponent if she could ram her above CI. The heaviest ships could then be employed as "capsizers", striking above WL, and the lightest ships never so, but ships of intermediate size might have to adjust on short notice, depending on the relative size of the opponent. The ships were often equipped with blunt rams, which evidently were not meant to penetrate the enemy's hull. Steffy (1991) argues that an impact of such a ram below WL would start the seams of the ship and cause her to sink. Although sinking would then take more time than a ship of which the hull had been breached, that disadvantage to the attacker was compensated by the avoidance of the very real danger of the ram remaining caught after penetrating the opponent's hull.

Even if a ramming impact which was received above the level of CI was of insufficient magnitude to cause capsizing, its effect could be that the accelerated rolling of the ship caused the *epibatai* standing on her deck to be flung overboard, which may have been an attractive second-best option to the attacker. An additional advantage of the rolling of the attacked ship was that the chances of the ram getting caught in the breach were much diminished. We shall discuss in the following sections some passages in the literature which appear to refer to such events.

In Antiquity the position of CI, the centre around which the stricken ship started to roll upon impact, must have been known from experience. That knowledge must have influenced the construction of warships not only as delivers of ramming attacks by various methods, but also as recipients of ramming impacts. Naval architects of the time will have tried to avoid designing a ship of which the level of CI was well below the waterline. A ship with that characteristic, if rammed on the waterline, would possess the disadvantage of having three possible scenarios leading to her loss: she might either be holed by the impact, or she could develop large leaks along the seams of the planking, and in both cases founder more or less rapidly, or, as the third option, she might capsize, especially if she was light.

On the other hand, having CI at a level much above WL might be possible only in a dangerously crank ship. It is not known whether or not warships in Antiquity were crank or not. Foley and Soedel (1981) thought they were, but Coates (Morrison and Coates, 1986) designed his "Olympias", which was inspired by the Greek trireme, with ample stability. We do not know at present which of the two choices best approaches historical reality. It is clear that obtaining a desirable height of CI was a matter of ballasting the ship with a proper amount of ballast. In addition, the distribution of the ballast fore and aft was essential in bringing the prow of the ship on the desired level for a ramming attack. A good design for the proper amount and distribution of ballast was a judicious compromise between extremes, as such a design always is.

Polybius' description of the battle of Chios

It is well-known that there is surprisingly little unambiguous evidence in the descriptions of battles at sea in the ancient historical literature explaining how and why ships became disabled by enemy action. Instead of trying to deduce from the surviving descriptions precisely what happened, we can only try to render obscure passages somewhat less obscure by consideration of the various technical possibilities, selecting the explanation which seems to fit best to the described events.

By far the most detailed report of an action at sea in Antiquity is in the "Histories" by Polybius (Casson 1991). It is a vivid description of the battle of Chios, which was fought in 201 BC between the fleet of Philip V of Macedonia and a combined force of Pergamene, Rhodian and Byzantine ships commanded by Attalus of Pergamon and Theophiliscus of Rhodes. The description is full of details which are better understood in the light of the foregoing discussion of the dynamic stability of ramming. In the following, the relevant passages will be cited and discussed one by one. Polybius (II.10.3-5) moreover described the skirmish off the island of Paxi in 229 BC in sufficient detail that the remarkable tactic employed by the Illyrians against the Achaeans becomes intelligible in the light of the mechanical considerations presented here.

We begin with the opening of the battle of Chios (Polyb. XVI.3.2): "Attalus engaged an *octeres* and ramming her first and inflicting on her a fatal blow under water, after considerable resistance on the part of the troops on her deck finally sank (*ebythize*) the ships'. Attalus' flagship was probably smaller than an *octeres*, so we understand that he had to ram his opponent under water. The disadvantage of this mode of attack is well illustrated by this passage: we see that it gave the enemy the time to put up a stiff resistance in spite of the blow ultimately being fatal.

A reason for thinking that Attalus' ship was smaller than an *octeres* is the description in Polybius XVI.6.2-5, of the interception of a small squadron consisting of this ship and two *pentereis* by a force assembled by king Philip, which comprised four *pentereis*, three *hemioliai* and a few *lemboi*. *Hemiolai* were smaller, and *lemboi* much smaller than *pentereis*, but all the same, Attalus felt himself compelled "in great disquietude to run his ships ashore", implying that Philip had gathered a much superior force. This, in its turn, carries the implication that Attalus' royal ship cannot have been much stronger than a *penteres*.

(Polyb. XVI.3.3-6) "Philip *dekeres*, which was the flagship, fell by a strange chance to the enemy. Charging a *triemiolia* which was in her path and ramming her with great force in the middle of her hull she stuck fast under the enemy's *thranite* thole, the helmsman being unable to arrest the way she had on her. So that as the ship was thus hanging on the *triemiolia* she was in a most difficult position and entirely incapable of moving. Two *pentereis* seized the opportunity to attack her, and striking her on both sides destroyed (*diephtheiran*) the ship and all the men on board her, including Democrates, Philip's admiral". Here we may note that the largest ship which took part in the engagement, a *dekeres*, apparently was utilized as a "capsizer", striking her enemy well above the waterline. A possible interpretation is the ram did not penetrate the hull of the *triemiolia*, but rode over the side of the ship which was rolling over under the impact, until it apparently became trapped under the lower stringer which formed part of the outrigger, and on which were mounted the *thranites'* tholes. When the attacked ship rolled back it will have caught the ram of the attacking ship very firmly (Fig. 6). It is mechanically obvious that the hold on the ram was released only after the *dekeres* had been rammed by other opponents and started sinking. The episode appears to have been a fatal mishap, perhaps illustrating an unexpected danger of the capsizing mode of ramming attack.

(Polyb. XVI.3.8-9) "Dinocrates [one of Attalus' admirals] engaged an *octeres* and himself received his adversary's blow above water, since the opposing vessel had its bows elevated (Casson 1989), but striking the enemy under her... could not at first get free of her although he repeatedly tried to back out. So that, as the Macedonians also displayed gallantry, he was in the utmost peril." We notice once again that apparently a large ship was trimmed to be a "capsizer", and that the smaller ship rammed her under the waterline, i.e. on the level of CI or slightly under it. That carried the danger with it that the ram could not be retracted after penetrating the enemy's hull with the ram under WL. To retract the ram it was necessary to back water, which produced a force which is much smaller than the one with which the impact was delivered. The risk of the ram getting caught was enhanced if stringers or a ceiling were present in the penetrated hull near the point of impact. The ship rolling under the impact of ramming would, if she did not capsize, eventually roll back, a motion which in general would greatly help in retracting the ram.

It seems probable that a heavy ship would roll back less than a light one when attacked under WL, and that that made it more probable that the ram of the attacking ship would get caught. Rolling on a ship after she had been rammed would be prevented if she was lashed alongside another ship, and ramming such a ship entailed a considerable risk of the ram becoming trapped. This danger was exploited by the Illyrians in 229 BC in the battle off the island of Paxi, which Polybius also described.

(Polyb. II.10.3-5) "The Illyrians lashed their *lemboi* together in batches of four and thus engaged the enemy. They sacrificed their own boats, presenting them broadside to their adversaries in a position favouring their charge, but when the enemy's ships had charged and struck them and getting fixed in them, found themselves in difficulties, as in each case the four *lemboi* lashed together were hanging on to their beaks, the *epibatai* leapt on to the decks of the Achaean ships and overwhelmed them by their numbers. In this way they captured four *tetrereis* and sunk (*ebythisan*) with all hands a *penteres*...". It seems reasonably clear that the Illyrians had formed floating fighting platforms of four *lemboi* each, and that they by some undescribed tactic enticed the Achaeans to attack these. The platforms may perhaps be regarded as analogous to squares of infantry surrounded by much more mobile cavalry during a land battle. Important in the present context is the result of these ramming attacks; it is remarkable that the Illyrians appear to have possessed the mechanical insight which was at the basis of this successful stratagem. It highlights the importance of rolling of the attacked ship to the attacker who rammed a breach in the hull.

We now return to the battle of Chios (Polyb. XVI.4.11-13): "But in the direct charges prow to prow they [the Rhodians] employed a certain artifice. For dipping their prows themselves they received the enemy's blow above water, but piercing him below water produced breaches which could not be repaired. It was seldom, however, that they resorted to this mode of attack; for as a rule they avoided closing with the enemy, as the Macedonian soldiers offered a valiant resistance from the deck in such close combats." It appears from this description that at least the ships of this Rhodian squadron could dip their prows if necessary, and apparently on short notice too. We shall discuss this point more fully in the last section, where it appears that a ship could dip her prow either by throwing out ballast aft, or, under certain conditions, by shifting forward part of the complement of rowers.

(Polyb. XVI.5.1-4) "The most brilliant part in the battle was taken by three Rhodian *pentereis*, the flagship on board of which was Theophiliscus, that commanded by Philostratus, and lastly that of which Autolycus was the helmsman but on board of it was Nicostratus. The latter had charged an enemy ship and had left her arm in it: the ship that had been struck sunk (*katadynai*) with all on board, while Autolycus and his men, the sea now pouring into the ship from the prow, were surrounded by the enemy and at first fought bravely, but finally Autolycus himself was wounded and fell into the sea in his armour, and the rest of the *epibatai* perished after a gallant struggle. At this moment Theophiliscus came up to help with three *pentereis*, and though he could not save the ship as she was full of water (*plere thalattes*), he rammed two of the enemy's ships, flinging their *epibatai* in the water."

The danger of losing the ram in an attack is illustrated particularly well by the description of the loss of Autolycus' *penteres*. It appears that the earlier dipping of the prow which proved to be fatal to this ship and the men on board cannot have been obtained by shifting part of the rowers forward, at least not in this *penteres*, or otherwise the prow could have been brought above the waterline quickly by shifting the mobile rowers aft again; it must have been effectuated by throwing out ballast.

That Theophiliscus, by ramming two opponents, caused the *epibatai* on their decks to be flung overboard by the impact of ramming is clear from the context: no hand-to-hand fighting is mentionned. As Theophiliscus attacked with comparatively heavy *pentereis*, these ships may well have carried their rams above WL, except, perhaps, the ship of Autolycus which probably rammed at WL. Of special interest is that this *penteres* appears to have remained afloat, though full of water, and that, at least in this instance, saving such a leaking and waterlogged ship was not considered to be feasible or worthwhile. One should not be tempted into thinking that this text furnishes an indication, or perhaps even a proof, that warships in general were ballasted so lightly that they did not founder but remained afloat, although waterlogged. From the text one can deduce no more than that this was true only for the specific *penteres* described in Polybius' text. The ship was part of the Rhodian fleet, in which the stratagem of dipping the prow to strike a heavier opponent under the waterline had been developed for the larger ships. As remarked before, it was probably accomplished by throwing ballast overboard. If so, the ship was more lightly ballasted than she was normally, which could explain her remaining afloat. We shall see that the evidence for ballasting is neither clear-cut nor simple: sometimes a sinking ship of war went to the bottom, sometimes not.

Bythizein, diaphtheirein and katadyein

Casson (1991) remarks that Greek authors speak in a variety of ways of what appear to be various degrees of damage to galleys. They could be *aplous* (unfit or unable to sail) or have been subjected to *katatraumatisein* or *titroskein* (wounding) or to *diaphtheirein* (destruction or crippling). He notes that the latter verb has no equivalent in modern language if it is used in a nautical context. We saw that Polybius gives it a sense which clearly implies that Democrates' flagship went to the bottom with all of her crew. It is also clear that she did not capsize. Yet in other ancient texts the verb implies no more than temporary crippling damage of a kind which left the wreck afloat. Often it was towed away by the victors.

It seems probable that most ancient Greeks had some knowledge of ships and the sea, perhaps in the same way as many of our contemporaries know something about driving and the mechanics of motorcars. That may have counterbalanced to some extent the use of technical sea-faring terminology in an indiscriminate manner by historians of the time, who were mostly not experts in nautical matters. On the other hand, such ambiguous usage may well have been inherent to the use of language by the later Greek authors, who tried to vary ways of expressing the same action by the use of near-synonyms (Wallinga, 1991). If so, it seems probable that an author would use a verb in a technically correct sense only if he wanted to convey the distinction. As a result, we may note no more than a tendency for a verb to carry such a distinctive technical meaning, and perhaps not even that much.

The second Greek verb, besides *diaphtherein*, which gives trouble when used in a nautical context is *katadyein*; in non-nautical texts it simply means "to sink". Landels (1978) says that (in a nautical context) it "in fact means no more than "dip" or "lower", and when a Greek writer wishes to indicate that something "went to the bottom" he generally uses a different word". The remark does not appear to fit too well to Polybius' use of the verb: "*katadynai* with all on board" strongly suggests that the ship perished with all hands, which implies going to the bottom. On the other hand, Casson (1991) presents an example —it will be cited below— from which it follows that ships that were victims of *katadynai* could be towed away.

The Greek verb *bythizein* for going or sending to the bottom to which Landels obviously alludes was used by Polybius in his description of the battle of Chios. Curiously, this word was not explicitly discussed either by Casson or by Landels, perhaps because it did not seem to present any ambiguity of interpretation. We begin the following brief discussion of these three Greek verbs with this one.

Bythizein. The two examples in Polybius' text fragments which were quoted above leave little doubt that the verb indicates that the attacked ships were sent to the bottom, and in both cases it is clear too, that the sinking took place after considerable fighting on deck. That decludes capsizing by ramming as the cause of the sinking in these instances.

One more example, which confirms that the verb means "sinking" in the sense as we understand it. Diodorus describes the aftermath of the battle of Elëus in 411 BC (Diod. XIII. 40.5): "Such was the end of the battle; and the Athenians captured eight ships of the Chians..., while they themselves lost five ships, all of them, as it happened, having been sunk (*bythisthenai*)." From the context one deduces that these ships must have sunk to the bottom, which seems all the more likely as *bythios* means "on the bottom of the sea", and *bythos* "the depth of the sea."

Conclusion: *bythizein/bythizesthai* meant "to go or to send to the bottom", but we do not know whether or not it included capsizing as the cause of it.

Diaphtheirein. The aftermath of the battle of Chios: (Polyb. XVI.6.13) "The Rhodians, taking some of the enemy's ships in tow and crippling (*prodiaphtheirantes*) others with their rams before their departure, sailed off to Chios". No sailor would knowingly abandon a floating waterlogged wreck, as that would constitute a hazard to all shipping, including his own. The implication is that when the Rhodians holed the captured ships with their rams, they did so knowing that the ships would sink to the bottom.

That such wrecks would sink may also be concluded from a passage in Herodotus' description of the battle of Salamis, where he remarks (Herod. VIII.89) that in the hard fighting few Greeks were slain, "for since they could swim, they whose ships were crippled (*diephtheironto*), yet were not slain in hand-to-hand fight, swam across to Salamis; but the greater part of the foreigners were drowned in the sea, not being able to swim". The Persians would have saved their lives, of course, if their ships had remained afloat in a waterlogged condition.

Yet in the same battle other crippled wrecks apparently remained afloat. (Herod. VIII.96) "The sea-fight being broken off, the Greeks towed to Salamis all the wrecks that were still afloat in those waters, and held themselves ready for another battle, thinking that the king would yet again use his ships that were left. But many of the wrecks were caught by a west wind and carried to the strand in Attica called Colias...". It has been suggested in recent years (Morrison and Coates, 1986) that the wrecks to which this passage refers were waterlogged hulls which had been holed by ramming. But the technicalities of towing such wrecks to the beach of Salamis, to get them above water without slipways and capstans, and to repair them during the night must have been far beyond the capabilities of the Athenians in their situation of that moment. It is much more probable that the floating wrecks which were recuperated by the Athenians were those of ships that have been disabled by damage above WL, but of which the hulls were still intact.

Something similar happened to three Corinthian ships which had been crippled during an engagement with an Athenian squadron near Erineus harbour in 413 BC. (Thuc. VII.34.5-6). "For a long time neither side gave ground. Three Corinthian ships were crippled (*diaphtheirontai*)... This was an indecisive battle, in which both sides claimed victory, but the Athenians got possession of the wrecks because the wind drove them out to sea and the Corinthians refused to come out after them." Clearly, those wind-driven Corinthian galleys were not waterlogged, and they were certainly in no sense "destroyed", although the same Greek verb is used as in the case of the wrecks deposed of by the Rhodians after the battle of Chios.

Conclusion: *diaphtheirein* most often meant "crippling" of a ship in the narrowest sense only, i.e. without any regard to what was the ultimate result of it, sinking to the bottom or remaining afloat. In some of the previous examples the crippling blow by the ram was followed by hand-to-hand fighting and in one a *dekeres* was sunk by two *pentereis* striking at both sides. All of this excludes capsizing.

Katadyein. The same ambiguity which we encountered in the use of the verb *diaphtheirein* manifests itself here too: a ship which had suffered *katadyein* could either go to the bottom or remain afloat.

During the battle of Chios Autolycus' ship rammed an enemy which "sunk (*katadynai*) with all on board", which strongly indicates that the ship went to the bottom. The same is suggested by a passage in Diodorus' description of the battle in Syracuse harbour, 413 BC, (Diod. XIII.15.3) "For when a ship had been intercepted by triremes and struck by their beaks from every direction, the water would pour in and she would be swallowed together with the entire crew beneath the sea. Some who would be swimming away after their ship had been sunk (*katadyomenon*)...

Yet after the action off Sybota, opposite Corcyra, in 433 BC, we read: (Thuc. I.50.1) "After the rout of the Corcyreans the Corinthians did not take in tow and haul off the hulls of the ships which were *katadyseian*, but turned their attention to the men, cruising up and down and killing them in preference to taking them alive...", which implies beyond doubt that the ships remained afloat.

We notice that after *katadysai* had occured often survivors were swimming away, and that no prior hand-to-hand combat on deck is recorded. That would accord well with the idea that the verb when used in a technical sense implies capsizing by ramming. Whether or not a capsized hull would sink depended on the amount of ballast on board. What Æeschylus has to say about the wrecks during the battle of Salamis in 480 BC seems significant in this context: (Æesch.

"Persians". 418-20) "The hulls of our vessels rolled over (*hyptiouto*), the sea was hidden from our sight, strewn as it was with wrecks and slaughtered men." The most straightforward explanation of the rolling over of hulls at the battle of Salamis to which this text apparently refers, seems that it was the result of ramming above the level of CI. In spite of the Persian ships being crowded close together like a school of tunnies, as Æeschylus' describes it, there must have been enough sea room between the two fleets for their enemies to carry out ramming attacks.

Regarding the capsized hulls which remained afloat: perhaps the comparison with Norwegian fishing boats of a century ago is relevant. These were built such that if they capsized, the overturned hulls lost their ballast (Færøyvik, 1979). If *triereis* did the same, they may have remained afloat in the capsized condition, and were then among the wreckage covering the sea, even if they originally carried an amount of ballast which would have sent them to the bottom if they had sunk in an upright position.

The interpretations of these verbs elucidate the distinction which e.g. Thucydides makes between the two modes by which ships were put out of action, as in his description of the first battle of Naupactus in 430 BC (Thuc. II.84.3): "...then at this critical moment Phormio gave the signal. Thereupon the Athenians fell upon them [i.e. the Pelopponesians]; they first capsized (*katadyousi*) one of the flagships, then crippled (*diephtheiron*) the rest as well whenever they came upon them...".

Conclusion: *katadyein* most probably meant "to capsize by ramming" in a nautical context where the various modes of causing a ship's loss were distinguished —and that certainly was not always the case—, but it did not imply that a ship either remained afloat or went to the bottom.

Hemiolia and trihemiolia

On the exterior of a famous and beautiful black-figured Attic cup of c. 510 BC (B.M. B 436) are shown two sailing merchant vessels, and two two-banked rowing ships, one with the two levels fully equipped with oars, and one in which they are lacking in the upper level in the half abaft the mast. It is a moot point whether the ship with the 1½ banks of oars (Fig. 7) is a *hemiolia* or not. Casson (1971) argued so at some length, and he interpreted the whole scene as depicting two phases of a piratical attack on a merchantman, but Morrison (1980) remarked that it "is difficult to see in a 6th-century vase-painting the only illustration of a ship-type which did not make an appearance in literature until the end of the 4th century."

More recently, Basch (1987) concurred with Casson's operational interpretation of the scene, but he was silent on the term *hemiolia* in this connection. One may remark that *hemiolia* would describe perfectly the mode of rowing of the one ship with the 1 ½ levels of oars. Casson thought that a *hemiolia* was basically a light, fast two-banked galley which was constructed such that the rowers and oars in the top bank abaft the mast could be swiftly removed. This would imply no more than that the ship was an aphract, allowing the oars to be transferred quickly —the deck-stanchions of a kataphract would have been much in the way for doing that. It is in fact clear from the literary context in which the word *hemiolia* often occurs that it always refers to an aphract.

One wonders whether the term was not used for any aphract bireme which was manned and rowed in this way, i.e. that the term referred primarily to the mode of usage rather than to a specific type of ship. Casson (1971) has explained the use of the *hemiolia* by the need for extra space on deck, but there may have been another advantage in connection with the problem of changing the trim of the ship in order to bring the ram either on the waterline or above it, because that could have been easily and quickly effectuated by placing the rowers of the half-filled upper level either fore or aft. Casson (1989) suggested that the *epibatai* could have done the same, but in situations where hand-to-hand fighting was imminent that would have been impraticable.

On the other hand, he gives an example in which a Roman fleet managed to escape from the chained-off harbour of Hippo in 247 BC by first elevating the prow, and then the stern, of each ship when it passed over the chain. That was indeed accomplished by having men on deck rushing aft and forward again.

A similar method of changing the trim may have been employed in the *triemiolia,* a type of warship which, as Casson (1971) remarks, was first found in the fleet of Rhodes. He explains the development of the *triemiolia* as follows: "What was needed was a vessel that could not only give chase but have a clear advantage in the fight to follow. The simplest and most logical explanation of the *triemiolia* is that it was a design worked out by the Rhodians as the answer to this problem. Pirates had taken the two-banked galley, rearranged the oars in the after part of the upper bank, and created the *hemiolia* to chase merchantmen; Rhodes' naval architects, fighting the devil with fire, took one of the faster aphract models of the trireme, adapted it in the same way, and created the *triemiolia* to run down *hemioliai.*" This explanation is slightly modified here, as it is assumed that in the upper bank the normal number of thwarts and tholes was present, but only half the complement of rowers. Depending on the relative size of the adversary, these were seated either fore or aft, thus lowering or raising the ram.

If "capsizing by ramming" was a Rhodian invention, it would go to explain both the development in Rhodes of the *triemiolia*, and two centuries after this new type ship had been mentioned first, the raising and dipping of prows in the Rhodian fleet during the battle of Chios. The latter may have been executed by order of the Rhodian admiral, using pre-arranged signals, as Basch (1991) surmises.

In the *triemiolia* the trim was changed by the thranites raising their oars and shifting to the desired position fore or aft. In other *triereis* with a full complement of rowers of in *pentereis* it was done either slowly by transferring ballast from fore to aft or the other way round, or more quickly, by throwing ballast overboard either fore or aft. We saw during the battle of Chios ballast in Autolycus' ship was probably thrown out aft to dip the prow.

Finally, it must be remarked that if we really see two phases of the same engagement represented on the celebrated Attic cup in the British Museum, the deployment of the crew of the galley is not one proper to the *hemiolia*, which involved half-manning permanently the upper bank of rowers. It is characteristic of an earlier stage, from which later the *hemiolia*, and ultimately the *triemiolia*, probably originated.

ACKNOWLEDGEMENT

The author wishes to acknowledge gratefully the comments which M. Lucien Basch and Professor H. T. Wallinga made on earlier versions of the paper, and the help of Mr. Brian H. Dolley with the photogaphy of both bronzes.

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ILLUSTRATIONS

1. The positions of the centres of gravity (CG), of buyonancy (CB), and of inertia (CI), of an ancient warship with an approximately semi-cylindrical hull are indicated schematically. The hull is displaced laterally without rotation by a horizontal force "F" which acts on it at the level of CI. The streamlines around the hull have been calculated on the basis of potential theory.
2. The hull of a rammed ship rolls towards the attacker if the impact is delivered below the level of CI, (a), it does not roll if the impact is on the level of CI, (b), and it rolls away from the attacker if the impact is above the level of CI, (c).
3. *Proembolia* of a warship depicted on a fragment of a Cretan *pithos* of the Late Geometric period. Drawing by L. Basch (1989).

4a. The ram of Bremerhaven, which probably dates from the 1st century BC.
4b. The bronze of the Fitzwilliam Museum in Cambridge, which was recovered from the bottom of the sea near Tunis. It is dated 3rd-1st century BC.
5. Drawing showing how the ram of Bremerhaven and the Fitzwilliam bronze may be combined as an *embolos* and a *proembolion* of the same ship. The convex upper part of the prow and the other details were typical of ships of war from Samos well into the Hellenistic period, as shown by Basch (1987).
6. Schematic depiction of how the ram of Philip's *dekeres* may have been caught under the outrigger of a *triemiolia* during the battle of Chios (201 B.C.)
7. Rowed two-banked ship with the upper level half-manned, as depicted on an Attic cup of *c.* 510 BC (B. M. B 436).

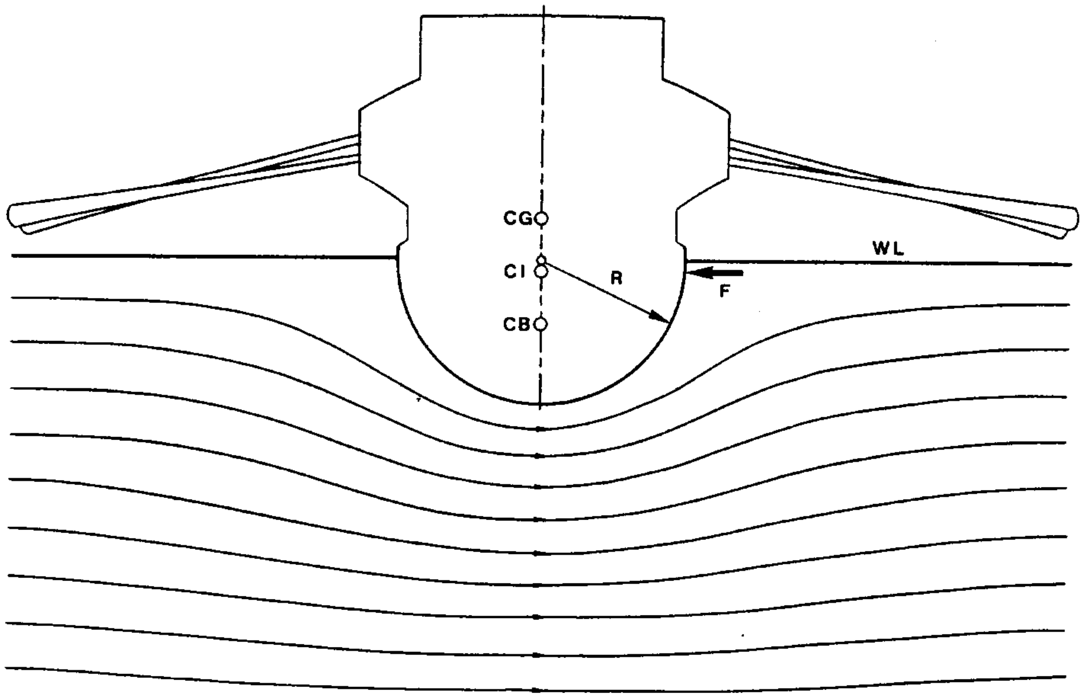


Fig. 1

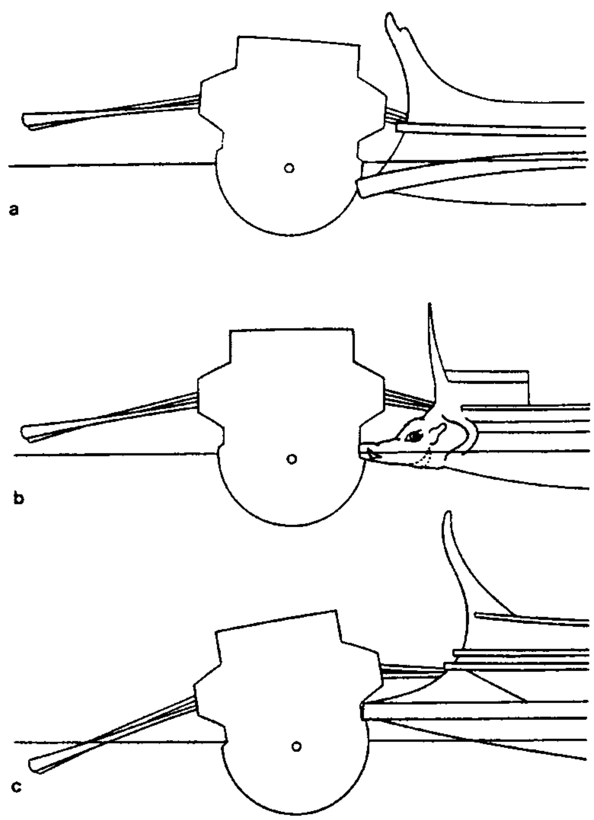
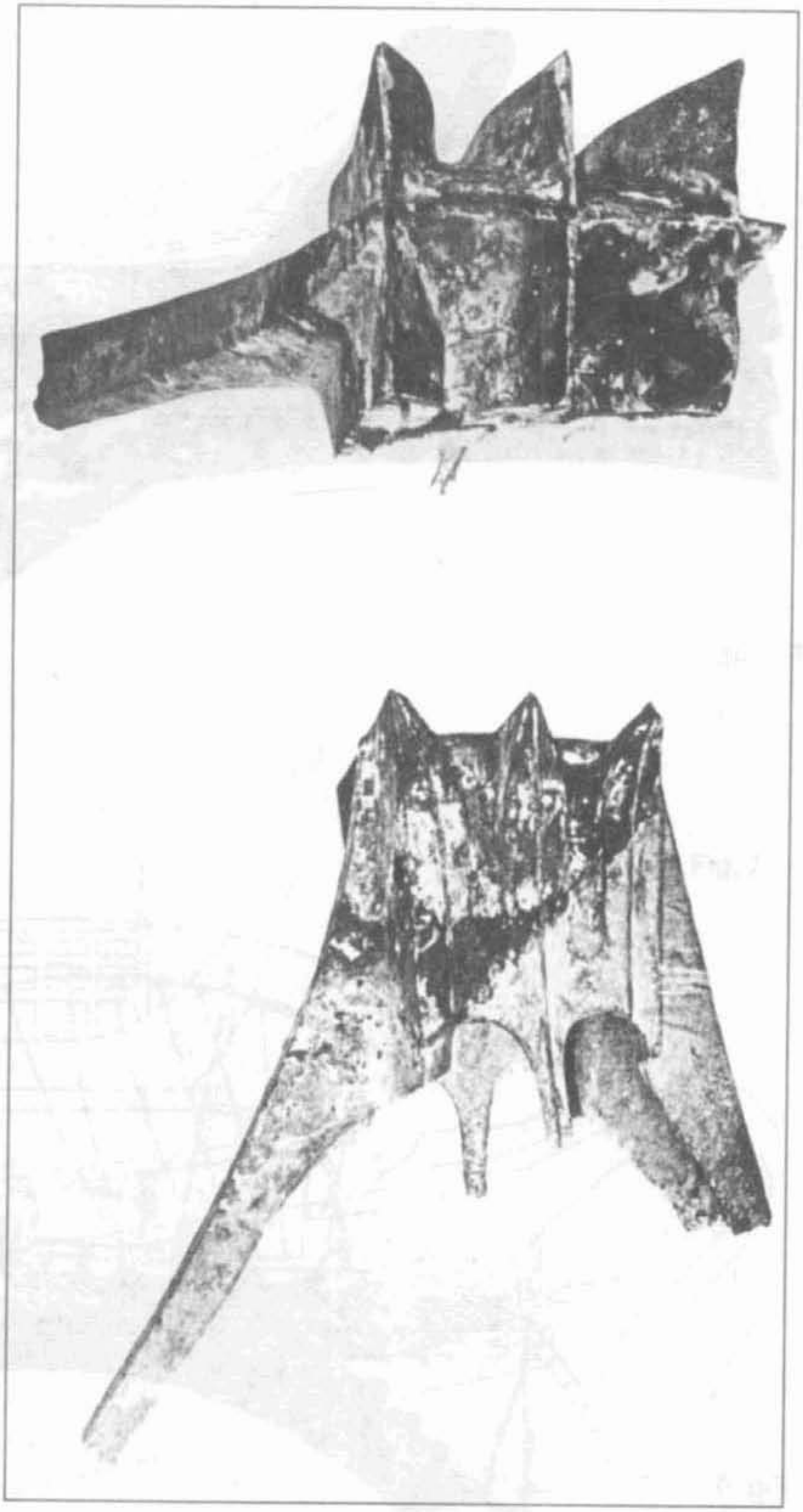


Fig. 2

Fig. 3

Fig. 4a



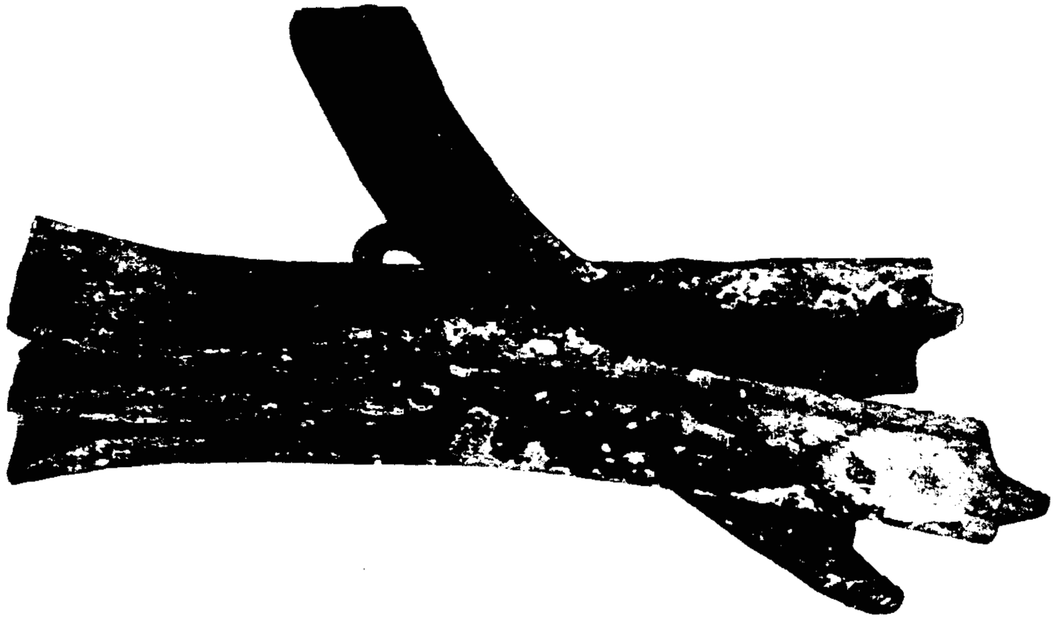


Fig. 4b

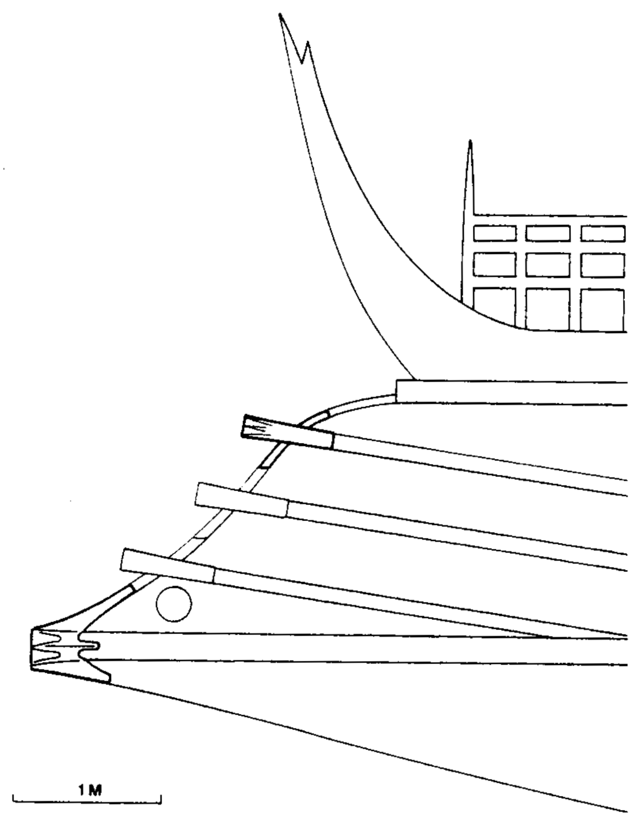


Fig. 5

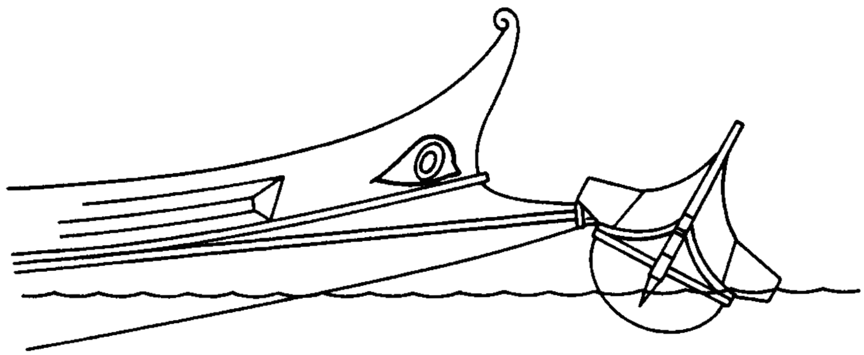
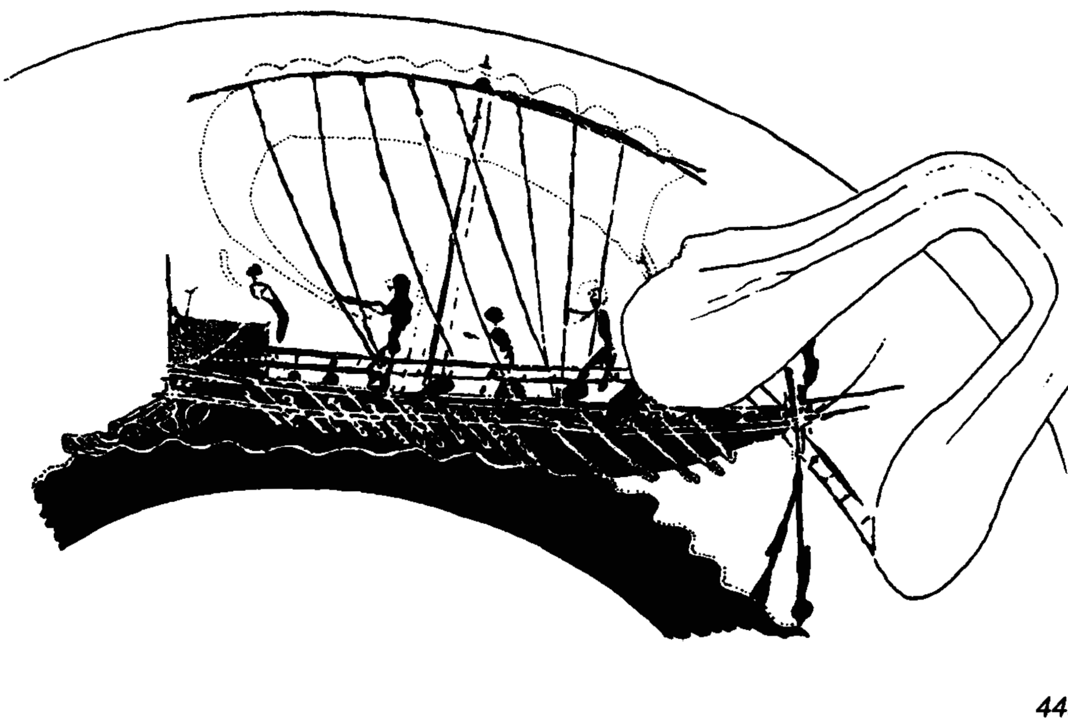


Fig. 6

Fig. 7



ΠΡΩΙΜΕΣ ΛΑΤΡΕΙΕΣ ΣΤΟ ΒΟΡΕΙΟ ΙΟΝΙΟ ΠΕΛΑΓΟΣ ΣΧΕΤΙΚΕΣ ΜΕ ΤΗ ΝΑΥΣΙΠΛΟΙΑ

Στον Ιάσονα Δεπούντη

1. Εισαγωγικά

Με την πεποίθηση ότι τα θρησκευτικά έθιμα ριζώνουν και διαρκούν στη συνείδηση των ανθρώπων κάθε περιοχής σκοπεύουμε να προσεγγίσουμε το θέμα για τις πρώιμες λατρείες στο βόρειο Ιόνιο Πέλαγος, επιχειρώντας να θίξουμε προκαταρκτικά προβλήματα απαρχής και προέλευσης ορισμένων εθίμων, προβλήματα ταυτότητας, προβλήματα θέσεων. Υπάρχουν περιθώρια μελέτης[1] και περαιτέρω έρευνας των λατρειών ως προς την ιστορική τους εξέλιξη, ως προς τις κοινωνικές και εθνικές ομάδες που γνώριζαν, σεβόντουσαν και έλεγχαν συγκεκριμένες λατρείες, ως προς την τοπογραφική διάταξη στα πλαίσια ενός χώρου, ως προς τα αίτια και τις κατευθύνσεις εντέλει μέσα στις οποίες αυτές αναπτύχθηκαν και διαμορφώθηκαν. Οι λατρείες έχουν ασφαλώς έναν πρωταρχικό ιδεολογικό χαρακτήρα, παράλληλα όμως προϋποθέτουν αφ' ενός συλλογική συνείδηση, και αφετέρου αποτελούν το θεσμοποιημένο πυρήνα, ο οποίος αναπήδησε από την πρακτική της εθιμοτυπίας.

Ως πρώιμες λατρείες εννοούμε εκείνες οι οποίες εντοπίζονται με στοιχεία εγκαθίδρυσης τους μέχρι τον 7ο αιώνα π.Χ. Επιλέχθηκε ως terminus ante quem ο 7ος αιώνας, γιατί το 625 π.Χ. ιδρύεται επίσημα η αποικία των Κορινθίων Αμβρακία[2], στο χώρο της οποίας είχαν εγκατασταθεί οι ίδιοι από τον 9ο αιώνα. Προς τα τέλη του 7ου αιώνα, εξάλλου, ολοκληρώνεται ένα μέρος των αποικιακών επιχειρήσεων στο Ιόνιο Κορινθίων, Ευβοέων, Λοκρών, Αχαιών[3]. Εξάλλου, ως terminus post quem επιλέξαμε τα μεσοελλαδικά χρόνια 2000 - 1550 περίπου π.Χ., αφού οι αρχαιολογικές μαρτυρίες[4] οδηγούν στην εκτίμηση ότι στη Λευκάδα, την Κέρκυρα, τη νοτιοανατολική Ιταλία η θάλασσα συνέβαλλε, με τη δυνατότητα μετακινήσεων ακτοπλοϊκά, στον εμβολιασμό των εντόπιων πολιτισμών με νέους παράγοντες ή στην εγκαθίδρυση καινούργιων κοινωνικών πραγματικοτήτων.

Ως βόρειο Ιόνιο Πέλαγος εννοούμε[5] τα παράλια από το ύψος της Λευκάδας και του Αμβρακικού κόλπου μέχρι τα στενά Κέρκυρας - Βουθρωτού (όπου θεωρείται το όριο με την Αδριατική θάλασσα) και τις αντίστοιχες "αντίπερα" ακτές της Απουλίας, της Λευκάδας και της Καλαβρίας.

Το ενδιαφέρον του θέματος για τις "πρώιμες λατρείες στο βόρειο Ιόνιο Πέλαγος", προκύπτει από τις ελλείψεις τις οποίες έχουμε σχετικά με τη συμβολή του θρησκευτικού συναισθήματος α) στη διευθέτηση των λειτουργιών ενός οικισμού, β) στις ασχολίες των κατοίκων της περιοχής και στις επαφές με άτομα από άλλες περιοχές, γ) στις δοξασίες των ομάδων και στις επιδράσεις τις οποίες δέχονταν άμεσα από εξωτερικούς παράγοντες, αλλά και από εσωτερικούς, οι οποίοι υπαγόρευαν μετατροπές στη δομή και στους στόχους του συνόλου, το οποίο ζούσε στο συγκεκριμένο τόπο και έκρινε τις τύχες του ιερού χώρου. Οι ελλείψεις στους τομείς αυτούς καλύπτονται εν μέρει με την πρόταξη αρχαιολογικών και φιλολογικών στοιχείων, εφ' όσον υπάρχουν, και με συλλογισμούς οι οποίοι σκιαγραφούν ορισμένες καταστάσεις.

2. Ιστορικό Πλαίσιο

Λίγες οι συστηματικές έρευνες για παράκτιους ιερούς χώρους στο βόρειο Ιόνιο Πέλαγος. Για τη βορειδυτική Ελλάδα επισημαίνουμε τις αναφορές των Hammond[6], Δάκαρη[7] και Lepore[8] σε συνθετικές ιστορικο-αρχαιολογικές εργασίες για την Ήπειρο τις δημοσιεύσεις της Τζουβάρα-Σούλη[9] για θεότητες του ηπειρωτικού και ευρύτερου χώρου (ιδιαίτερα κάτω από την επιρροή των Κορινθίων αποίκων), του Καλλιγά[10] για ευβοϊκές και κορινθιακές λατρείες στην Κέρκυρα και τη Λευκάδα. Για την νοτιοανατολική Ιταλία αξίζει να αναφέρουμε τις εργασίες του Pugliese Caratelli[11], ο οποίος έστρεψε την προσοχή των ερευνητών στις μυκηναϊκές λατρείες, οι οποίες επιβιώνουν στα χρόνια του αποικισμού και μετά από αυτόν και εκείνες του Pagliara[12], ο οποίος ερευνάει συστηματικά τα παράκτια ιερά της δυτικής πλευράς του βορείου Ιονίου.

Το ιστορικό πλαίσιο μέσα στο οποίο επικεντρώνουμε την προσοχή μας αρχίζει να διαμορφώνεται από το 18ο αιώνα π.Χ. στο 16ο, όταν πρωτο- και μεσο- ελλαδικές ενδείξεις εμφανίζονται στους τύμβους της Λευκάδας[13], στα παράκτια της Κέρκυρας[14] και της Απουλίας[15]. Η ναυσιπλοΐα, για την οποία δεν έχουμε στοιχεία ικανά για να στηρίξουμε το συστηματικό χαρακτήρα της, χρησιμοποιήθηκε για τη διάδοση της μινύειας κεραμικής, χάλκινων μαχαιριών και ξιφών, για τη μετακίνηση ατόμων και νέων ιδεών σχετικών με τη δομή των κοινοτήτων και την οικονομία.

Ακολούθως, η μυκηναϊκή εξάπλωση προς τα δυτικά άγγιξε - όπως είναι γνωστό - δυναμικά θέσεις των ακτών του βορείου Ιονίου, όπως την Εφύρα και την Κίπερη στη Θεσπρωτία[16], το Scolgio del Tonno και το Porto Perone (Τάρας), την Coppa Nevigata, τον Torre Santa Sabina και την Punta Le Terrare (Brindisi), την Punta Meliso (Λεύκα), τη Scala di Furno κ.α. στη νοτιοανατολική ιταλιωτική ακτή[17], από το 16ο μέχρι τον 11ο αιώνα π.Χ. Οι διαδοχικές φάσεις της μυκηναϊκής παρουσίας γίνονται εμφανείς με την τροχήλατη κεραμεική, με τα επιτεύγματα της χαλκουργίας, με την εγκατάσταση ή την αναδιάρθρωση οικισμών και την ενίσχυσή τους, πιθανότατα, από άτομα με νέες ασχολίες και σχέσεις.

Οι ναυτικές διαδρομές των Μυκηναίων καθώς και η μυκηναϊκή παρουσία επηρέασαν την καθημερινή πρακτική των κοινωνιών σε θέσεις των παραλίων του βορείου Ιονίου. Για το μεσοδιάστημα από την παρακμή των Μυκηναίων μέχρι τις πρώτες αποικίες στη Δύση, από τον 11ο μέχρι τον 8ο αιώνα π.Χ., τα υλικά κατάλοιπα είναι περιορισμένα στο ελληνικό τμήμα του βορείου Ιονίου[18], ενώ αφθονούν στο ιταλικό[19] μυκηναΐζοντα αγγεία, περιφερειακή παραγωγή και διακίνηση χάλκινων εργαλείων και όπλων, υπό την επίδραση και κεντροευρωπαϊκών και βαλκανικών στοιχείων.

Οι αιώνες του αποικισμού[20], 8ος και 7ος, χαρακτηρίζονται από ιδιαίτερη κινητικότητα Ευβοεών, Κορινθίων και άλλων στο Ιόνιο, πάνω σε ναυτικά δρομολόγια μυκηναϊκά και παραλλακτικά, ήδη γνωστά σε δραστήριες, ανώνυμες συχνά ομάδες από Κεφαλλήνες, Ιθακήσιους, πειρατές, εμπόρους, μετοίκους. Η ίδρυση αποικιών σε περιοχές του Ιονίου, της Αδριατικής, του Τυρρηνικού, προδίδουν προθέσεις άλλης τάξης σε σχέση με το παρελθόν: "πόλεις" καρπώνονται μέρος της ενδοχώρας και εξυπηρετούν στρατηγικά και εμπορικά συμφέροντα μητροπόλεων και δικά τους σε καταστάσεις μικρών και μεγάλων ηγεμονιών.

3. Λατρείες: Ενδεικτικές περιπτώσεις

Ενδεικτικές είναι ορισμένες πρώιμες λατρείες, οι οποίες έχουν διαπιστωθεί στα παράλια του βορείου Ιονίου:

I. Λατρείες "εκτός των τειχών".

II. Λατρείες των "Νυμφών".

III. Τοπικές λατρείες.

I. Λατρείες "εκτός των τειχών"

Πρώιμες λατρείες στο βόρειο Ιόνιο γίνονται αντιληπτές από "ιερά εκτός των τειχών". Τη θεωρία για τα "ιερά" αυτά εισήγαγε το 1962 ο Pugliese Carratelli[21], αλλά μόνο τα τελευταία χρόνια αναγνωρίστηκε. Σύμφωνα με τον Pugliese Carratelli, ιερά αφιερωμένα σε θεότητες, οι οποίες αναφέρονται σε πινακίδες με γραμμική γραφή Β (Ήρα, Αθηνά, Ποσειδών) και ανήκουν στο μυκηναϊκό πάνθεον, ευρίσκονται κοντά, αλλά έξω από τα όρια ελληνο-ιταλιωτικών πόλεων τέτοιες λατρείες φαίνεται ότι εμφυτεύθηκαν εκεί κατά τη διάρκεια των μυκηναϊκών εγκαταστάσεων και όχι μετά τον αποικισμό. Οι θέσεις στις οποίες συνήθως υπήρχαν τα ιερά αυτά ήταν κατάλληλες για τις δραστηριότητες των Μυκηναίων, στις εκβολές πλωτών ποταμών, σε λόφους κοντά σε λιμάνια.

Η λατρεία της Περσεφόνης στο Νεκρομαντείο του Αχέροντα (λόφος Άϊ-Γιάννη)[22] στην Ήπειρο, δυτικά της αποικίας των Ηλείων Πανδοσία και στο ιερό πλησιόχωρα της αποικίας των Λοκρών Λοκροί Επιζεφύριοι[23], στη νοτιοανατολική Ιταλία, επιβεβαιώνει την άποψη, σύμφωνα με την οποία άποικοι ακολούθησαν σε θέσεις των Μυκηναίων, προερχόμενοι από συγγενείς ή γειτονικές περιοχές.

Με δεδομένη τη μυκηναϊκή Περσεφόνη (Πέρσα ή Φερσέφασσα) των πινακίδων και την πελοποννησιακή παράδοση της λατρείας[24] καθώς και τη μυκηναϊκή παρουσία στο Ξυλόκαστρο/Εφύρα[25] - όπου το κυκλώπειο τείχος - και την Κίπερη (Πάργα)[26] - όπου ο θολωτός τάφος, η αρχαϊκότητα της λατρείας στις εκβολές του Αχέροντα επιβεβαιώνεται και από τη μαντική πρακτική[27]. Ο Δάκαρης[28] και ο Παπαχατζής[29], εξάλλου, οι οποίοι μελέτησαν τα "νεκρομαντεία" του Αχέροντα και του Ταινάρου αντίστοιχα, τονίζουν τη συνήθεια της λατρευτικής χρήσης σπηλαίων, τα οποία θεωρούνταν "ψυχοπομπεία" και στα οποία λειτουργούσε η "νεκρομαντεία". Οι δύο μελετητές, επίσης, θεωρούν τον "ίππιο" Ποσειδώνα, χθόνια προϊστορική θεότητα, ως υπόβαθρο της κατοπινής λατρείας της Περσεφόνης, κυρίας του κάτω κόσμου.

Το "Νεκυιομαντείον του Αχέροντος" πρέπει να λειτούργησε αρχικά σε συντονία με τη μυκηναϊκή εγκατάσταση της Εφύρας, στις βόρειες όχθες του Αχέροντα ποταμού, ο οποίος εκβάλλει στο "Γλυκύ Λιμένα" (Θουκ.-1.16.4, Στράβ. 7.7.5). Το σπήλαιο, οι ποταμοί Κωκυτός, Πυριφλεγέθων και Αχέρων, και η Αχερουσία λίμνη τροφοδότησαν τη μυθολογία και προκάλεσαν το δέος σε γενεές του δεύτερου μισού της 2ης χιλιετίας, αλλά και της 1ης μέχρι την καταστροφή των ελληνιστικών κτισμάτων στα ρωμαϊκά χρόνια. Η θρησκευτική παράδοση η οποία διαμορφώθηκε στα υστερομυκηναϊκά χρόνια εμπεριέχεται στη λ Ραψωδία -γνωστή ως νέκυια- της Οδύσσειας (και Οδ. κ487-495, 508-520) και στον Ηρόδοτο (5.92η). Βέβαια, η πρώϊμη λειτουργία του λατρευτικού χώρου είχε μία σαφή πολιτική και οικονομική διάσταση, αφού οι παρακείμενοι κάτοικοι της μυκηναϊκής εγκατάστασης της Εφύρας ήλεγχαν τον πλωτό ποταμό και τον ευλίμενο κόλπο, σταθμό για μυκηναϊκά και φιλικά πλοία[30].

Το ιερό της Περσεφόνης στους Λοκρούς Επιζεφύριους και τα τοπωνύμια *Πανδοσία - Αχέρων - Αχεροντία*[31] στη νοτιοανατολική Ιταλία σηματοδοτούν εν πρώτοις ανάλογη με του Νεκρομαντείου της Ηπείρου λατρευτική κατάσταση στην "αντίπερα" ακτή. Ταυτόχρονα φανερώνουν ένα δεσμό των δύο περιοχών. Η ίδρυση του Μεταποντίου νοτιοδυτικά του Τάραντα από τους Αχαιούς το 680 π.Χ. και το εκτός των τειχών ιερό της Ήρας (Tavole Palatine)[32] ενισχύει την άποψη για τις πρό του 7ου αιώνα επαφές με το βόρειο-βορειοδυτικό πελοποννησιακό παράγοντα, όπως φαίνεται και στην περίπτωση Εφύρας και Πανδοσίας στην Ήπειρο.

Άλλα γνωστά "ιερά εκτός των τειχών" στην Απουλία, τη Λευκανία και την Καλαβρία, τα οποία εντάσσονται στις σχετικές προηγούμενες θεωρήσεις είναι της Ήρας Λακινίας στον Κρότωνα, της Αρτέμιδος στο Ρήγιο, της Αθηνάς Ιλιάδος στη Σίρι και τη Δαυνία[33]. Αυτά τα πρώιμα ιερά και οι λατρείες δεν δικαιολογούν την παρουσία τους στα νοτιοανατολικά παράλια της Ιταλίας, αν δεν συσχετισθούν με ταξιδιωτικές δραστηριότητες των Ελλήνων, τους εμπορικούς στόχους και τις σχέσεις σε κοινωνικά και ιστορικά πλαίσια.

Συνεπώς, οι ενδείξεις για την πρώιμη λατρεία της Περσεφόνης στην Εφύρα και στους Λοκρούς Επιζεφύριους καταδεικνύουν απολήξεις υδάτινων δρόμων επικοινωνίας, παράλληλων, εγκάρσιων και ακτοπλοϊκών. Η λατρεία υπήρχε σε συνάρτηση με "εμπορικές" και ναυτικές δραστηριότητες διαφορετικών κοινωνιών και κατά τα φαινόμενα ελέγχονταν από τους "φιλοξενούμενους".

II. Λατρείες των "Νυμφών"

Η λατρεία των "Νυμφών" στο βόρειο Ιόνιο είναι χαρακτηριστική μιάς πραγματικότητας με ρίζες στα προϊστορικά χρόνια και εμβέλεια σε εντόπιους και επισκέπτες. Οι αρχαίες πηγές ήδη από τα ομηρικά ποιήματα (Οδ. μ 316-318, Ιλ. ψ 194-197, Ω 616) αναφέρουν τις Νύμφες και τελετουργίες, οι οποίες σχετίζονταν με σπήλαια και το υγρό στοιχείο (ποταμούς, πηγές). Όπως απέδειξε η μελέτη της Τζουβάρα-Σούλη[34] για τις λατρείες των Νυμφών στην Ήπειρο, τα αρχαιολογικά δεδομένα φανερώνουν τη διάδοση της λατρείας από τον 9ο αιώνα π.Χ. μέσω Κορινθίων στο χώρο του Ιονίου και της Αδριατικής. Από την άλλη πλευρά η άποψη του Hammond[35] με βάση φιλολογικά δεδομένα είναι ότι ακριβώς η λατρεία των Νυμφών και του Πάνα μαζί με τη μαντική προήλθαν από την περιοχή της Απολλωνίας και της Ηπείρου στην κεντρική και νότια Ελλάδα κατά τη διάρκεια των μεταμυκηναϊκών και πρό του Αποικισμού χρόνων.

Οι δύο απόψεις, της Σούλη και του Hammond, εμφανίζονται καταρχήν αντίθετες. Θεωρούμε όμως ότι αμφότερες ανταποκρίνονται σε πραγματικότητα, η οποία δεν αναιρείται ούτε από τη μία ούτε από την άλλη γνώμη. Η Σούλη αναφέρεται μέσω των αρχαίων ευρημάτων σε αντικείμενα σχετικά με τη λατρεία των Νυμφών και σε μνημόνευση τελετών και συμβόλων (πήλινα ειδώλια - ανάγλυφα - νομίσματα - επιγραφές), ουσιαστικά στο τυπικό της λατρείας και τις εκδηλώσεις της, όπως αποκρυσταλλώθηκαν κάτω από την επιρροή του κορινθιακού παράγονται από την Κόρινθο μέχρι τις Συρακούσες, από τον 8ο στον 4ο αιώνα π.Χ. Ο Hammond αντίθετα δίνει έμφαση σε επιτόπιες αρχαιότερες πρακτικές της λατρείας, η οποία σαφώς παραλλάσσεται σε επιφανειακά χαρακτηριστικά, αλλά αναφέρεται σε ίδιους χώρους και σε ίδιους θρησκευτικούς πυρήνες. Τίποτε, όμως, δεν αποκλείει την περαιτέρω διάδοση της λατρείας των Νυμφών στα χρόνια της κορινθιακής επιρροής στο Ιόνιο, όπως δεν αποκλείει και την ύπαρξη σε προηγούμενους αιώνες των ίδιων κατά βάση αντιλήψεων και πίστεων σε ανάλογους χώρους.

Τα παραδείγματα της Λευκάδας[36] και του Βουθρωτού[37] είναι χαρακτηριστικά. Στο σπήλαιο Ασβότρυπα της Λευκάδας και στο φρέαρ - σπήλαιο του Βουθρωτού βρέθηκαν όστρακα "προϊστορικής" κεραμικής. Αν και η παρουσία τέτοιων οστράκων δεν προκαθορίζει την ύπαρξη λατρείας, εντούτοις συσχετίζοντας τη λατρεία με άλλα στοιχεία δημιουργείται υπόνοια για τη χρήση του χώρου ως λατρευτικού άντρου των Νυμφών. Η γνώση της λατρείας των Νυμφών στη βορειοδυτική Ελλάδα, η παρουσία του γλυκού νερού κοντά σε ευλίμενο όρμο, η υποβλητική μορφή του σπηλαίου, με μακραίωνη παράδοση λατρειών, η θέση σε σχέση με ναυτικές διαδρομές προς Β και Δ, αποτελούν ενδείξεις[38] για τη λειτουργία του σπηλαίου της Λευκάδας και του Βουθρωτού πριν από τους Κορινθίους.

Στην Κέρκυρα επίσης, το σπήλαιο του Καρδακιού[39] αποτελεί ένα άλλο παράδειγμα λατρείας. Οι Ευβοείς καταρχήν, πιθανότατα στα μισά του 8ου αιώνα π.Χ. συνέδεσαν το σπήλαιο του Καρδακιού και τη γνωστή πηγή με τη Νύμφη Μάκριδα. Οι Κορίνθιοι οι οποίοι ίδρυσαν την Κερκυραϊκή αποικία στα τέλη του 8ου αιώνα, επέδρασαν ώστε το σπήλαιο του Καρδακιού να αφιερωθεί στη Μήδεια, στη μνήμη του γάμου της με τον Ιάσονα στην αυλή του Αλκινόου (Απολλ. Ρόδ. IV 534 κεξ.). Και για την Κέρκυρα δεν αποκλείεται η πριν τους Ευβοείς χρήση για λατρευτικούς σκοπούς του "Άντρου της Νύμφης", διότι πληρούνται οι όροι σχετικά με τη γεωμορφολογία (πηγή, κοντά σε ευλίμενο όρμο, χάσμα βράχου) και τη θρησκευτική παράδοση (τοπικές λατρείες σε σπήλαια όπου αναβλύζει πόσιμο το υγρό στοιχείο).

Τα σπήλαια των Νυμφών, λοιπόν, εξυπηρετούσαν κατά τα φαινόμενα, ιδεολογικές ανάγκες εντόπιων και επισκεπτών περαστικών. Ήταν δε, σε συνάρτηση με την τοποθεσία, με τον ανεφοδιασμό των πλοίων σε νερό, όχι μακρυά από κάποιο λιμάνι ή εμπορικό σταθμό, με την επιδίωξη να εξασφαλισθεί ο πλούς στην περιοχή του βορείου Ιονίου, ιδίως των Κορινθίων και των συμμάχων τους.

Κατά συνέπεια, οι ενδείξεις για τη λατρεία των Νυμφών στη Λευκάδα, την Κέρκυρα, του Βουθρωτό, ευβοϊκής και κορινθιακής παράδοσης - αλλά και με βάσιμα στοιχεία αρχαιότερα και ενδημικά - συνιστούν κατάσταση την οποία συναντάμε, για την ώρα, μόνο στην ανατολική πλευρά του Ιονίου. Είναι έργο της συστηματικής έρευνας να εντοπίσει και άλλα Νυμφαία σε κάποια από τα πολυάριθμα σπήλαια των δυτικών ακτών του πελάγους. Τα σπήλαια των Νυμφών λειτούργησαν φυσικά κάτω από προϋποθέσεις θρησκευτικής έκφρασης, αλλά οπωσδήποτε τούτο συνέβη από την ανάγκη για πόσιμο πηγαίο νερό, απαραίτητο και για τη συνέχιση των ταξιδιών. Δεν είναι σαφές αν ο έλεγχος των ιερών αυτών ανήκε πάντα στους εντόπιους.

III. Τοπικές λατρείες

Η μέχρι τώρα αναφορά σε πρώϊμες λατρείες και ιερά του βορείου Ιονίου στα ανατολικά και δυτικά παράλια φανερώνει ελλιπή γνώση για τοπικά θρησκευτικά έθιμα. Οι γραπτές μαρτυρίες δεν δίνουν φυσικά έμφαση, γιατί αντλούνται κυρίως από τα ελληνικά κέντρα και όχι από επιτόπιες πηγές. Επίσης, η ερμηνεία των αρχαιολογικών δεδομένων υπογραμμίζει ενίοτε τα επείσακτα στοιχεία και υποβαθμίζει τα εντόπια.

Ο Pagliara[40] ερεύνησε για μία εικοσαετία τα παράλια από το Βρινδήσιο στη Santa Maria de Leuca (Λεύκα) στο νότιο τμήμα των παραλίων της Απουλίας, γνωστό και ως Salento (Σαλλεντίνη), και εντόπισε παράκτια ιερά. Τα σχετικά δεδομένα πληροφορούν για δύο ουσιώδη θέματα: πρώτον και οφθαλμοφανές, ότι τα παράλια από το Βρινδήσιο στη Λεύκα και ιδίως στην περιοχή του Ότραντο υπήρξαν τα πιό κοντικά σημεία των ανατολικών ακτών του Ιονίου, αν κρίνουμε από τη θέση των Διαποντίων Νήσων, της Κέρκυρας, του Βουθρωτού και των θεσπρωτικών παραλίων· δεύτερον, λιγότερο οφθαλμοφανές, ότι τα ευρήματα στην παράκτια ζώνη της Σαλλεντίνης περιλαμβάνουν επείσακτα αλλά τα εντόπια υπερτερούν και δεν επισκιάζονται από τα μυκηναϊκά ή των άλλων ελληνικών κέντρων.

Η εκτίμηση η οποία προκύπτει από τη σχέση των ιερών παράκτιων θέσεων με το γεωγραφικό χώρο, είναι ότι παρέχονται σοβαρά δείγματα τοπικών πρώιμων λατρευτικών εθίμων στα σπήλαια, όπως φανερώνει η ανάπτυξη της κεραμεικής "matt-painted"[41] πριν τον αποικισμό σε ιταλιωτικό έδαφος μετά την ώθηση πιθανότατα ναυτικών και μετοίκων από τη νότια Αλβανία και τη βόρεια Ήπειρο. Ακολούθως, η επίσκεψη αποίκων από τις γύρω περιοχές δεν οδήγησαν στην απώλεια τοπικών χαρακτηριστικών (π.χ. το σπήλαιο Porcinara του Zis Bates στη Λεύκα[42]). Ενδιαφέρον παρουσιάζει το γεγονός ότι στη ζώνη Βρινδήσιο - Λεύκα, παρά τη γειτνίαση των ακτών με τον ελλαδικό χώρο και με άλλες αποικίες (Τάραντα, Μεταπόντιο) και παρά την επιρροή των Ευβοέων, Κορινθίων, Κερκυραίων, το τοπικό στοιχείο διαδραμάτιζε πρωταγωνιστικό ρόλο.

Η άλλη εκτίμηση η οποία προκύπτει από τη σχέση των ιερών με την κοινωνική πραγματικότητα στην ιστορική εξέλιξή τους από τα προϊστορικά χρόνια στον αποικισμό και στη συνέχεια μέχρι το Μεσαίωνα είναι η εξής: η παράκτια ζώνη της Σαλλεντίνης στην ιστορική διαδικασία πριν και μετά τον αποικισμό δέχθηκε ως ενδιάμεσος σταθμός και ως σχετικά αυτόνομος παράγοντας, ξένους επισκέπτες, στα πλαίσια ναυτικών δρομολογίων προς Β και προς Δ[43] - είτε από ελληνικά κέντρα, είτε από διάφορα σημεία του ιονίου και αδριατικού χώρου κυρίως.

Επισημαίνω την περίπτωση του σπηλαίου "Poesia" ή "Ποσία"[44] στη Roca, στα παράλια της Μεσσαπίας. Η εκεί λατρεία δεν απώλεσε ουσιαστικά την τοπική της ταυτότητα και τούτο δεν εμπόδισε τη συνέχιση της λειτουργίας του σπηλαίου και των επισκέψεων ξένων. Το σπήλαιο αυτό έδωσε επάλληλες αρχαιολογικές μαρτυρίες από την ανώτερη παλαιολιθική εποχή μέχρι το Μεσαίωνα. Με την περίπτωση του σπηλαίου "Πόσια" επανατοποθετείται το όλο θέμα των παράκτιων ιερών στο βόρειο Ιόνιο και τη νότια Αδριατική. Το πρόβλημα, βέβαια, τίθεται εντονότερο για τη δυτικά πλευρά του Ιονίου, το οποίο ήταν έξω από τον ελλαδικό χώρο.

Εξάλλου, ας σημειωθεί ότι ο τοπικός χαρακτήρας εν γένει είναι ρευστός και έχουμε κενά στις γνώσεις μας ως προς την πραγματική μορφή λατρείας και ιερού στις διάφορες θέσεις. Από το σπήλαιο "Πόσια" εντούτοις έχουμε την ένδειξη ότι μία λατρεία δύναται να έχει διαχρονική εμβέλεια, και ότι δύναται να είναι σεβαστή από άτομα διαφορετικών προελεύσεων. Στο πλαίσιο αυτό, ενός κοινού παρονομαστή θρησκευτικών δοξασιών, ήταν εφικτές παρεμβάσεις, αναγνωρίσιμες κατά περίπτωση και κατά τόπο, όσον αφορά στις σχέσεις και τις αλληλοεπιρροές οικονομικών και κοινωνικών πραγμάτων.

Εν τέλει, οι ενδείξεις για τις πρώιμες εντόπιες λατρείες των δυτικών παραλίων του Ιονίου με ρίζες στην προϊστορία συνιστούν δείγμα ανθεκτικότητας θρησκευτικών δοξασιών των εντόπιων σε θέσεις, οι οποίες δέχθηκαν εξωτερικές επιρροές σε διάφορα επίπεδα. Επίσης, οι πληροφορίες συγκλίνουν στην εκτίμηση ότι τα σπήλαια με εν ισχύ τοπικές λατρείες ήταν δεύτερης και τρίτης σημασίας σημεία θαλάσσιων διαδρομών. Πιθανότατα ιδίας εμβέλειας με τα σπήλαια τύπου "Πόσια" ήταν και τα παράκτια σπήλαια των Νυμφών. Με αντίστοιχο τρόπο, εξυπηρετούσαν τους ταξιδιώτες και τα πληρώματα των πλοίων με πόσιμο νερό και ιδεολογική κάλυψη. Στην περίπτωση μάλιστα τοπικών λατρειών γίνεται φανερή η συμβολή της ενδοχώρας στη δημιουργία και διατήρηση θρησκευτικών λατρειών στα παράλια, χωρίς οι δραστηριότητες των κατοίκων της ενδοχώρας να σχετίζονται πάντα άμεσα με τη θάλασσα.

Επίλογος

Καταλήγοντας την ανακοίνωση με τα ανοιχτά ζητήματα των πρώϊμων λατρειών στο βόρειο Ιόνιο συνάγεται κατά κύριο λόγο ότι οι λατρείες διαμορφώνονται στα πλαίσια μιάς πολυπλοκότητας σχέσεων ανάμεσα σε Έλληνες και μη μικρών ή μεγάλων κέντρων. Γι' αυτό, οι λατρείες συμπεριλαμβάνουν διαστάσεις με ποικίλα χωρο-οικονομικά και οικονομικο-πολιτικά και ιδεολογικά χαρακτηριστικά.

Κώστας Σουέρεφ
Πόντου 20
570 01 Θέρμη
Θεσσαλονίκη

ΣΗΜΕΙΩΣΕΙΣ

1. Σχετικά με την έρευνα αρχαίων λατρειών αναφέρουμε επιλεκτικά: Mylonas 1944, Adrados 1977, Παπαχατζής 1976, 1987, Brelich 1978, Hiller 1981, Renfrew 1980, 1985, Rutkowski 1984, Cole 1986.
2. Για ην ίδρυση της Αμβρακίας πρβ. Hammond 1959:116, 657, 1967:656, Βοκοτοπούλου 1979.
3. Πρβ. τις απόψεις για τον αποικισμό των Hammond 1959, 109-134, Lepore 1978, Moscati 1980:23-29, Boardman 1986: 175-209, Pugliese 1986.
4. Πρβ. τις παρατηρήσεις για την Πρώϊμη και Μέση Εποχή Χαλκού στο Βόρειο Ιόνιο των: Hammond 1959, 109-139, 1976a:291-340, 1967β, Sordinas 1968, 1969, Biancofiore 1975, Van Compernolle 1988.
5. Για την αντίληψη των αρχαίων ως προς τα όρια Ιονίου - Αδριατικής πρβ. Pallotino 1973, Lepore 1973, Nenci 1973a, 1973β, 1979, Braccesi 1979, D'Andria 1983, 1984a, 1984β.
6. Hammond 1967α.
7. Δάκαρης 1958, 1960, 1971, 1972, 1975, 1984α, 1984β.

8. Lepore 1962.
9. Τζουβάρα 1979, 1985, 1988, 1988-89, 1990.
10. Καλλιγάς 1968, 1969, 1979.
11. Pugliese 1958, 1961, 1962, 1964, 1967, 1968, 1969, 1971, 1977, 1978α, 1978β, 1983, 1986.
12. Pagliara 1978, 1979, 1987, 1990.
13. Για τα πρώτο- και μεσο-ελλαδικά της Λευκάδας βλ. Dörpfeld 1927, Hammond 1967α, 1967β, 1974α, 1974β, 1976α, 1976β, Branigan 1975, Pelon 1976, Muller 1989.
14. Για τα πρωτο- και μεσο-ελλαδικά της Κέρκυρας βλ. Dörpfeld 1913, 1914, Bulle 1934, Δοντάς 1965: 378-381, 1967:369-370, Hammond 1967α. Sordinas 1968, 1969.
15. Για τα πρωτο- και μεσο-ελλαδικά της Απουλίας βλ. ενδεικτικά Biancofiore 1975, 1978, 1984, Benzi-Graziadio 1980, Van Compernolle 1988 όπου και βιβλιογραφία.
16. Εργασίες που αναφέρονται στη μυκηναϊκή παρουσία στην Ήπειρο: Δάκαρης 1971, 1972, 1984α, Hammond 1967, Παπαδόπουλος 1976, 1987, Wardle 1977, Kilian 1984β, Harding 1984:223-227, Poursat 1984, Σουέρεφ 1986, 1989α, 1989β, 1989γ.
17. Εργασίες που αναφέρονται στη μυκηναϊκή παρουσία στη νοτιοανατολική Ιταλία: Taylour 1958, Biancofiore 1967, 1990, Macnamara 1970, Vagnetti 1970, 1981α, 1981β, 1982, 1983, 1991, Marazzi 1976, Lo Porto 1977, 1984, Moscati 1980:13-17, Holloway 1981, Cipolloni 1984, Harding 1984:244-261, Peroni 1984, Peroni et al 1984, Van Compernolle 1988.
18. Αναφέρονται στα ελληνικά παράλια και νησιά του Ιονίου για το μεσοδιάστημα από τη μυκηναϊκή παρακμή μέχρι τον αποικισμό εργασίες όπως: Desborough 1964, 1972, Hammond 1967α, Snodgrass 1971, Wardle 1977, D'Adostino 1978, Δάκαρης 1984α, Boardman 1986:21-33, Βοκοτοπούλου 1986, Σουέρεφ 1989γ, 1990.
19. Αναφέρονται στα ιταλικά παράλια του Ιονίου για το μεσοδιάστημα από τη μυκηναϊκή παρακμή μέχρι τον αποικισμό εργασίες όπως: Bietti Sestieri 1973, Bietti Sestieri-Lo Schiavo 1976, Cipolloni 1973, 1977, D'Agostino 1974, Marazzi 1976, Carancini 1977, De Juliis 1977, 1979, 1984, 1985, 1988, Lo Schiavo-Peroni 1977, Vagnetti 1977, Moscati 1980:17-23, Holloway 1981, Orlando 1983, Kilian 1984, Cremonesi 1990.
20. Για τον αποικισμό και την κινητικότητα στο Ιόνιο και την Αδριατική βλ. ενδεικτικά: Hammond 1959: 92-134, Lepore 1973, 1978, 1984, Kilian 1974, Mele 1975, Adamesteanu 1979, Βοκοτοπούλου 1979, D'Andria 1979, 1981, 1984α, 1984β, 1988, Moscati 1980:23-29, De La Genière 1981, Van Compernolle 1981, Boardman 1986:175-216, 247-252, 257-260, Pugliese 1986, Lombardo 1990, Σουέρεφ 1990.
21. Για τα "ιερά εκτός των τειχών" στη Μ. Ελλάδα και την ερμηνεία τους βλ. Pugliese στη σημ. 11. Πρβ. Moscati 1980: 21, Graf. 1981.
22. Για το "Νεκυιομαντείον του Αχέροντος" και τη λατρεία της Περσεφόνης και του Άδη εκεί βλ. Δάκαρης στη σημ. 7. Πρβ. Τζουβάρα 1979, Huxley 1958, Hammond 1967α, Παπαχατζής 1976, 1987:63, 73.
23. Για τη λατρεία της Περσεφόνης στους Λοκρούς Επιζεφύριους βλ. Zancam 1959, Giannelli 1963, Pugliese 1964.
24. Σχετικά με τη μυκηναϊκή παράδοση της Περσεφόνης βλ. σημ. 22 &23.
25. Για τα μυκηναϊκά στοιχεία στο Ξυλόκαστρο βλ. Δάκαρης στη σημ. 7, Scoufopoulos 1971, Παπαδόπουλος 1976, 1987, Σουέρεφ 1986, 1989α, 1989β.
26. Για τα μυκηναϊκά στοιχεία στην Κίπερη βλ. Δάκαρης 1960, 1971, 1972, 1984α, Παπαδόπουλος 1976, 1981, 1986, Σουέρεφ 1986.
27. Περί μαντικής βλ. Καλιτσουνάκης 1953/54, Hammond 1967α:399-424, Παπαχατζής 1976, 1987.
28. Δάκαρης 1984β.
29. Παπαχατζής 1976.
30. Για τη σημασία της μυκηναϊκής εγκατάστασης στην Εφύρα βλ. Σουέρεφ 1989β. Πρβ.

Laviosa 1982.

31. Όροι όπως Πανδοσία, Αχέρων, Αχεροντία/Αχερουσία, Χάονες/Χώνες, Γραίοι/Γραικοί συναντώνται στην Ήπειρο και τη νότια Ιταλία. Πρβ. Pugliese στη σημ. 11 και De Simone 1984, Maddoli 1984.
32. Για την ίδρυση του Μεταποντίου και "Tavole Palatine" βλ. Pugliese στη σημ. 11. Πρβ. Moscati 1980:20-22, Graf. 1981.
33. Για τα "ιερά εκτός των τειχών" στην Ιταλία, βλ. Pugliese στη σημ. 11. Πρβ. Moscati 1980:20-22, Graf. 1981.
34. Για τις λατρείες των "Νυμφών" βλ. Τζουβάρα στη σημ. 9. Πρβ. Mylonas 1944, Adrados 1977:119, Rutkowski 1986: 47-67, 200-201, Gigante 1987, Malkin 1987:141-143.
35. Hammond 1967α:366-367, 399-400.
36. Λατρεία Νυμφών στη Λευκάδα: Dörpfeld 1927:332, Καλλιγάς 1968:321.
37. Λατρεία των Νυμφών στο Βουθρωτό: Ugolini 1942, 72-73, 81 κεξ.
38. Για τις προϋποθέσεις παράκτιων λατρειών βλ. σημ. 1 και 34. Επίσης Laviosa 1982, Nenci 1983, Pagliara 1990.
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EARLY RELIGIOUS RITUALS ON THE N. IONIAN COASTS RELATED TO NAVIGATION

Ancient worship practices located in the N. Ionian area are categorized as following:

I. "Extra muros" worships

II. Worships of Nymphae

III. Local worships

I. **The Persephone worship practices** at Efyra in Epirus and Locri Epizephyrii in S.E. Italy, indicate sea-communication road-endings, parallel, cross-sectional and between coasts.

The worship grew in connection with commercial and nautical enterprizes of different societies.

From the 15th up to 12th century B.C., it was controlled mostly by Mycenaeans, while since 8th and 7th centuries by Collonists coming from the same areas.

II. **Nympae worship practices** of Euboean and Corinthian tradition with more ancient and local elements in the archaic period at Leucas, Corcyra, Boutrint, have been identified, for the moment, on the Eastern side of Ionian sea.

Nymphae caves were created on religious premises but it was basically under the need of providing water to the sea travellers.

It has not been identified whether locals were always in control of these sanctuaries.

III. **Local worship practices** identified on the Western Ionian Coast indicate proof of the endurance of local religious beliefs in cases where extended influences of several kinds have been noticed.

The sacred caves were second and third level points in the sea itineraries of prehistoric years up to the middle ages. It is possible, that coastal Nymphae caves were of the same importance with the caves like the "Grotta" dela Poesia or Posia of Salento. In the case of local worship practices the contribution of mainland is prevalent in creating and maintaining the religious beliefs, even though the inhabintants' occupations had no relation to the sea.

LA DÉCOUVERTE DE L'ARSENAL DE PHILON

Il y a peu de monuments de l'antiquité qui ont connu la carrière littéraire brillante de la Skeuothèque ou Hoplothèque (en latin *armamentarium*) de Philon. Ayant perdu sa raison d'être bientôt après son achèvement, en conséquence de la destruction de la flotte Athénienne à la bataille navale d'Amorgos (322), détruit lui même à son tour par Sylla en 86, ce dernier des monuments de l'impérialisme athénien doit sa gloire postume aux commentaires des historiens, géographes et encyclopédistes de l'époque romaine des Vitruve, Strabon, Plutarque, Valère Maxime[1] et surtout de Pline qui parait l'admirer au même titre que les merveilles du monde antique[2]. La réputation dont jouit actuellement l'arsenal de Philon est cependant due moins à sa glorification par les anciens qu' à la découverte, il y a déjà plus de cent ans, d'une non moins fameuse inscription contenant le devis de construction de l'architecte Philon[3]. Cet unique document a permis, immédiatement après sa découverte, la reconstitution sur papier de l'édifice[4] avec une telle exactitude que, comme disait ce fameux architecte et archéologue qu'était Doerpfeld, *bien qu'on n'en ait jusqu'à présent trouvé une seule pierre, il n'y a pas un seul monument de l'architecture grecque qu'on puisse prétendre de connaître aussi parfaitement que la Skeuothèque de Philon.* Ainsi les lacunes de notre information sont limitées soit aux omissions volontaires de l'inscription qui ne traite pas des détails de moindre importance ou de ceux qui étaient évidents pour les contemporains, comme par exemple l'appareil des murs, la nature (colonnes ou piliers) et l'ordre des κίονες de la colonnade intérieure, l'emplacement exact (en haut ou en bas des murs) des fenêtres, l'arrangement de la frise, notamment le nombre des triglyphes etc., soit à notre propre ignorance de la mesure du pied employé et de l'emplacement et de la fonction exacte du bâtiment dans l'arsenal du Pirée. Il s'agit dans tous ces cas de questions auxquelles la réponse pourrait être donnée seulement par l'édifice même. Cependant celui-ci paraissait être définitivement perdu pour la postérité. Ce prestigieux monument n'est pas mentionné par aucun des voyageurs qui ont visité le Pirée du 17e au 19e siècle, quand celui-ci était encore un champ de ruines[5]. Au moment de la découverte en 1882 de l'inscription qui a permis de localiser la Skeyothèque au nord du port de Zéa, cette partie de la ville avait été déjà bâtie. La réconstruction récente (entre 1960 et 1980) du Pirée n'en a pas donné aucune trace. Ainsi le renouveau entre 1958 et 1981 de l'interêt scientifique pour le monument[6] paraissait coincider avec l'abandon définitif de tout espoir de redécouverte de l'oeuvre fameuse de Philon. Une demission qui s'est averée prématurée.

Pendant des sondages effectués en Septembre 1988 dans la rue II Merarchias au coin NO de Zéa on a découvert à une petite profondeur, presque immédiatement sous le tapis de la rue, le tracé de deux murs parallèles, entre lesquelles se trouvait une double série de bases carrées. Malgrè leur mauvais état de conservation - seules les pierres de fondation d'un mur étaient conservées, tandis que du second, aussi bien que des trois bases, il n'en restait que le négatif creusé dans le rocher- l'incontestable parenté du plan avec celui de la Skeuothèque ne permettait de doute sur l'identité de la ruine. La forme de portique fermé, avec une double rangée des piliers intérieurs, les rapports de grandeur entre ses parties (la partie centrale, plus grande, et les côtés) et l'ensemble de l'édifice, reproduisaient exactement les données de l'inscription. Le repère indispensable pour l'ancrage des pilliers et des murs (épaisses de 2 pieds et demi) sur des fondations d'une largeur de deux mètres, et le point de départ pour la calculation du pied, ont été donnés par la trace du stylobate sur la surface d'une des fondations des piliers. Ses dimensions - 1m 15 sur 1m 30m- correspondaient en effet exactement à celles données par l'inscription, c'est à dire une largeur de 3 pieds et une palaste, et une longueur de 4 pieds, à condition d'accepter un pied de 32.75 cm. L'emploi de ce pied a été ultérieurement confirmé par toutes les mesures dans le sens de la largeur du bâtiment, le corridor central mesurant 6m55, les côtés 4m90, la largeur totale, murs inclus, 18m, ce qui donne (calculé en pieds de 32,75 cm) point par point 20, 15 et 55 pieds, c'est à dire les mesures correpondantes de l'inscription, avec une marge d'erreur qui ne devrait pas depasser les 7 millimètres (Fig. 1).

L'identification a été confirmée, quelques mois après, par la découverte dans un terrain voisin, des fondations de la façade nord de la Skeuothèque, reconnue immédiatement grâce à l'arrangement particulier de l'entrée à double portière (θυραία)[7]. La fouille a tout d'abord apporté le preuve de la position des entrées au milieu des façades, mise en doute recemment par Lorenzen (*op.cit.*) pour des raisons d'ordre fonctionel. Quant au plan, il correspond point par point aux données très detaillées de l'inscription. L'entrée occupe toute la largeur du corridor central. Elle est divisée par une murette de 10 pieds de longueur (le μέτωπον) en deux compartiments correspondant aux deux portes, tandis que des deux côtés elle est encadrée par deux murs (les περικαμπτόμενοι τοῖχοι) qui forment le prolongement des deux colonnades (Fig. 1).

La fouille a aussi permis de compléter de serieuses omissions du devis, spécialement en ce qui regarde les grandes dimensions de l'édifice. Dans l'inscription la longueur de la Skeuothèque est donnée grossièrement en plethres (4 plethres) ce qui pose la question, à savoir si l'épaisseur des murs y était incluse ou s'il fallait supposer une longueur totale de 405 pieds. En plus ni l'entrecolonnement (ou l'espace axial entre les piliers) ni la longueur des murs qui reliaient les colonnades aux murs extérieurs n'y étaient donnés. Il est maintenant établi, grâce aux mesurements effectués sur les trois paires de bases fouillées à la rue II Merarchias, que l'espace axial entre les piliers était de 3m 50, c'est à dire 10 pieds et 3 palastes. Ainsi la distance de 82m 60 qui sépare l'entrée de l'édifice du pilier de la fouille de la rue II Merarchias comprendrait 22 espaces axiaux de 3m50, et laisserait un reste de 5m50, qui doit correspondre à la longueur des murs qui encadraient l'entrée. Ceux-ci depassaient ainsi le μέτωπον de 2m vers l'intérieur, de façon à former juste derrière les portières et entre celles-ci et la colonnade un petit hall d'entrée encadré de deux compartiments supplémentaires d'une superficie utile égale à celle des magasins des côtés. On est fondé à partir de cette reconstitution de calculer la longueur exacte du bâtiment à 131m, c'est à dire 400 pieds de 32 cm et 7mm.

Le pied qui a servi à la construction de l'arsenal de Philon est, comme il a été largement confirmé par tous les mesurements, l'ancien pied attique, quelquefois nommé aussi pied dorique[8]. Qu'il continue à être employé au troisième quart du 4e siècle, en même temps que le pied de 30 cm, aurait pu paraitre étrange s'il n'y avait la découverte récente, à Salamis, d'un relief métrologique à peu près contemporain, où les deux pieds sont figurés[9]. Ce qui en l'occurance est particulièrememnt intéressant est que toutes les autres mesures (doigt, palaste, coude etc) représentées sur ce même relief sont calculées justement à partir de ce pied de 32,2 cm.

Avant de passer à la plus discutée des parties du monument, notamment à sa superstructure, il faut tout d'abord souligner la pauvreté des données archéologiques à notre disposition. Elles ne sont pas pour autant sans importance: on a déjà mentionné la trace du stylobate conservée sur la surface de la première assise des fondations. Il existe aussi une trace possible du dallage. Beaucoup plus intéressante est cependant la trouvaille d'un petit fragment de triglyphe, un membre d'une importance majeure pour la reconstitution de la superstructure de ce bâtiment. Le triglyphe reconstitué sur papier a une largeur de 0,50, c'est à dire d'un pied et demi. Quant à sa hauteur elle peut être calculée à partir de l'inscription comme l'égal de deux assises du mur, c'est à dire 3 pieds (ou 98 cm). Le triglyphe ainsi reconstitué serait plutôt étroit, le rapport entre la largeur et la hauteur étant à peu près de un à deux[10]. La frise dorique comportait par conséquence 13 triglyphes sur les façades et 90 sur les longues côtés de l'édifice. La prescription, à première vue obscure, selon laquelle la longueur des pierres d'angle devrait se conformer à l'ordre (pas au module) des triglyphes[11] est d'ordre esthétique. Elle a comme but de garantir l'équilibre de l'appareil isodome des parois. L'élégance de la solution suggerée apparait clairement sur le dessin de reconstitution de l'angle du bâtiment (Fig. 2).

La découverte de l'arsenal de Philon est d'une grande importance pour la connaissance de la topographie du Pirée. Le monument a été d'habitude et sans preuves localisé près du lieu de trouvaille de l'inscription, c'est à dire juste au nord de Zéa avec une orientation Est-Ouest. Maintenant on sait qu'il était orienté sur un axe NE-SO, le long de la pente est de la crête centrale de la peninsule du Pirée, au NO de ce même port (Fig. 3). L'édifice était encadré à l'ouest par une rue, fouillée en partie, probablement une des rues principales (des πλατεῖαι οδοί) de la ville. D'après les prescriptions du devis de construction selon lesquelles "on commencerait le bâtiment près d'un des propylées de l'agora et plus particulièrement celui qu'on rencontre en partant de l'arrière des cales qui ont un toit commun"[12], l'emplacement de l'édifice nous donnerait des indications exactes sur la topographie du Pirée. En effet la Skeuothèque étant localisée entre les cales et l'agora, sa facade nord (celle qui vient d'être fouillée) doit se trouver près du propylée de l'agora d'Hippodame, dont la position serait du même coup assurée. De l'autre côté il est evident que l'emplacement définitif du bâtiment a été celui prévu dès le début. Il y a eu pour ce choix de raisons importantes: la nature du terrain, les possibilités de ventillation offertes par la direction dominante des vents, enfin les avantages d'ordre fonctionel du lieu. En effet le terrain est caractérisé par une pente douce et uniforme aussi bien dans le sens de la largeur (la différence de niveau y est de 3-4 pieds sur une largeur de 55 pieds) que dans celle de la longueur où l'inclinaison est de 1%. Ainsi sont d'avance éliminés les problèmes d'accès aux portes, qui se seraient produits dans le cas d'une grande différence de niveau entre les deux bouts de l'édifice. De même les prescriptions de l'inscription coincident avec les données de la fouille concernant les travaux indispensables pour l'applanissement du terrain[13]. Le rocher après déblayage a été effectivement nivelé à 3 pieds à mesurer du point le plus saillant (ἀπό τοῦ μετερεωτάτου), afin de former une assiette aux fondations. Il va de soi que les éventuelles différences de niveau locales, comme celle au coin NE de l'édifice sont corrigées par une plus grande profondeur des fondations. Le terrain plat mais étroit ou a été trouvée l'inscription ne semble par contre correspondre à aucune des présupositions déjà notées.

Un autre facteur, aussi important que le terrain mais completement méconnu, bien qu'il tienne une place importante aux considérations de l'architecte, est le besoin de ventillation de l'intérieur de l'édifice[14]. A l'opposé de l'emplacement sur le terrain plat et humide au nord du port, une orientation NE/SO sur la pente du terrain qu NO du port était spécialement avantageuse, vue la fréquence des vents de nord dans la région.

De beaucoup plus décisives étaient pourtant les considérations d'ordre fonctionnel, qui ont prévalu au choix de l'endroit, situé entre l'agora, lieu de ressemblement des équipages des trirèmes, et les cales. L'emplacement de l'agora ainsi que celui du groupement principal des cales sont donnés par la forme du terrain. L'agora présuppose un terrain plat, et ne peut par conséquence être située - si on exclue la distance place du Théatre Municipal (ou place Coray) que sur l'emplacement actuel de la place de Pachalimani (appellée aussi place Kanari) au nord du port de Zéa. Le site correspond exactement aux renseignements d'ordre topographique dont on dispose sur l'agora d'Hippodame: celle ci se trouvait en effet au carrefour des rues qui reliaient les trois ports et était traversée par la grande rue qui menait du temple de Zeus Sôter à celui d'Artémis Mounichia, en contrebas de la colline de Mounichie, suivant l'information précieuse fournie par Xénophon dans la narration de la bataille de 403[15]. Un indice supplémentaire pour la localisation de l'agora est fourni par la trouvaille, aux environs, de la majorité des bornes des trittyes, suggérant l'emplacement dans la région du lieu de ressemblement des équipages[16]. Ainsi, l'agora était limitée du côté sud par la Skeuothèque et le quai nord de Zéa. Cette partie plate du quai s'offrait d'ailleurs peu à l'installation de cales, dont en effet il n'y a pas de trace. Celles-ci devaient former par contre deux groupes le long des bords inclinés nordest et surtout ouest du port, au sud de la Skeuothèque.

La fouille a apporté des informations archéologiques importantes sur l'histoire du port militaire de Zéa. La décision de construire cet énorme magasin était liée au dernier grand effort militaire d'Athènes dont témoigne la construction supplémentaire entre 357/6 et 325/4 de 127 trirèmes, un nombre qui correspondrait eventuellement aux 134 caisses prévues pour la Skeuothèque[17]. Elle faisait ainsi partie d'un plan ambitieux de réamenagement de l'arsenal du Pirée. La découverte sous ses fondations d'une maison privée du second quart du 5e siècle, est un indice des expropriations étendues qui ont accompagné l'extension de l'arsenal[18].

De nombreuses traces de charriots illustrent l'ampleur des travaux. Aux fondations de la grande Skeuothèque ont élé d'ailleurs largement réemployés les restes des cales du 5e siècle détruites par les Trente à la fin de la Guerre du Péloponnèse[19].

Nos informations archéologques illustrent enfin la mort lente du monument transformé à la fin de l'antiquité en une énorme carrière qui fournit le matériel à une courte renaissance du port au 4e siècle de notre ère, peut être au moment du transfer de la capitale de l'Empire à Byzance. L'effort a été alors centré dans la région du grand port, le Canthare: des blocs provenant de la Skeuothèque y ont été effectivement réemployés à la construction d'une grande installation de thermes, et surtout au rehaussement des quais submergés par la mer[20]. La destruction a été completée par les travaux de fortification du Pirée par Morosini durant la guerre Veneto-Turque[21].

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NOTES

1. Strabon 395, 15, Plutarque, *Sylla* 14, Val. Max. 8.12 (*gloriantur Athenae armamentario suo nec sine causa: est enim illud opus et impensa et elegantia visendum etc*) voir aussi Appien, *Mithr.* 41, Vitruve 7.152.12.
2. Plin *NH*.38.1: *Laudatus est et Chersiphron Cnosius aede Ephesi Dianae admirabili fabricata, Philon Athenis armamentario CD navium* etc.
3. Αλ. Μελετόπουλος, *Πειραϊκαὶ Αρχαιότητες: Ἀνέκδοτος ἐπιγραφή. Ἡ Σκευοθήκη τοῦ Φίλωνος*, Athènes, 1882, *IG* II² 1668.
4. P. Foucart, *BCH* 6, 1882, 540 ff, E. Fabricius, *Hermes* 17, 1882, 551 ff. A. Choisy, *L'arsenal du Pirée*, 1883, W. Doerpfeld, *AM* 8, 1883, 147 ff. V. Marstrand, *Arsenalet i Piraeus og Oldtidens Byggerregler*, 1922.
5. La seule exception est peut être le grand bâtiment aux triglyphes vu par W. Leake au bord de Zéa (v. A. Milchhöfer, Der Peiraeus in: E. Curtius - J. Kaupert (ed.) *Karten von Attika* 1881, t.1 p. 59).
6. K. Jeppesen, *Paradeigmata, Three Mid-Fourth Century Main Works of Hellenistic Arichitecture Reconsidered*, 1958, E. Lorenzen, *The Arsenal at Piraeus*, 1964, H. Eiteljorg, *The Greek Architect of the Forth Century BC.*, 1973, A. Linfert (ed.), *Die Skeuothek des Philon*, 1981, W. Meyer-Christian, *Das Arsenal des Architekten Philon in Zea Piraeus*, 1983, J.A.K.E. de Waele, "Das Schiffsarsenal des Philon im Piraeus (IG II² 1668)", *BABESCH* 68, 1993, 107-120. En effet le monument figure depuis dans tous les manuels d'architecture grecque et a fait l'objet de maint seminaire de faculté.
7. *IG* II² 1668, l.l. 22-26: διαλείπων θυραίας κατὰ τὸ πλάτος τῆς σκευοθήκης, δύο ἑκατέρωθεν, πλάτος ἐννέα ποδῶν, καὶ οἰκοδομήσει μέτωπον ἑκατέρωθεν ἐν τῶι μεταξὺ τῶν θυρῶν, πλάτος δίπουν, εἰς δὲ τὰ εἴσω δεκάπουν, καὶ περικάμψει τὸν τοῖχον μέχρι τῶν πρώτων κιόνων, πρὸς ὅν ἀνοίξεται ἡ θύρα ἑκατέρα.
8. Sur le pied attique classique voir H.-G. Bankel, *AM* 98, 1983, 93 ff.

9. I. Dekoulakou-Sideris, "A Metrological Relief from Salamis", *AJA* 94, 1990, 445 ff.
10. La largeur est 50% de la hauteur, au portique de Brauron 57%.
11. L.21: τοὺς δὲ (ὀρθοστάτας) ἐπὶ ταῖς γωνίαις μῆκος ἐκ τοῦ μέτρου τῶν τριγλύφων, *cf* I.27/28.
12. L.4/5: σκευοθήκην οἰκοδομῆσαι τοῖς κρεμαστοῖς σκεύεσιν ἐν Ζείαι ἀρξάμενον ἀπὸ τοῦ προπυλαίου τοῦ ἐξ ἀγορᾶς προσιόντι ἐκ τοῦ ὄπισθεν τῶν νεωσοίκων τῶν ὁμοτεγῶν.
13. L.7-10: κατατεμὼν τοῦ χωρίου βάθος ἀπὸ τοῦ μετερεωτάτου τρεῖς πόδας, τὸ ἄλλο ἀνακαθαράμενος ἐπὶ τὸ στέριφον στρωματιεῖ καὶ ἀναλήψεται ἴσον κατὰ κεφαλὴν ἅπαν ὀρθὸν πρὸς τὸν διαβήτην.
14. L.92-94: ¬πως δ' ἂν ψῦχος ἧι ἐν τῆι σκευοθήκηι, ὅταν οἰκοδομῆι τοὺς τοίχους τῆς σκευοθήκης διαλείψει τῶν πλινθιδίων ἐν τοῖς ἁρμοῖς ἧι ἂν κελεύηι ὁ ἀρχιτέκτων.
15. Xenophon *Hell.* II 4,11: οἱ δὲ ἀπὸ Φυλῆς ... συνεσπειράθησαν ἐπὶ τὴν Μουνιχίαν, οἱ δὲ ἐκ τοῦ ἄστεος εἰς τὴν Ἱπποδάμειον ἀγορὰν ἐλθόντες πρῶτον μὲν συνετάξαντο ... ὥστε ἐμπλῆσαι τὴν ὁδὸν ἣ φέρει πρὸς τὸ ἱερὸν τῆς Μουνιχίας Ἀρτέμιδος καὶ τὸ Βενδίδειον· καὶ ἐγένετο εἰς βάθος οὐκ ἔλαττον ἢ ἐπὶ πεντήκοντα ἀσπίδων, οὕτω δὲ συντεταγμένοι ἐχώρουν ἄνω.
16. Il s'agit du groupe des cinq bornes de trittyes *IG* II² 1127- 1131. Sur le classsement topographique des bornes du Pirée: D.K. Hill "Some boundary stones from the Piraeus", *AJA* 1932, 254-259. Sur le lieu du ressemblement des équipages: Andocide I 45, Xen *Hell.* 2.4.11, cf. P. Siewert, *Die Trittyen Attikas und die Heeresreform des Kleisthenes, ZETEMATA* 33, München 1982 p. 10-16.
17. *IG* II² 1611-1629 cf. Boeckh, *Urkunden über das Seewesen des attischen Staates*, 1840, p. 180.
18. I. Kraounaki, "Ein frühklassisches Wohnhaus unter der Strasse II. Merarchias im Piraeus", in W. Hoefner-L.Schwandner (edds) *Haus und Stadt im klassischen Griechenland*, München, 1994 p. 32-38.
19. Isokr. 7.66.
20. *ΑΔ* 35, 1980, Χρον. 65 ff (Γ. Σταϊνχάουερ).
21. Ε. Σοφού, ΑΕ 1973, 246 ff.

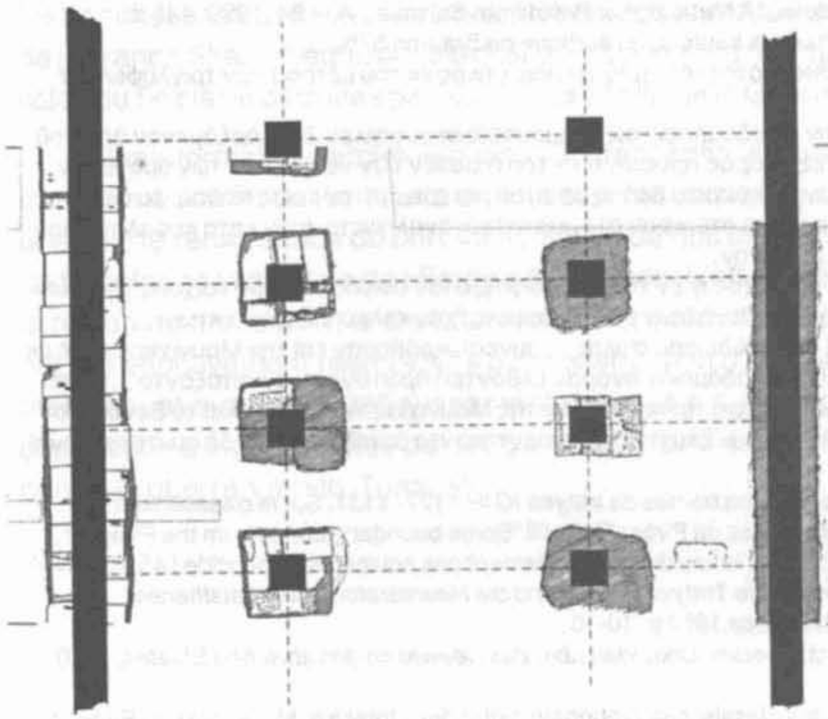

Fig. 1

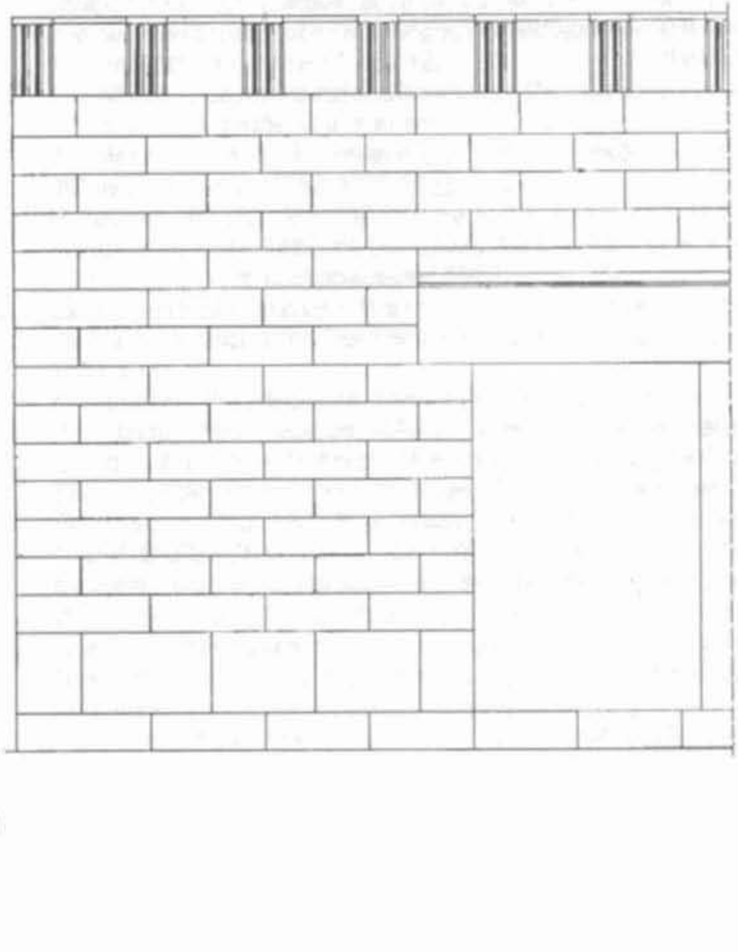

Fig. 2

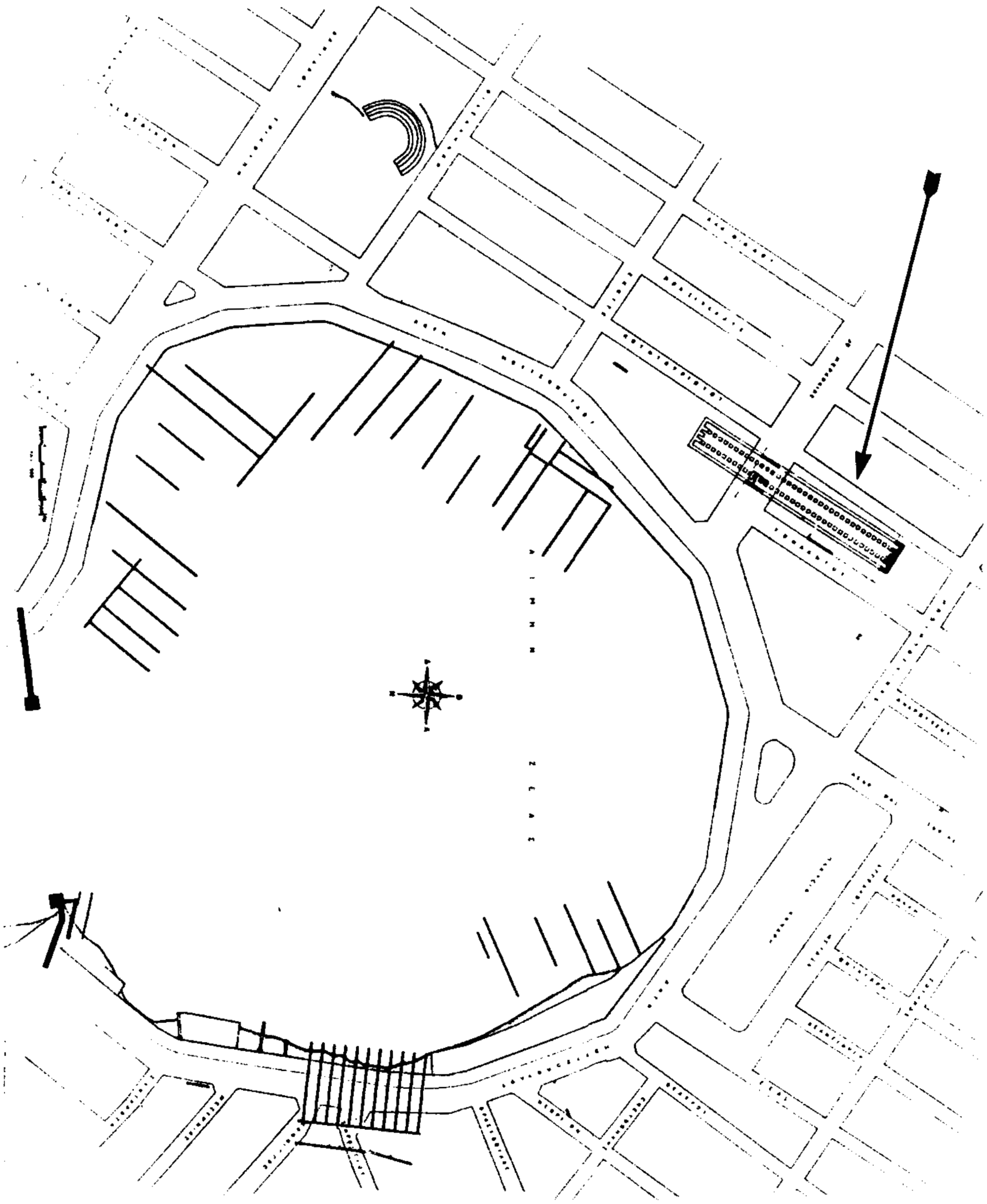

Fig. 3

ROWING ASTERN - AN ANCIENT TECHNIQUE REVIVED

This paper discusses a technique for rowing astern which seems to have been used in the ancient Mediterranean, forgotten for two thousand years and just recently revived. About half the evidence was published in an article written in 1973 in collaboration with Mrs. Valerie Fenwick. The rest has come to light more recently.

The paper depends a good deal on ancient representations of ships. Most work on the iconography of ancient ships has been subjective, not scientific. It is generally held that ancient artists were inaccurate when they tried to depict ships, and that their supposed errors have to be corrected before useful conclusions can be drawn. I quote a typical opinion:

> "When an Attic vase painter has illustrated a potter at work .... one can be pretty sure that his drawing is right in every practical detail, but when the same artist paints a ship, for example, one is often left in considerable doubt about the accuracy of his detail. Indeed it is only too painfully clear that some vase painters had no idea either how a ship was constructed or how it was sailed".
> (Hodges, 1970, 4).

M. Lucien Basch has gone further:

> "In the case of every ship representation, whether painted or carved, irrespective of whatever period it may be referred to ... *error is always to be presumed unless the contrary is proved*"
> (Basch, 1985, 413).

The trouble with that approach is that each writer feels free to "correct" the supposed inaccuracies in the actual evidence to suit his preconceived ideas. People with different ideas offer different corrections, so that one person very rarely convinces another.

Another factor militating against scientific objectivity is the emphasis on representations that are time-worn or otherwise obscure, and the putting forward of arguments based on intangibles, such as supposed ancient paint of which there is now no trace (Morrison and Williams, 1968, 171), or on supposed small features which the artist did not actually include (Morrison and Coates, 1986, 150), or on a supposed original of which the actual monument is supposed to be an inaccurate copy (Basch, 1988, 179).

In this paper it is intended to avoid subjectivity, first by making no claim that its deductions from the iconography are true - only that they are in accordance with the evidence; and second, by arguing only from features which are too clear to be disputed. If these limitations are accepted, a scientific approach becomes possible.

This (Fig. 1) is part of a 6th century B.C. Corinthian plaque. It shows the after part of a ship. There are two complete oarsmen, rowing with their backs to the stern. On the left are part of a third oarsman and his oar, rowing in the same unusual way as the other two. The helmsman seems to be encumbered with two steering oars both on the same side - not a practical method of steering.

There is an empty oar-port. Clearly, one oarsman's place is vacant. Someone has recently been rowing and has retracted his oar in order to do something else.

The ship is being rowed stern first. This was noticed by R.T. Williams, who in 1968 remarked that "... the oarsmen seem to be backing water" (Morrison and Williams, 1968, 89) but he did not comment on the method they are using. It is unusual to modern eyes. The custom today is for oarsmen to back water by staying in their normal position facing aft, and to push their oars instead of pulling. A seated man pushing his oar generates much less power than when he rows ahead by pulling in the normal manner, as we heard yesterday. So this technique seems superior because it gives as much power when rowing astern as when rowing ahead.

One authority on ancient naval warfare, Vice Admiral Rodgers (whose book has recently been reprinted and is on sale here) shrewdly divined the need in ancient warships for a method of rowing astern by pulling the oars instead of pushing them, but he cited no evidence for it. He suggested that when required to row the ship astern, each oarsman stepped over his oar (Rodgers, 1937, 10) or ducked under it (Rodgers, 1937, 120) and sat facing the bow on the rowing bench next abaft his usual one. But this picture (Fig. 1) shows a slightly different technique. Each man keeps to his own bench, but turns round and uses the oar which is generally pulled by his shipmate next towards the ship's bow. These oarsmen (in Fig. 1) had been rowing in the normal way, facing the stern. Their first movement was to throw the right leg over the rowing bench, so as to sit astride it, at the same time taking hold of the next man's oar with the right hand. The second movement was to throw the left leg over the bench and sit facing forward, ready to pull with both hands on what was normally the other man's oar.

There are two complications. In the bow, an oarsman with no oar: in the stern, an oar with no oarsman.

This (the foremost of the two oars held by the helmsman in Fig. 1) is the oar with no oarsman. It is not a steering oar. It is normally used by the stroke oarsman when he is facing the other way. The helmsman, as soon as he gets the chance, will unship it and stow it inboard. This explains why the stroke (aftermost) oar is rowed over the gunwale while all the others run through oar - ports - it is in order to make it easier to unship the oar when the ship is rowed astern.

Without further evidence, one might well doubt that explanation, regarding it as a mere contrivance thought up to fit a theory. But this ship (Fig. 2) does indeed have the stroke oar running over the gunwale, like the steering oar, while all the others run through oar-ports. R.T. Williams's descriptions is never disputed:

> "Nine oars emerge from the hull well below the gunwale ... the stroke oar, however, is rowed over the gunwale"
> (Morrison and Williams, 1968, 86)

A peculiarity of this method of rowing astern is that the foremost (bow) oarsman ends up empty handed. He could of course join in with the others, using an extra oar kept ready for the purpose. But it is sometimes an advantage if the bow oarsman stops rowing before the others. In the ancient Mediterranean, ships typically secured by going stern-first towards a beach, letting go one or two anchors over the bow before the stern grounded. English-speaking sailors call it "Mediterranean mooring". Then, you need someone forward to work the anchor(s) and an empty-handed oarsman will do nicely.

This (Fig. 3) shows a vessel going astern using the method I have described. Odysseus is finally coming home. He intends to secure the ship by Mediterranean mooring. We can see four starboard-side oarsmen facing the bows and rowing the ship astern, while a fifth man (the foremost) is also facing the bows, but empty-handed. He is available for anchor work. There are no steering oars to be seen. They have been unshipped and stowed inboard, because they would have dug into the sand when the ship beached. Odysseus is looking astern, controlling the ship's speed and direction by ordering the oarsmen on one side or the other to vary their stroke. It is the same with many of today's twin-screw ships: when going astern the rudder is left amidships (centred) and the ship controlled by varying the speed of one engine or the other.

M. Lucien Basch has said of the maker of this mosaic (Fig. 3):

" ... son ouvrage est d'une qualité si médiocre qu'on ne peut décider s'il a eu tort ou raison de représenter ses rameurs face à l'avant" (Basch, 1975, 238).

But in this paper the question of artistic error is not relevant, because my theory is put forward merely on the grounds that it is in accordance with the evidence. One can say as a matter of fact, not opinion, that the three apparent anomalies in this picture (Fig. 3):

the oarsmen facing forward
the empty-handed man in the bows
and the lack of steering gear,

are all explained by the one hypothesis, and have never been explained in any other way except by impugning the evidence.

This slide (Fig. 4) shows part of an Attic crater of the late Geometric period, found in Athens and now in the Louvre. The ship has always proved something of a puzzle. The crew has been described, by R.T. Williams again, as follows:

"The attitude of the thirteen oarsmen is unique. They sit with their ... chests to the front, and each with his right hand holds his own oar ... and with his left hand holds the oar of the man behind him; the stroke oarsman seems to have no oar and to be grasping with his right hand either the stern balustrade or the oar of an invisible far-side oarsman" (Morrison and Williams, 1968, 25).

Williams also asked "where is the helmsman?" Moreover, we can see that there is apparently no steering gear.

The hypothesis advanced in this paper will explain all these apparent anomalies. The ship is about to beach stern first. The first action was to unship and stow the steering oar or oars. The oarsmen are turning round to face the bow, and at the instant captured by the artist they sit astride their rowing benches, each man with one hand on his own oar and his left hand grasping his shipmate's oar. The aftermost man is not an oarsman. He is the helmsman or the captain, relieving the stroke oarsman of his propulsive oar. The crew will complete the drill by throwing the right leg over the rowing bench and turning to face the bow, with both hands on the oar that is not normally theirs. The helmsman will stow the stroke oar. The arrangement will then be just the same as in Fig. 3 - no steering gear, oarsmen facing the bows and pulling on their oars to row the ship astern, and an empty-handed man right forward, ready to let go an anchor.

Here again, the hypothesis explains the picture in an exact and objective way. Even though one were to agree with Kirk that the picture is really " ... a singularly naive attempt simply to portray rowers in action" (Kirk, 1949, 99) one could not deny that the hypothesis and the picture fit each other exactly.

In a criticism of this interpretation of Fig. 4, M. Lucien Basch pointed out, quite understandably, that Valerie Fenwick and I had ignored the funerary nature of the vase. He commended the idea of a ceremonial greeting in honour of the deceased (Basch, 1976, 232). But there need be no clash between the hypothesis put forward in this paper and the idea of ceremony, greeting or salutation. In naval boats of the present century, the actions that make up a ceremonial salute are exactly the same as those used in the ordinary course of manoeuvring. In double-banked boats the oars are "tossed", that is to say held vertically in the air, both ceremonially as a salute and routinely, to get the oars out of the way when the boat comes alongside. In single-banked boats, the oars are never tossed, but the position of the salute - the oars held horizontally at right angles to the keel - is the same as that used in routine manoeuvres.

So far, all the evidence has been iconographic. I hope that even some of those who are skeptical of iconography will be impressed by the way in which one hypothesis explains all the hitherto unexplained oddities in four different pictures. However, for those who hold resolutely to M. Basch's dogma that "error must always be presumed unless the contrary is proved", there is experimental evidence. The method has been used in the *Olympias*. I quote from the report of the 1987 trials:

> "BACKING WATER It was very awkward to attempt to back water by pushing the oar away, and the ship did not back very quickly. ...the Rowing Master tried having the thranites and zygians spin round in their seats, each rower taking the oar of the rower immediately behind, and actually rowing the ship backwards. ...Although there was some awkwardness in finding an appropriate place to brace the feet, the arrangement worked quite well with only two levels"
>
> (Morrison and Coates, (ed.) 1989, 106).

So wrote S.F. Weiskittel, the author of the section of the trials report entitled "How to Row a Trieres". The editors of the report took the unusual step of adding their own comments, putting forward four objections to the method:

"The absence of any ancient evidence for this procedure for backing at any period, the non-participation of the thalamians, the difficulty experienced by the participating oarsmen in bracing their feet, as well as the confusion such movements would cause in the heat of battle, make its use very unlikely"

(Morrison and Coates (ed.) 1989, 106).

The contention that there is no ancient evidence is surprising, because R.T. Williams had written of Fig. 1 in the book he co-authored with J.S. Morrison: " .... the oarsmen seem to be backing water" (Morrison and Williams, 1968, 89). However, by 1988, when the method was tried again, the other three editorial objections seem to have evaporated:

"Two ways of going astern were tried. The "normal" way of pushing the oarhandles rather than pulling them produced only about 3 kts; and so another way was tried. Rowers turned round in their seats and then pulled. This produced a speed of about 4 knots, but as the rudders are unbalanced they tend to take charge at that speed. There is accordingly no point, in *Olympias*, in departing from the normal method, and in any case the ancient Greek word *proeressein* is authority for retaining it"

(Coates *et al.*, 1990, 31).

The difficulty with the rudders when going briskly astern is not so much as objection to the method as confirmation of the iconographic evidence that the steering oars of small vessels were generally brought inboard before the vessel moved astern. In bigger ships, the rudders or steering oars were brought clear of the water into a horizontal position, as can be seen on the Lindos relief and the Ficoronian *cista*. This modern painting (Fig. 5) will remind us. It was made for the 1987 Symposium in this series. There is a ship with her stern on the beach and the steering gear hoisted up horizontally, but the artist has also shown men facing the ship's bow for rowing the ship astern. I wonder who painted this picture and whether the artist had in mind the method that is the subject of this paper.

The *Argo* is a twenty-oared boat built for Tim Severin, who with his crew rowed around the Mediterranean in a re-creation of Jason's quest for the Golden Fleece. The boat is now on the river Thames, and is rowed under the auspices of the (British) Nautical Archaeology Society. Admiral Rodgers' method of going astern is often used. As I mentioned earlier, Admiral Rodgers suggested that each oarsman moved one bench further aft, faced the bow and then used his own oar to pull the ship astern.

This (Fig. 6) shows the *Argo* with the port bank facing the bow and rowing astern, while the starboard bank row ahead in the normal manner. The object is to make a tight turn in a narrow space. It is quite possible that the ship in Fig. 1 is also making a tight turn, rather than going astern with both banks of oars, a possibility I omitted earlier for the sake of simplicity.

The *Argo's* use of this method of rowing astern is particularly valuable evidence because it is used regularly, in real earnest, by skippers with no particular interest in ancient ships, not merely as an experiment in nautical archaeology.

One of archaeology's perennial teasers is the question of diffusion versus separate invention. Oddly enough, I have not been able to find out which of the two applies to rowing astern in the *Olympias* and the *Argo*. Both rowing masters told me that the idea came to them from some now-forgotten member of the crew.

If anyone has information, I would be glad to share it. I would also like to know of any other ancient ship pictures which seem relevant, and of any reference to the use of these methods in modern times.

For anyone convinced by this paper, it may have done more than show a better way of rowing backwards. It may have shown merit in the approach to marine iconography that I advocate: to try much harder to find a theory that fits the pictures before questioning the artist's accuracy. If such an approach were more widely adopted, several long-standing problems, including how to row a trireme, might well be settled.

But more than that. If one looks at Fig. 4, for example, and assumes as Kirk did, that it is " ... a singularly naive attempt simply to portray rowers in action", or if one looks at ancient ship pictures in general while telling oneself that "Error is always to be presumed unless the contrary is proved", there is a risk that the bird-brained woolly-mindedness thereby ascribed to ancient maritime artists and their patrons will affect one's overall view of a people who were (with the possible exception of their modern descendants who have so generously hosted this symposium) the most intelligent the world has ever known.

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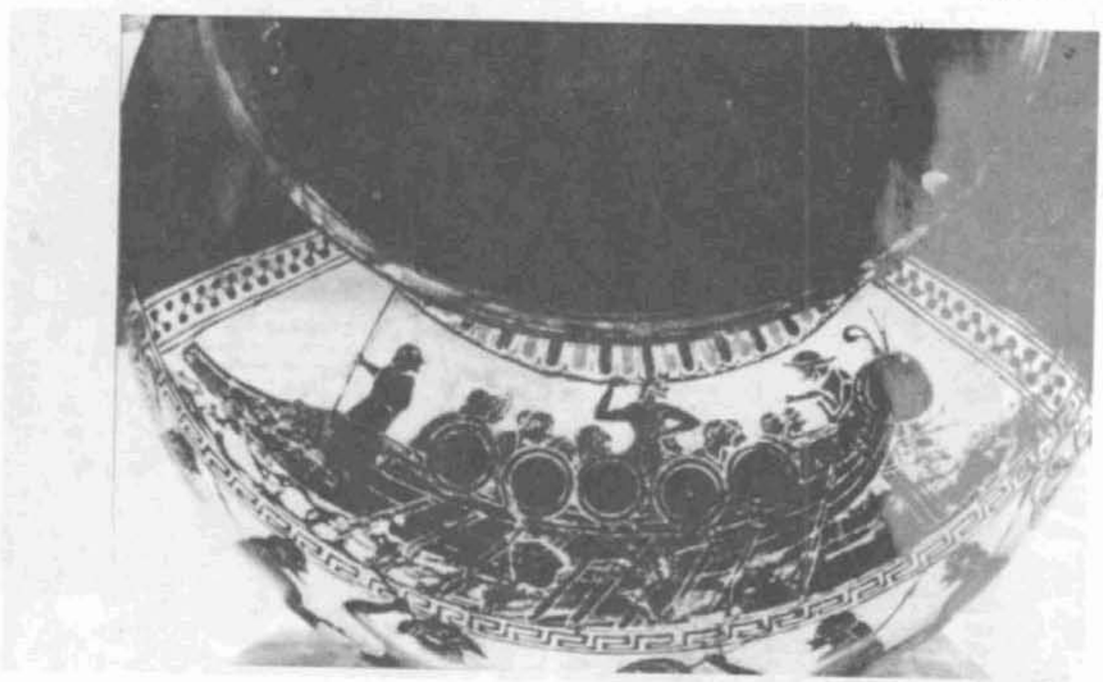
ILLUSTRATIONS

1. Corinthian plaque. 6th century B.C.
2. Attic Black figure hydria in the Louvre. 6th century B.C.
3. Mosaic with the ship of Odysseus.
4. Late Geometric Attic crater in the Louvre.
5. Modern painting of a ship.
6. *Argo's* trials in the Thames.

FIG. 1

FIG. 2



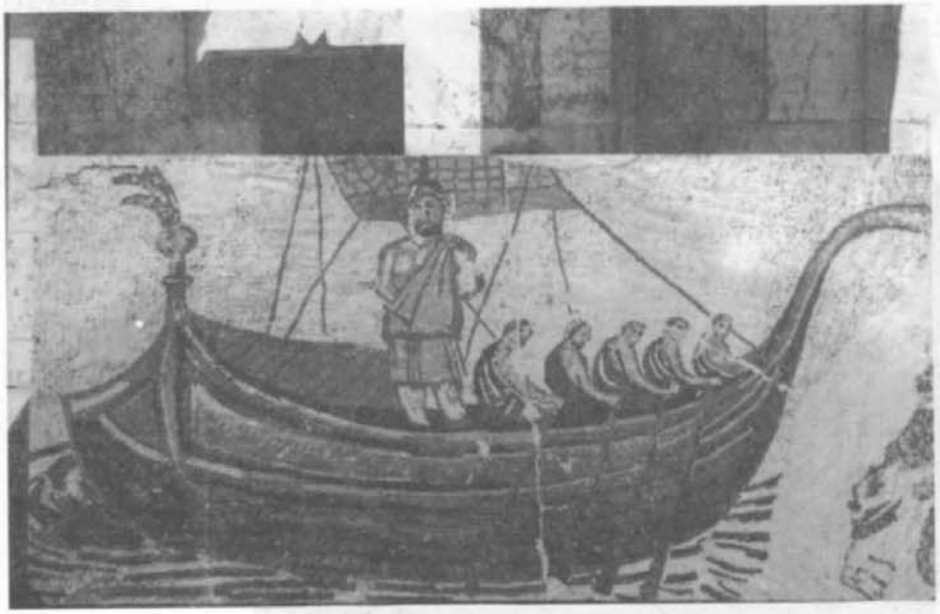


FIG. 3

FIG. 4

FIG. 5

FIG. 6

ΠΑΡΑΣΤΑΣΕΙΣ ΠΛΟΙΩΝ ΣΕ ΤΟΙΧΩΜΑΤΑ ΔΕΞΑΜΕΝΩΝ ΝΕΡΟΥ ΣΤΟΝ ΠΕΙΡΑΙΑ

Η γεωλογική ιδιαιτερότητα του πειραϊκού βράχου δεν επιτρέπει την υδροδότηση της πόλης από πηγές ή πηγάδια και η κακή ποιότητα του νερού που έφερνε το (πιθανότατα ιπποδάμειο) υδραγωγείο[1] υποχρέωσαν τους κατοίκους της αρχαίας πόλης να λύσουν το σημαντικό αυτό πρόβλημα με την κατασκευή μεγάλων υπόγειων δεξαμενών για τη συλλογή και την αποθήκευση του νερού της βροχής. Ο βράχος σε όλην σχεδόν την έκταση της αρχαίας πόλης είναι αρκετά μαλακός ώστε να σκάβεται με σχετική ευκολία και ταυτόχρονα είχε συνοχή και ήταν αρκετά ισχυρός ώστε να μην υποχωρεί στα κάθετα επιφανειακά φορτία. Επειδή όμως δεν ήταν αδιάβροχος, τα τοιχώματα των δεξαμενών αυτών επενδύονταν με ισχυρό υδραυλικό κονίαμα. Δεξαμενές συλλογής νερού βροχής έχουν βρεθεί πολλές στον Πειραιά· σχεδόν κάθε σπίτι είχε μιά η δυό το λιγότερο δεξαμενές όγκου 38 - 45m^3. Πολύ συχνά, ιδιαίτερα στα ρωμαϊκά χρόνια, κατασκεύαζαν συστήματα δεξαμενών συνδεδεμένων με υπόγειους αγωγούς για να πετύχουν να αποκτήσουν νερό όσο το δυνατόν καθαρότερο και υγιεινότερο.

Ένα σχετικά πολύπλοκο σύστημα δεξαμενών για περισυλλογή, αποθήκευση και άντληση νερού αποκαλύφθηκε το 1981 στο οικόπεδο του λεγόμενου "Δικαστικού Μεγάρου" στο οικοδομικό τετράγωνο ανάμεσα στην οδό Δημοκρατίας, τη Σκουζέ, τη Λεωχάρους και τη Φιλελλήνων. Δύο μεγάλες κωδωνόσχημες δεξαμενές συνδέονται με υπόγειους αγωγούς. Όλο το σύστημα είναι επενδεδυμένο με αδιάβροχο υδραυλικό κονίαμα (εικ. 1). Στον κεντρικό αγωγό πλησιέστερα στην δεξαμενή Β', τον τέταρτο ή πιθανότατα τον πέμπτο μ.Χ. αιώνα, πάνω στο υδραυλικό κονίαμα των τοιχωμάτων σχεδιάστηκαν με κεραμεικό όστρακο μια σειρά ιστιοφόρα πλοία. Τα σχέδια βρίσκονται και από τις δυο πλευρές του αγωγού. Στον "βόρειο" τοίχο είναι σχεδιασμένα δύο μεγάλα πλοία από τα οποία το ένα δεν ολοκληρώθηκε (εικ. 2, 3 και 4). Στον απέναντι είναι σχεδιασμένα, σε μικρότερη κλίμακα άλλα έξι πλεούμενα, τρία ιστιοφόρα, δύο βάρκες και η αρχή ενός άλλου (εικ. 5)*.

Το μεγαλύτερο πλοίο, Α, στον "βόρειο" τοίχο, με μήκος 65cm, δείχνει να είναι τυπικό ιστιοφόρο εμπορικό πλοίο της όψιμης αρχαιότητας με καμπύλη καρίνα. Το μεγάλο κατάρτι έχει σχεδιαστεί και στο εσωτερικό του σκάφους, έως το σημείο όπου θα πρέπει να στηριζόταν στην τρόπιδα. Τα πανιά του, το μεγάλο κάτω από την οριζόντια κεραία, τα δύο τριγωνικά από πάνω, και, πιθανότατα, τα δύο με μορφή σκαληνού τριγώνου πάνω από τα τελευταία, είναι απλωμένα, με τα σχοινιά τεντωμένα. Στην πρύμνη εικονίζονται τα δύο κουπιά-πηδάλια και, στο ίδιο σημείο στο κατάστρωμα, διακρίνεται ένα εξάρτημα που θα μπορούσε να είναι είτε δέστρα για τα παλαμάρια είτε το τιμόνι (η λαγουδέρα) για τα πηδάλια. Στην κατάληξη της πρύμνης διακρίνεται επίσης και ένα προστατευτικό δικτυωτό στηθαίο (παραπέτο) (εικ. 6). Στην πλώρη διακρίνεται, χωρίς πανί, το πλωριό κατάρτι. Και στις δύο καταλήξεις της καρίνας φαίνονται δύο ελλειψοειδή σχήματα, οι οπές γιά τις άγκυρες ή τα αποτρεπτικά όκια.

Το δεύτερο πλοίο στην "βόρεια" πλευρά, Β, μήκους 74cm, απέχει από το πρώτο μόλις 3cm και, εκτός από την καρίνα και τμήμα από το μεγάλο κατάρτι, δεν έχει ολοκληρωθεί. Από την καρίνα, που είναι πιό έντονα κοίλη, φαίνεται ότι θα σχεδιαζόταν μεγαλύτερο από το Α. Διαθέτει, σε όλο το μήκος της γέφυρας το προστατευτικό δικτυωτό στηθαίο που στο προηγούμενο πλοίο περιοριζόταν μόνο στην περιοχή της πρύμνης. Αν κρίνουμε από τα μόλις διακρινόμενα κουπιά-πηδάλια που διασταυρώνονται με τα πηδάλια του γειτονικού πλοίου, έχει αντίθετη κατεύθυνση από το άλλο με την πλώρη προς τα αριστερά και την πρύμνη, που καταλήγει σε μια ενισχυμένη διαμόρφωση, στα δεξιά. Στην πλώρη διακρίνεται μια περίεργη κατασκευή που καταλήγει πιθανότατα στο ονομαζόμενο από τον Lucien Basch ως ferro[2]. Πιό λογικό είναι βέβαια να συμβαίνει ακριβώς το αντίθετο, να έχει δηλαδή το πλοίο την ίδια κατεύθυνση με το προηγούμενο και οι γραμμές που φαίνονται ως πηδάλια να υποδηλώνουν απλά παλαμάρια· σ' αυτή την περίπτωση η διαμόρφωση στην πρύμνη —στα αριστερά δηλαδή— θυμίζει κάποια υστερότερα, βυζαντινής εποχής καράβια με την υπερυψωμένη πρυμιά γέφυρα.

Στον απέναντι τοίχο, χαμηλότερα, έχουν σχεδιαστεί έξι πλεούμενα στη σειρά. Τα τρία είναι ιστιοφόρα, περίπου του ίδιου τύπου με το Α. Τα δύο είναι βάρκες από τις οποίες η μια σύρεται από ένα από τα μεγάλα ιστιοφόρα ενώ το έκτο, όπως και στον απέναντι τοίχο, δεν έχει ολοκληρωθεί. Επειδή είναι σχεδιασμένα σε χαμηλότερο ύψος, στο τοίχωμα του αγωγού, εκεί όπου το κονίαμα έχει υποστεί σημαντική διάβρωση, είναι πολύ χειρότερα διατηρημένα. Παρουσιάζονται με τη σειρά, με πρώτο το κοντινότερο στη δεξαμενή Β.

Το πλοίο Γ, μήκους 60 cm, είναι σχεδόν όμοιο με το Α· κοίλη καρίνα, χοντρό κεντρικό κατάρτι, ανοικτά πανιά και, όπως και όλα τα άλλα, διαθέτει στην πρύμνη δυο κουπιά-πηδάλια. Στην πλώρη φαίνεται καθαρά το μικρό μπροστινό κατάρτι, χωρίς πανί και αυτό· στην πλώρη και στην πρύμνη διακρίνονται οι κυκλικές οπές - τα όκια. Πάνω στο κατάστρωμα, στην πρύμνη, έχει γίνει προσπάθεια να αποδοθεί ένα υπερυψωμένο κατάστρωμα όπου πιθανότατα θα στεγάζονταν και οι καμπίνες του πλοίου. Ακριβώς εκεί που τελειώνει το κατάρτι, στην κορυφή του έχει γίνει απόπειρα να σχεδιαστεί κάποιο άλλο πλοίο που, άγνωστο γιατί, εγκαταλείφθηκε.

Αμέσως δεξιά, έχει σχεδιαστεί μια βάρκα (εικ. 7), α, μήκους 20 cm· είναι δεμένη με δυο σχοινιά στην πρύμνη του επόμενου ιστιοφόρου πλοίου. Οι εννιά κάθετες γραμμές που εξέχουν προς τα επάνω μπορεί να εικονίζουν είτε ανεβασμένα κουπιά είτε κάποια μόνιμη εγκατάσταση για δίκτυ ή προστατευτικό πανί.

Το πλοίο στο οποίο είναι δεμένη η βάρκα, το Δ, είναι όμοιο με τα προηγούμενα. Στο σχέδιο έχει μήκος 42 cm, η καρίνα του είναι κοίλη και διαθέτει χονδρό κατάρτι και τα δύο πηδάλια στην πρύμνη. Τα πανιά, σε αντίθεση με τα άλλα δύο πλοία είναι μαζεμένα και, πάνω στο πλοίο, περίπου στο επίπεδο του καταστρώματος, φαίνεται κατεβασμένη η οριζόντια κεραία (μπούμα). Στην κορυφή στο κατάρτι έχει σχεδιαστεί ένας κύκλος, που εικονίζει μάλλον το καρχήσιο, που ήταν κρυμμένο στα άλλα πλοία με απλωμένα τα πανιά. Στην πλώρη μόλις διακρίνεται το όκιο.

Πολύ διαφορετικό είναι το επόμενο πλοίο, Ε, μήκους 40 cm (εικ. 8). Η καρίνα είναι έντονα κοίλη ενώ τα πανιά του έχουν σχεδιαστεί πολύ φουσκωμένα. Η πρύμνη καταλήγει σε έντονη προεξοχή και, λίγο πιό κάτω, διακρίνεται το διάκι (η λαγουδέρα), που συνδέεται με τα πηδάλια. Φαίνονται επίσης καθαρά τα ξάρτια που στηρίζουν το μεγάλο κεντρικό κατάρτι. Στο κατάστρωμα, δεξιά και αριστερά από το κατάρτι, και εδώ διαφέρει ουσιαστικά η παράσταση του πλοίου αυτού από τα προηγούμενα, εικονίζονται δύο πρόσωπα το ένα από τα οποία φαίνεται να χειρίζεται το διάκι (η λαγουδέρα).

Στη βάρκα, β, που βρίσκεται δεξιά του πλοίου Ε, μήκους 36 cm, διακρίνεται καθαρά ο πηδαλιούχος (εικ.9, 10), πολύ μεγαλύτερος από τις κάθετες γραμμές που είναι σχεδιασμένες κατά μήκος του καταστρώματος και που πιθανόν, όπως και στην βάρκα α, να εικονίζουν ανεβασμένα κουπιά ή κάποιο μόνιμα εγκατεστημένο παραπέτο για τα δίκτυα ή για προστασία από τα κύματα.

Το τελευταίο πλοίο, ΣΤ, που δεν έχει ολοκληρωθεί, θα είχε γίνει πολύ μεγαλύτερο απ' όλα τα άλλα· μόνο το μισό τμήμα της καρίνας που έχει σχεδιαστεί έχει μήκος 65 cm (εικ. 11). Από τα λίγα στοιχεία που έχουμε φαίνεται ότι θα ήταν όμοιο με τα υπόλοιπα. Διαφέρει μόνο στον τρόπο σχεδίασης αφού είναι το μόνο που έγινε με αιχμηρό αντικείμενο —είναι το μόνο πραγματικό ακιδογράφημα.

Δύο είναι τα προβλήματα που θέτει η παρουσία των παραστάσεων των πλοίων στις δεξαμενές στον Πειραιά· η χρονολόγηση και η αιτιολόγηση — το γιατί δηλαδή σχεδιάστηκαν σε έναν χώρο που ήταν προορισμένος να δέχεται νερό καθώς και το ποιός ή ποιοί είναι οι "καλλιτέχνες".

Θα ξεκινήσουμε από το δεύτερο:

Το σύστημα των δεξαμενών κατασκευάστηκε για να εξυπηρετήσει ένα σπίτι 120-150m^2 και να γεμίζει με βρόχινο νερό από τις στέγες του που θα είχαν αντίστοιχο εμβαδόν. Φαίνεται ότι κάποια στιγμή, πιθανότατα μετά την εισβολή των Ερούλων το 267 μ.Χ., το κτίσμα έπαθε αλλοιώσεις και η συνολική επιφάνεια της στέγης δεν επαρκούσε να γεμίσει με νερό το σύστημα των δεξαμενών ετσι ώστε να είναι δυνατή η άντληση του από το φρέαρ Α. Οι κάτοικοι ήταν ετσι αναγκασμένοι να κατεβαίνουν στο εσωτερικό του συστήματος και να γεμίζουν δοχεία με νερό από τα βαθύτερα σημεία. Αυτό εξηγεί και το γεγονός ότι γύρω γύρω στη δεξαμενή 2 βρέθηκαν πάρα πολλά όστρακα αμφορέων που θα τους γέμιζαν στο σημείο αυτό και θα τους μετέφεραν μετά έξω. Κάποια φορά, κατά τη διάρκεια αυτής της εργασίας συνοδοί των εργαζομένων εκεί ή, ακόμα, και κάποιος από αυτούς τους ίδιους σε στιγμή ξεκούρασης, ασχολήθηκαν με το σχεδίασμα στα τοιχώματα των αγωγών. Το θέμα των σχεδίων δεν πρέπει βέβαια να μας ξενίζει αφού ο Πειραιάς συνέχιζε να είναι ένα από τα μεγάλα λιμάνια της Μεσογείου και ο κάτοικός του θα είχε καθημερινά την ευκαιρία να βλέπει πλοία. Διακρίνω τουλάχιστον τρία χέρια στη σχεδίαση των πλοίων. Διαφορετικά έχει σχεδιαστεί το πλοίο **Α** από τα πλοία του απέναντι τοίχου. Ο σχεδιαστής δείχνει να έχει άνεση, οι γραμμές του αποδίδουν άμεσα και τα λειτουργικά τμήματα του πλοίου. Το γεγονός ότι ο "στολίσκος" του νότιου τοίχου είναι σχεδιασμένος χαμηλότερα μπορεί να μας οδηγήσει στην σκέψη ότι έγιναν από παιδί ή παιδιά. Τα πλοία **Γ** και **Δ** και, πιθανότατα, η βάρκα **Α** ενώ μοιάζουν με το πλοίο **Α** δεν παρουσιάζουν την ίδια σχεδιαστική άνεση που διακρίναμε στο τελευταίο. Διαφέρει επίσης η απόδοση της κατάληξης της πλώρης και της πρύμνης. Το πλοίο **Ε** διαφέρει και στη μορφή αλλά και σχεδιαστικά από τα άλλα ενώ εδώ έχει προστεθεί και ένα στοιχείο ουσίας, ο άνθρωπος, που δεν υπάρχει στα άλλα. Αυτά οδηγούν στο συμπέρασμα ότι το πλοίο αυτό και η βάρκα **Β** έχουν σχεδιαστεί από κάποιον τρίτο "καλλιτέχνη".

Ως προς τη χρονολόγηση· ο τύπος των πλοίων συναντιέται στις μεσογειακές θάλασσες από τις αρχές του δεύτερου μ.Χ. αιώνα[3] έως τα βυζαντινά χρόνια. Τα όστρακα των αμφορέων που βρέθηκαν στο βάθος του συστήματος των δεξαμενών δείχνουν ότι χρησιμοποιήθηκε και στο τέλος του τέταρτου και τον πέμπτο αιώνα και πιθανότατα τα πλοία είναι σύγχρονα με τους αμφορείς.

Άρης Τσαραβόπουλος
Β΄ Εφορεία Προϊστορικών και
Κλασικών Αρχαιοτήτων
Πολυγνώτου 13
105 55 Αθήνα

NOTES

1 Vitruvius, 8, 3, 6
2. Lucien Basch, *Le musée imaginaire de la marine antique*, Athènes 1987, 457 κ.ε.
3. L. Basch, όπ. παρ. fig. 1038, 1045, 1102, J- M. Gassend, M-F. Giacobi-Lequément, J-M. Joulain, L. Lambert, Le *graffito de cucuron (Vaucluse) : Un navire sous voiles figuré sur un panneau d ' enduit peint,* Archaeonautica 6(1986) 11-30.

Οι συνθήκες φωτογράφησης στο εσωτερικό του αγωγού είναι εξαιρετικά δύσκολες — δεν υπάρχει χώρος για να μπορέσει να φωτογραφηθεί ολόκληρη η παράσταση ενώ πολλές από τις γραμμές συγχέονται με το φόντο του κονιάματος. Για τον λόγο αυτόν προτιμήθηκε η απόδοσή τους με σχέδιο. Η σχεδίαση έγινε από τους Γιάννη Παντζόπουλο και Γιάννη Γιαρμενίτη. Ορισμένες λεπτομέρειες δίνονται με φωτογραφίες. Για τις φωτογραφήσεις με βοήθησαν οι Γιάννης Πατρικιάνος και Βάλτιν von Eiksted. Ιδιαίτερες ευχαριστίες για την παρότρυνση να παρουσιάσω το θέμα στο 4ο Συμπόσιο Αρχαίας Ναυπηγικής και τις σημαντικές υποδείξεις του στο θέμα οφείλω στο συνάδελφο Νίκο Λιανό. Για τις πολύτιμες υποδείξεις του ευχαριστώ επίσης τον μεγάλο και ακούραστο δάσκαλο Lucien Basch.

ABRIDGED TRANSLATION OF MR ARIS TSARAVOPOULOS' PAPER BY THE EDITOR

SHIP-REPRESENTATIONS ON THE WALLS OF A CISTERN IN PIRAEUS

An intricate system of cisterns for receiving water was excavated in 1981 in the center of Piraeus, on a site between Democratias, Skouzé, Leoharous and Filellinon streets. The construction is dated to the IVth or Vth c. AD.

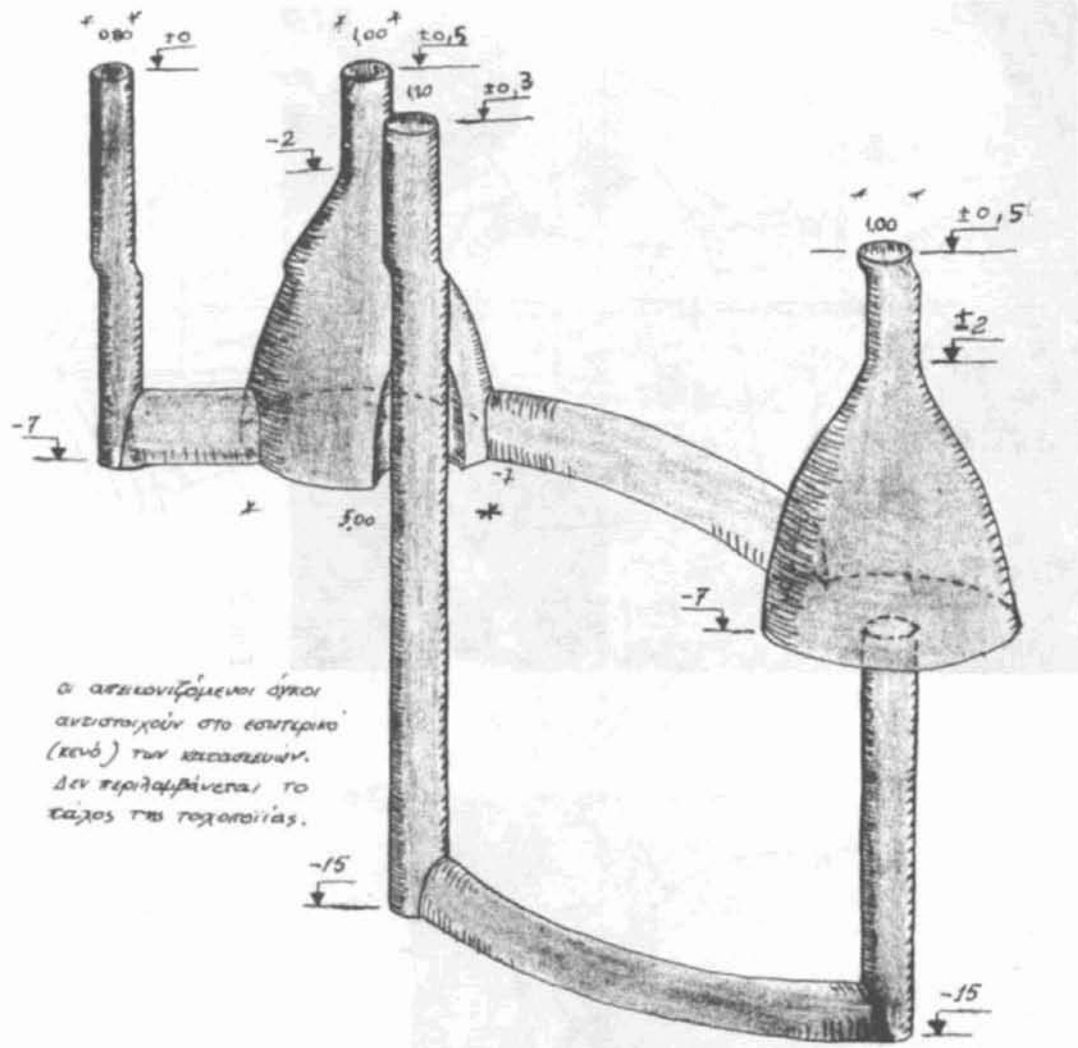
A total of eight sea-crafts are depicted on the inside walls near the bottom of the cistern-system. Seven vessels are made by using pottery sherds as material for drawing, while the eighth, a real graffiti was made with a pointed instrument.

Five large ships are represented, while three are small boats or tenders to the ships.

One of the ships is uncomplete, another, the largest, is unfinished.

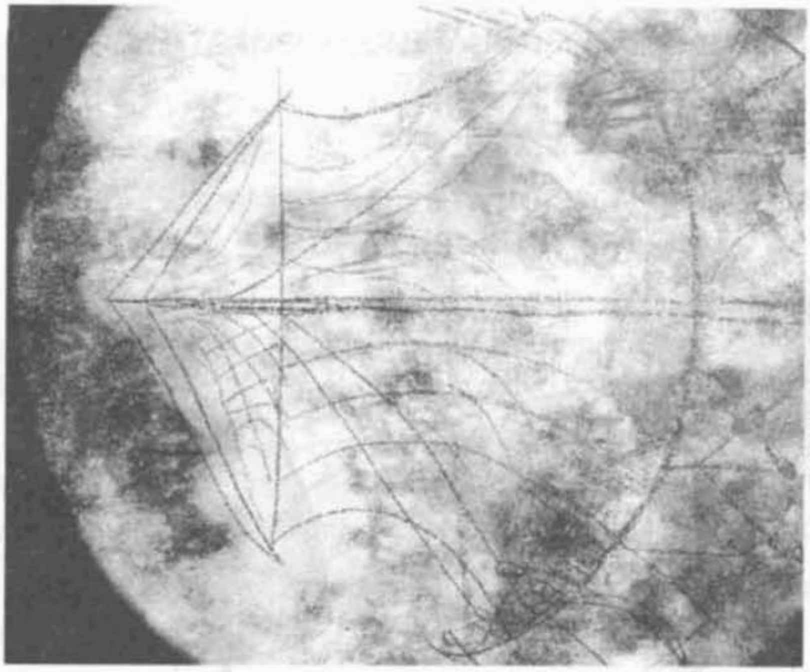
Interesting details of the hulls, rigging, sails as well as the streeting-oars mechanism are depicted.

The typology of the depicted ships is common to the Mediterranean from the beginning of the IInd c. AD to the Byzantine period. The pottery sherds found at the bottom of the cistern are dated to the end of the IVth and Vth c. AD and probably contemporaneous of the ships.



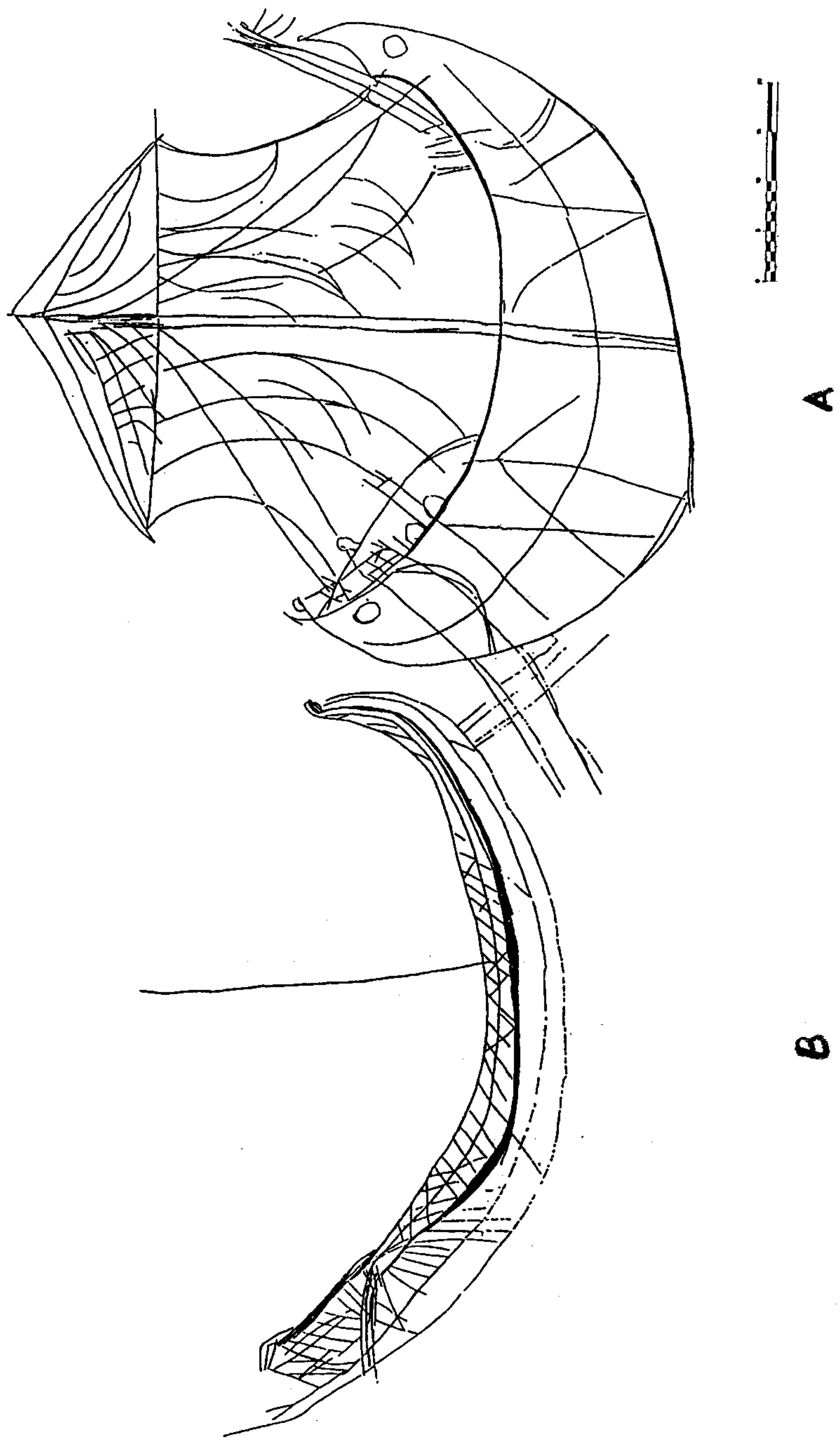
Σχέδιο: Ντίνος Κυριακόπουλος

Εικ. 1

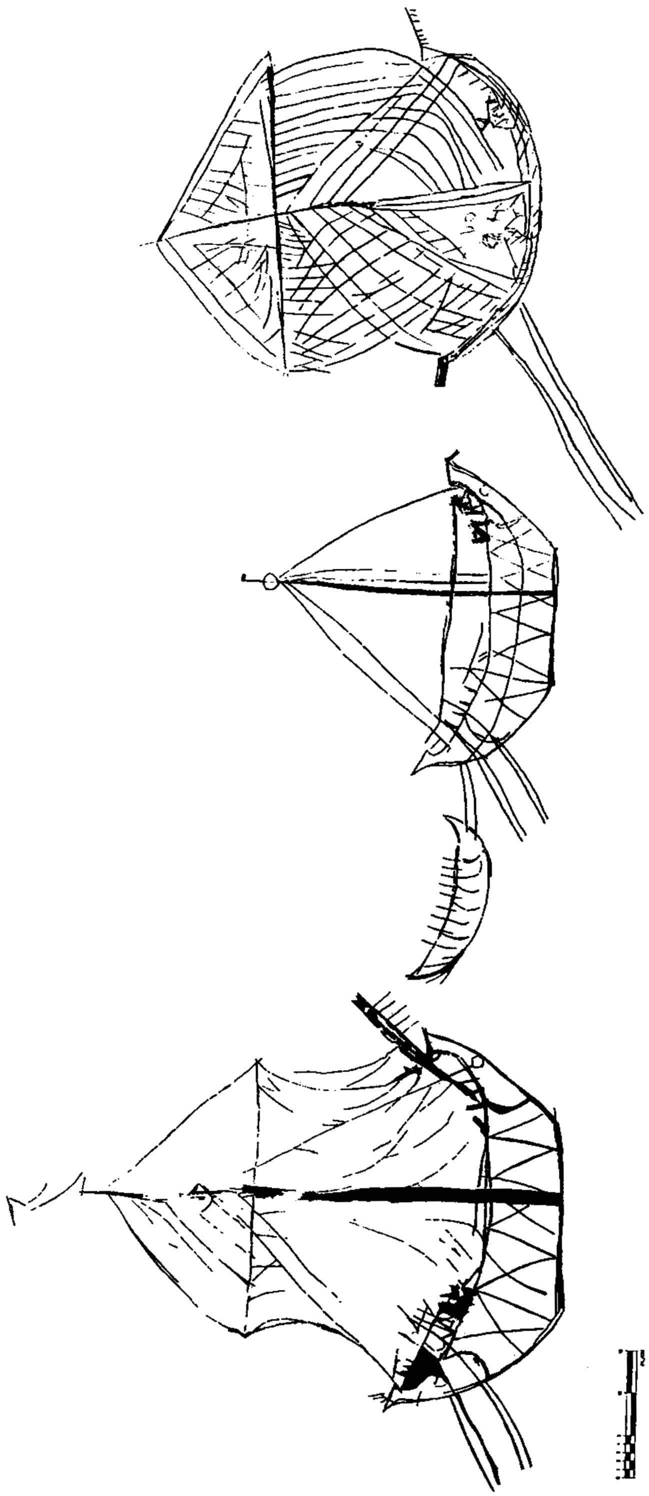


Εικ. 3

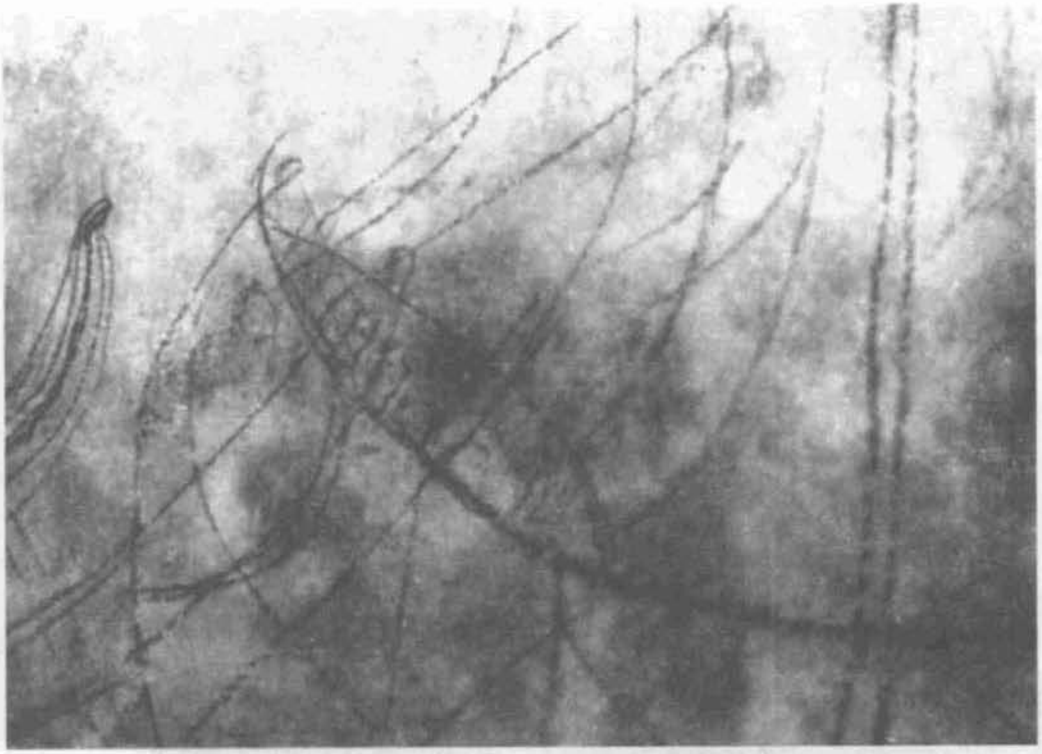
Εικ. 2



Εικ. 4 Αποτύπωση: Γιάννης Παντζόπουλος

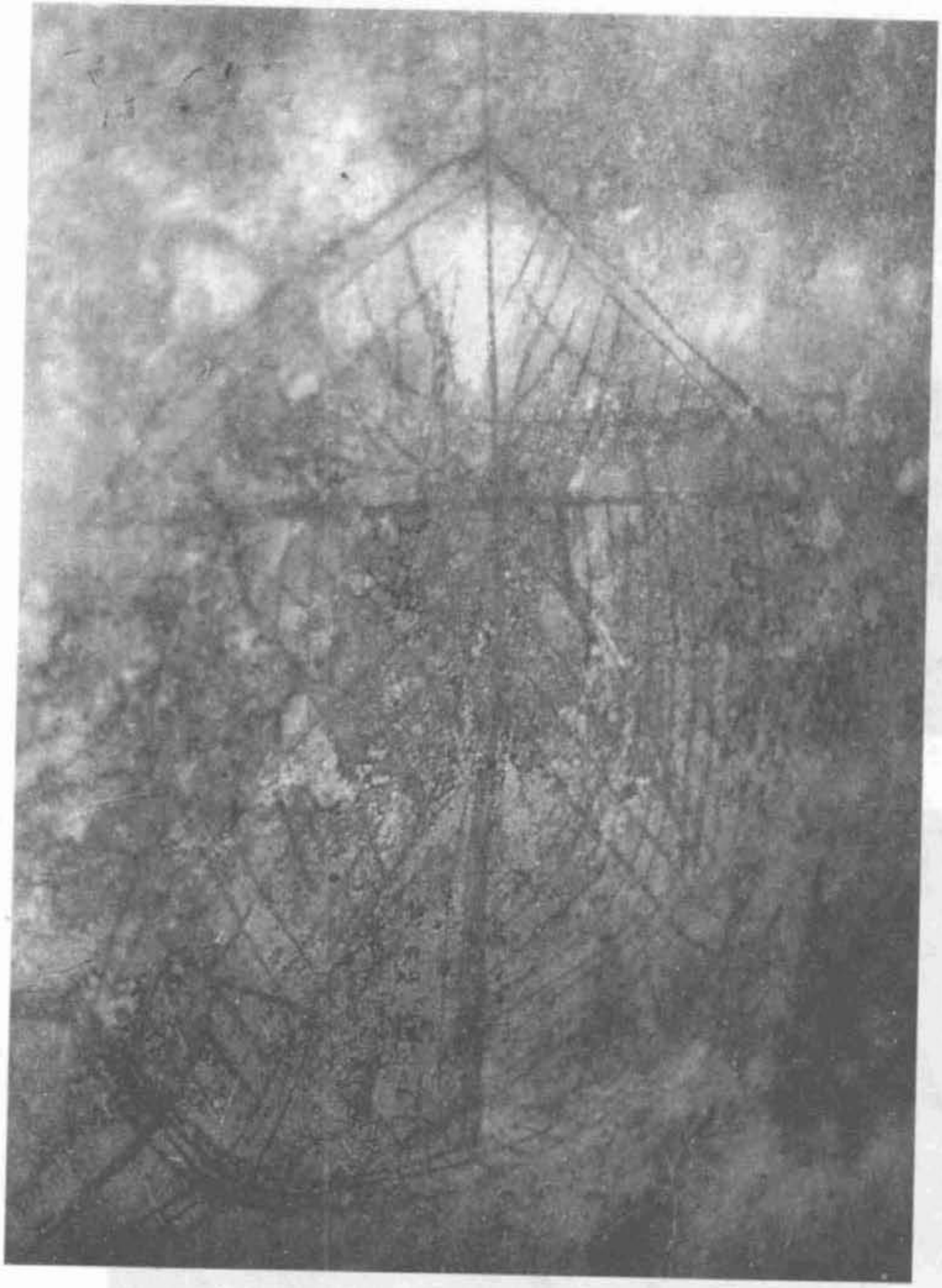


Εικ. 5 Αποτύπωση: Γιάννης Παντζόπουλος και Γιάννης Γιαρμενίτης



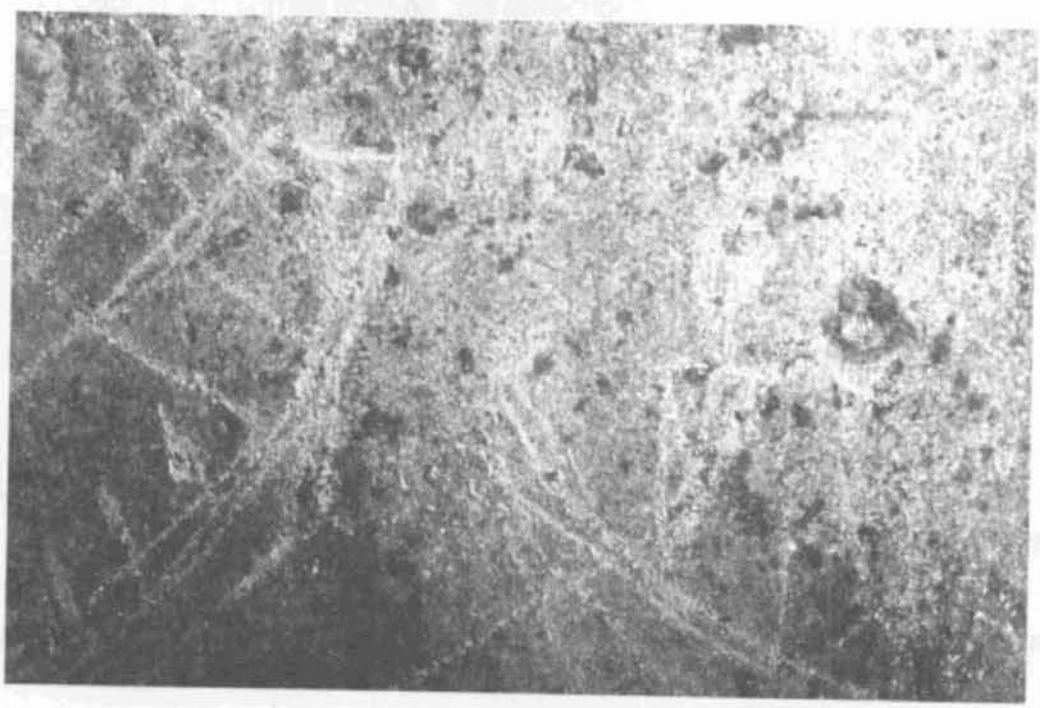
Εικ. 6

Εικ. 7

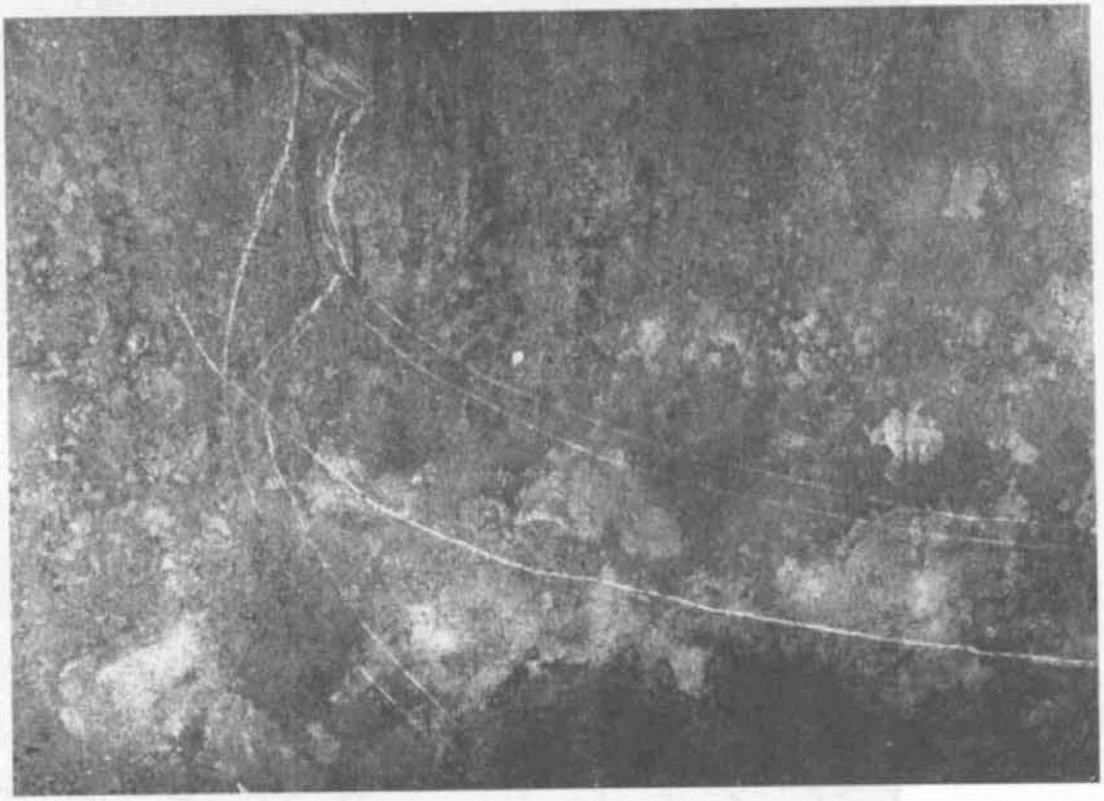


Εικ. 8

Εικ. 9



Εικ. 10



Εικ. 11

PROBLEMS IN DATING A NEW CYPRIOT SHIP MODEL

The aim of this communication is to present a new clay ship model from Cyprus and discuss the difficulties that its dating and typology present.

This model is unpublished and is presented for the first time to scholars.

Although there is a large number of known ships' clay models of Cypriot origin with a wide variation of shapes, this model, has no parallel.

The model was acquired in London in 1990, from an established antique dealer. All what we know of its provenance is the dealer's declaration that it is Cypriot and comes from an "old collection".

This is to say, that as for several other Cypriot ship models, the provenance is uncertain and the dating problematic as it was found out of an archaeological context.

The model is now in Athens and is part of a private collection[1].

Its main dimensions are (Fig. 1 and Fig. 2):
Length overall: 22.5 cm
Beam amidship: 7 cm
Height of stempost: 11.5 cm
Height of sternpost: 10 cm.

As the uppermost part of both posts is missing one can estimate that the total height was about 13cm for each post. I also believe that the stempost upper part was completed in the shape of a reversed horn.

This is one of the largest known clay models of a ship from Cyprus (there are some seven known to be slightly larger).

The model is restored from three broken pieces and is complete. Except for the missing upper part of the posts, there is a minor chip on the top rail of the portside amidship.

The color of the clay is light yellow ochre and the fabric typically Cypriot. It is made of fine clay by a skilled modeler in a very distinctive style, well different from the rough and glumsy way other Cypriot models are shaped.

There are numerous traces of much faded dark-brown paint on several parts of the model. We can say with certitude that it was decorated mostly with dark-brown linear paint. The painting is noticeable on both stem and stern posts, on the body of the hull, the gunwale as well as the underbody. Also, scarce remains of dark paint survived on some parts of the interior.

A thin light brown painted line run all over the top tail and indicate that the bulwark was probably painted with a lighter color.

The authenticity of the model was ascertained by a thermoluminecence carried on at the National Centre for Scientific Research "Dimokritos" in Athens by Dr. Ch. Michail.

Also a chemical analysis of the clay was made at the Chemical Laboratory of the National Archaeological Museum of Athens by Dr. El. Mangou in order to compare the clay composition with samples of pottery sherds of Cypriot provenance.

The analysis[2] was positive as the composition of the clay is comparable to the clay from various Cypriot areas with, in particular, a high consistence in calcium (CaO).

I would like to take this opportunity to thank Dr. Olga Tsahou-Alexandri, director of National Archaeological Museum of Athens and Dr. E. Mangou for making both analyses possible.

And now let us come to the difficulty of the dating of this model which we can certainly call Cypriot.

Is it a Bronze Age model or should it be dated later, perhaps as late as the Geometric period?

As it was said earlier we cannot find a close parallel with the other known Cypriot ship models as none has this straight quasi-perpendicular stem and stern.

Another peculiarity of this ship is her flat bottom. Was the modeller representing a boat with a flat bottom or was the underbody flattened to make the model stand?

At this point it must be stressed that most ship models are not made to stand. This model stands without any support and actually I may say that it stands correctly with the prow slightly upwards.

One would be tempted to make a comparison with the well-known models of Mochlos[3] (Fig. 3) and Palaikastro (Fig. 4), both from the Minoan Bronze Age but the resemblance is limited to their bottom flatness.

As the quest should not be limited to Cyprus and the Aegean area, I believe that there is a resemblance with the ship depicted on a scaraboid seal of Ugarit[5] (Fig. 5) dated circa 1200 B.C. There too we have an absolute perpendicular stem and stern. Another ship that is in a certain way comparable is the ship of the sea-people from the Funerary Monument of Ramses III from Medinet Habu[6] (Fig. 6). The shape of the bottom is not totally flat but the stem post is absolutely vertical, while the stern is slightly leaning backwards.

Obviously the vessels of the sea-people are totally different from the shape of the Pharaonic vessels and the carver of the relief differentiates these two very different types of ships.

I believe that one of the warships of Kynos (Fig. 7) presented by Dr. Phanouria Dakoronia yesterday has a stem very similar and a bottom comparable to our model. But what is left of the broken stem can also be compared as a possible parallel. Also the second ship presented by Dr. Dakoronia in a complete manner, after the happy discovery of a further sherd (Fig. 8), does also compare with our model. There is some resemblance. The Kynos ships are dated of the late Bronze age, Late Helladic (1300 B.C.).

To which period can we date our model?

Is this a ship of the early Bronze age or a ship of the Cyprus - Mycenean period?

Can we dismiss the possibility of a later dating: Cyprus - Archaic circa 700 - 600 B.C.

Perhaps, further comparable discoveries in the future may give an answer.

However, this model raises another question: Is this a flat-bottomed construction deprived of a keel or did the ship that inspired the modeler had a keel and a sail? Was the underbody flattened, slightly, purposely to make it stand? How can we explain this angular shape of the bottom amidship?

In my opinion the ship represented was not a flat bottom but probably had a keel.

The way the stem and the stern are built high above the water offers a good protection against high waves, so I believe that this is an open sea craft and although I have not found such an indication this could possibly be a sailing ship.

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NOTES

1. H. E. Tzalas' Collection catalogue no. 163.
2. See the detailed analysis at the end of this paper in *appendix.*
3. S. Marinatos *BCH* 57 (1933) p. 215, R. W. Hutchinson, Prehistoric Crete (1962), 91 ff. C. Renfrew, The emergence of Civilization (1972) 356 ff.
4. S. Marinatos *BCH* 57 (1933) p. 173. C. Renfrew, *The emergence of Civilization* (1972) 356 ff. P. Johnston, *The Sea-Craft of Prehistory* (1980) 61 ff.
5. L. Basch, *MIMA* (1987) p. 70.
6. M. Artzy, On boats and sea peoples, *BASOR* 266.

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Westerberg, Karin, *Cypriote Ships from the Bronze Age to c. 500 B.C.* Götenburg (1983).

ILLUSTRATIONS

1 and 2. The Cypriot model (Photo. Christos Diamandis).
3. The boat from Mochlos, Crete (Circa 2600-2000/1900 BC). See L. Basch, *MIMA* (1987) p. 133 Fig. 276.
4. The boat from Palaikastro, Crete (*Circa* 2600-2200 BC). See L. Basch, *MIMA* (1987) p. 83 Figs 170, 171.
5. Ship from a scaraboide seal. Ugariti (*Circa* 1200 BC). From Schaeffer, *Ugaritica* IV p. 134, Fig. 114 in L. Basch, *MIMA* (1987) p. 70, Fig. 131.
6. Ship of the Sea People, Ramses III Temple at Medinet Habu. L. Basch, *MIMA* (1987) pp. 68, 69 Figs. 123-130 (*Circa* 1185 BC).
7. Kynos ship as per Fig. 1 *TROPIS III*, p. 147.
8. Kynos ship as per Fig. 2 *TROPIS III*, p. 148.

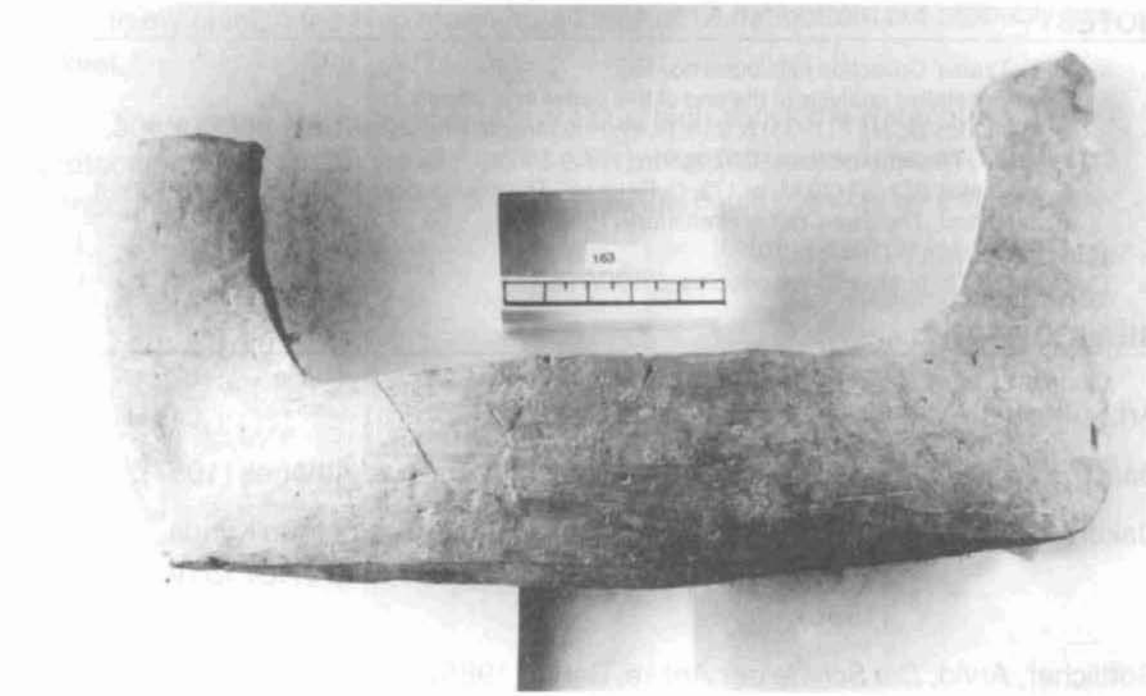

FIG. 1

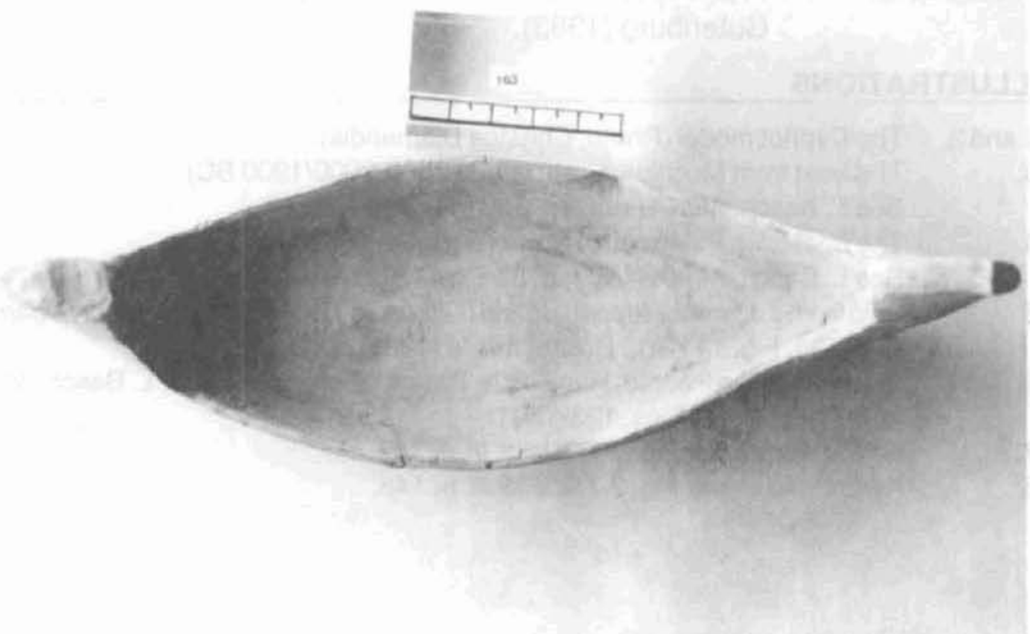

FIG. 2

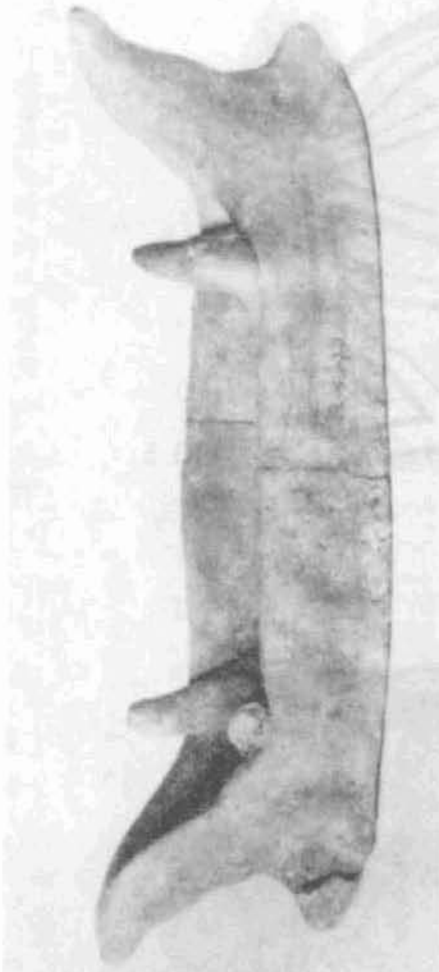

FIG. 3

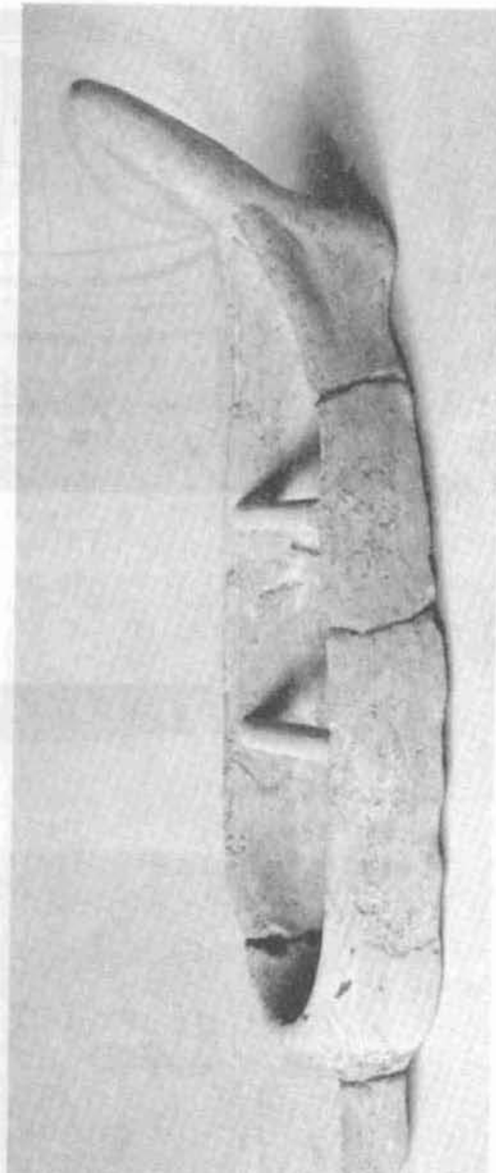

FIG. 4

FIG. 5

FIG. 6

FIG. 7

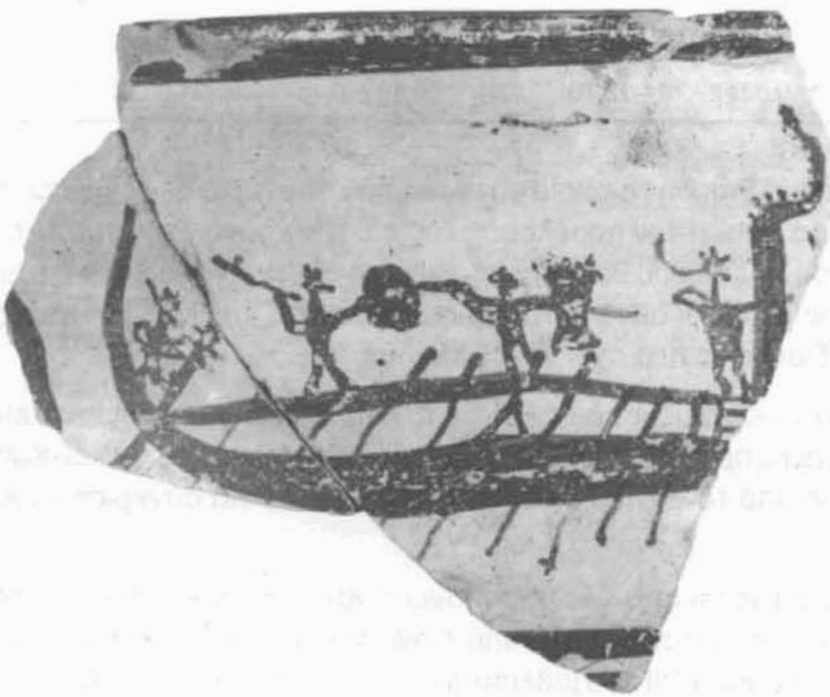

FIG. 8

APPENDIX

ΧΗΜΙΚΗ ΕΞΕΤΑΣΗ ΠΗΛΙΝΟΥ ΟΜΟΙΩΜΑΤΟΣ ΠΛΟΙΟΥ

Το δείγμα για τη χημική ανάλυση του πηλού του ομοιώματος πλοίου ελήφθη με τρυπάνι καρβιδίου του βολφραμίου σε μορφή κόνης. Η διαλυτοποίηση του δείγματος έγινε με σύντηξη με μεταβορικό λίθιο. Η χημική ανάλυση του δείγματος έγινε με τη μέθοδο της ατομικής απορρόφησης στο Χημικό Εργαστήριο του Εθνικού Μουσείου.

Τα αποτελέσματα της χημικής ανάλυσης επί τοις εκατό σε οξείδια των στοιχείων δίνονται στον παρακάτω πίνακα:

% ΧΗΜΙΚΗ ΣΥΣΤΑΣΗ ΣΕ ΟΞΕΙΔΙΑ

Είδος αντικειμένου	Fe_2O_3	CaO	Al_2O_3	Ka_2O	Na_2O	MnO	MgO	Gr_2O_3	NiO	TiO_2
Πήλινο ομοίωμα πλοιαρίου	5,76	27,80	12,98	1,43	0,18	0,13	5,45	0,043	0,031	0,81
Κυπριακό όστρακο ΕΑΜ 15414	10,02	29,70	12,78	1,84	0,19	0,13	8,62	0,051	0,031	0,82

Παρατηρήσεις: Επειδή το ομοίωμα πλοιαρίου από πηλό δεν έχει σαφή προσδιορισμό όσο αφορά την προέλευσή του και την χρονολόγησή του, η χημική ανάλυση του πηλού του θα ήταν παρακινδυνευμένα καθοριστική του τόπου προέλευσής του. Και αυτό γιατί πηλοί παρόμοιας χημικής σύστασης χαρακτηρίζουν διάφορες περιοχές π.χ. Ελλάδας, Κύπρου κ.λ.π.

Για τη συγκεκριμένη ερώτηση, αν το πήλινο ομοίωμα πλοιαρίου είναι από πηλό Κυπριακής προέλευσης, έγινε χημική ανάλυση ενός οστράκου Κυπριακής προέλευσης από το Εθνικό Μουσείο με αρ. 15414 για σύγκριση καθαρά ενδεικτική.

Όπως φαίνεται από τον παραπάνω πίνακα, αλλά και από τα δεδομένα χημικών αναλύσεων σε πηλούς από διάφορες περιοχές της Κύπρου που δίνονται στο Appendix VII του βιβλίου Jones 1986 υπάρχουν κάποιες ενδείξεις για συσχετισμό του πηλού ως Κυπριακού, χωρίς αυτό να είναι απόλυτα καθοριστικό. Συγκεκριμένα παρατηρείται ένα υψηλό ποσοστό ασβεστίου (CaO) που χαρακτηρίζει πηλούς από διάφορες περιοχές της Κύπρου.

21-2-91
Ελ. Μάνγκου
Χημικός
Χημικό Εργαστήριο
Εθνικό Αρχ/κό Μουσείο

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ABRIDGED TRANSLATION OF Dr. EL. MANGOU (CHEMICAL LABORATORY OF THE NATIONAL ARCHAEOLOGICAL MUSEUM) REPORT ON THE CHEMICAL ANALYSIS OF THE SHIP-MODEL CLAY

The sample of clay taken from the model was analysed and the results compared with the analysis of the clay from a pottery sherd of Cypriot provenance no. 15414 of the National Archaeological Museum of Athens.

% CHEMICAL COMPOSITION

Nature of the object	Fe_2O_3	CaO	Al_2O_3	Ka_2O	Na_2O	MnO	MgO	Gr_2O_3	NiO	TiO_2
Ship model	5,76	27,80	12,98	1,43	0,18	0,13	5,45	0,043	0,031	0,81
Cypriot sherd EAM 15414	10,02	29,70	12,78	1,84	0,19	0,13	8,62	0,051	0,031	0,82

21-2-91
El. Mangou
Chemist
Chemical Laboratory
National Archaeological Museum

THE EXCAVATION OF AN EARLY BRONZE AGE CARGO AT DOKOS: THE FIRST TWO CAMPAIGN SEASONS (1989-1990)

Towards the end of August 1975 Peter Throckmorton, who was a founding member of the Hellenic Institute of Marine Archaeology (H.I.M.A.), located piles of broken prehistoric vases in the small bay of Skindos, at Dokos island (Figs. 1a, 1b). He immediately informed the ephor of antiquities George Papathanassopoulos. Thus began a long train of events that has finally culminated in the present programme for a complete archaeological excavation of the site by the Institute.

PLANNING AND METHODOLOGY

The surveys made in 1975 and 1977 of the underwater archaeological site at Dokos revealed the special character of the site and the difficulties involved in a full archaeological excavation of it. It became apparent that although the greatest depth of the site did not exceed 32 m, the time required to set up a grid of the traditional type and to record the positions of the finds by any of the known surveying methods would be excessive in the case of a full-scale excavation.

Taking into account the large number of finds and the fact that many of them were concreted to each other and to the rocks, it was clear that the total time needed to finish the excavation would in this case be almost prohibitive. The magnitude of the problem had been well stated by the archaeologist in charge of the 1977 survey, Charalambos Kritzas.

The results of the one-day survey carried out in May 1989 confirmed these observations, and the traverse section of the site was of great assistance in planning the 1989 campaign, especially for the design of the stereophotographic grid.

In view of the impracticability of using the conventional grid and survey method, mainly because of the steep gradients and irregularities of the seabed in the area of the excavation, we turned to a new system for mapping and recording the positions of finds underwater which we had heard of in February 1988 from the then president of the Institute of Nautical Archaeology, at the A. & M. Texas University, Donald Fray.

This system, known as the Sonic High Accuracy Ranging and Positioning System (SHARPS), had been designed by INA scientists especially for use in underwater excavations for mapping the seabed and plotting the positions of finds by means of a computer through the transmission of high-frequency sound pulses.

Since this was the first time in the world that the SHARPS was to be used as the principal survey instrument on an underwater archaeological excavation, we also decided, profiting by the past experience of foreign excavation teams, to make a photomosaic and to construct a stereophotographic plan of the site.

By choosing these two topographical systems, the SHARPS and the stereophotographic grid we were sure that the topographical requirements of the excavation would be largely taken care of. We decided to use both systems so that if the results from one of them were not as reliable as expected we could always fall back on the other.

The adoption of these two systems also solved the most difficult problem of the excavation: how to make a scale plan of the underwater site and to record the positions of the finds accurately. The projects for the 1989 season concerned the delimitation of the archaeological zone recording the visible objects on the seabed, attaching numbered labels to each cluster of finds or to important single finds, and raising and transporting them all safely to a museum.

It was decided that the delimitation of the archaeological zone would be carried out by two archaeological divers, and they would also be responsible for locating the finds. To mark all the objects we had made plastic labels with white numbers on a black ground, which would be visible by ordinary light to the eye and in photographs. We also decided because of the large number of objects, chiefly small sherds, to label clusters of sherds rather then individual pieces.

Every cluster would comprise all the objects in the immediate vicinity of a feature find. Each cluster would be placed in a plastic bag with its label and raised to the surface, and for their safe transport the plastic bags with the finds would be placed in buckets and bowls of water.

The projects for the 1990 season, involved repositioning the perimeter exactly as it had been in 1989 and excavating two separate trenches in order to determine the depth of the archaeological deposit and the nature of the stratigraphy. In addition a reconnaissance of the wider area surrounding the site was planned for 1990.

It was decided that both topographical methods applied in 1989 would be used again in 1990.

The methodology was planned, not only with an eye to correct archaeological excavation procedure, but also with the aim of conducting a model underwater excavation that would yield worthwhile results, thanks to the use of advanced technology and to the training of as many archaeologists and scientists engaged in underwater archaeology as possible.

THE EXCAVATION

The 1989 season began on the 20th of August with the transport to Dokos of the equipment and material needed for the excavation and the setting up of the floating and onshore installations. This task was undertaken by a team of HIMA members with technical qualifications aided by three professional mechanics.

Their chief tasks were to moor the yacht "Pnoe", which was to house the excavation team and take part of the portable equipment, to moor the floating platform over the main area of the site, to set up the electric generators and the air compressors for filling the tanks, and to construct the shore platform on which to install the computer for the SHARPS system.

During the three first days the archaeologist Elpida Hadzidaki and Yannis Vichos explored the site of the wreck, covering a total area of 900 m2. The archaeological finds were found to extend over an area from about 15 to 30 m in depth. A few isolated finds were also located beyond the 30 m mark, but it was decided to confine the work in the 1989 season to the main archaeological zone, which occupies an area of 650 m2.

The zone was marked off with a cord fastened to 18 numbered iron stakes. It was polygonal in shape and the perimeter was initially plotted in the traditional way in a series of dives by the topographer Vaso Kyriakopoulou and a number of archaeologists and divers. Later on the perimeter was also plotted using the SHARPS (see Fig. 7).

Both plotting methods were used in order to compare the time needed for each of them and to check the measurements given by the SHARPS, since it was being used for the first time. The results were most interesting and confirmed both the reliability of the SHARPS and its much greater speed.

The following seven days were chiefly spent in setting up and adjusting the SHARPS. This required the positioning of the three receivers at fixed points on the seabed so as to form as nearly as possible an isosceles triangle.

In order to find the best positions for the receivers for the system to function properly without any reflections due to the irregularities of the bottom, the receivers had at first to be moved around a great deal. They were mounted on iron poles about 2.5 m high embedded in cement-filled cans.

The system was calibrated and the speed of the sound pulse, through the water, measured; this is about 1518 m per second. The three receivers were labeled A, B, and C, and the distances between them and from them to the surface were measured.

While the SHARPS was being installed and adjusted, other jobs were carried out, and the area within the perimeter was divided by cords into nine separate sectors in order to simplify the work of recording and plotting the sherds.

As soon as the SHARPS was functioning properly, the perimeter of the working zone and the dividing cords of the nine sectors were plotted. Afterwards pairs of divers, each under an archaeologist, began marking the objects and clusters in each sector with numbered labels from A1 to A250 (the letter A indicates the stratum, in this case the surface of the seabed, to which the 1989 excavation confined itself). When the marking of the finds in each sector was completed, another pair of divers made a list of the numbers of the labels together with a short description of the objects. Meanwhile the first group or another one photographed all the finds and clusters that had been marked. (Fig. 2).

When the task of marking the objects was finished, plotting their positions with the SHARPS began (Fig. 3).

While this was in progress, the stereophotography of selected parts of the delimited zone, where the bulk of the finds was concentrated, began.

Before taking the photographs, the surface of the objects under the frame was cleaned.

During these activities two stone slabs of greenish schist with a hole at one end were brought to the surface after they had first been photographed in place and their positions in relation to the perimeter of the archaeological zone had been fixed. These slabs, which had been located during the reconnaissance dives at depths of 34 and 38 m respectively and some 40 m away from the main site, must be prehistoric anchors and may be directly related to the wreck (Figs. 5a, 5b).

The next step was to map the area with the SHARPS, and particularly to plot the rocks within the delimited zone and fix the archaeological site in relation to the shore in order to incorporate it into the general topographical map for which a land survey was being made (see Fig. 7).

After completing the marking and plotting of the finds with the SHARPS, the stereophotography and the photography of the finds, we began the task of raising methodically both the separate pieces and the clusters, according to how they had been marked on the bottom and recorded by the SHARPS.

The finds were raised by sectors after being placed together with their labels into plastic bags. The bags were then carried up in a perforated iron basket attached to a lifting balloon. When there were enough finds in the basket, the balloon was filled with air from one of the diver's tanks and hauled up to the floating platform at a point where part of it had been removed to make it easier to remove finds from the basket.

All the work on the bottom and ashore was photographed, and parts of it were recorded on video for the archives of the Institute.

On the last day of the excavation all the finds that had been raised were carried on board the "Energy" to the island of Spetses, accompanied by the director of excavations. There they were put in the Archaeological Museum in the charge of the guards.

The 1990 season began on the 27th of July.

As soon as the site was delimited, the first trial trench was layed out in an area where is a thick sandy deposit. The surface finds were labeled and were raised after their position had been recorded with SHARPS and stereophotography. Subsequently the trench was excavated with an airlift layer by layer (Fig. 6). The finds of each layer were recorded and photographed *in situ* and raised. Three levels A, B and C were determined. All three layers of the trench, the depth of which reached 1,5 m from surface to natural bedrock, contained Early Helladic sherds including large fragments of Early Helladic vases, but also a large number of obsidian blades and flakes, animal bone and teeth, two seeds and other food remains.

Work was continued by locating, recording, and raising surface finds from the entire site, which had not been spotted in the course of the previous season. Obviously sand shifted by currents during the winter had exposed these new surface finds.

Concurrently the second trial trench was layed out at the end of the rocks in the central part of the site.

Due to the limited time available, only the top layer of this second trench was recorded and all surface finds were raised.

Alongside the above mentioned tasks reconnaissance dives were performed in the wider area and two lead anchor-stocks, probably of Classical or Hellenistic date, were located recorded *in situ* and raised.

METHODOLOGICAL RESULTS

The reconnaissance of the underwater archaeological site at Dokos resulted in the delimitation of a zone of 650 m2 that began at a depth of 15 m and went down to 32 m. Nearly all the visible finds on the seabed that had been located during the reconnaissance phase were within this zone. Some isolated finds were outside it at a depth greater than 32 m, but the main bulk of them was concentrated in the middle of the delimited zone.

This was divided into nine sectors of irregular shape, due to the anomalies and steep slope of the seabed. The irregular shape of the sectors did not hamper the plotting of the positions of the finds, because the operation of the SHARPS is unaffected by the shape of any grid; it is based solely on a theoretical horizontal plane bounded by the lines between the three fixed receivers. The nine sectors into which the delimited zone was divided serve only for carrying out the tasks of marking, plotting and collecting the finds.

The latter were marked in clusters, because generally there were many small sherds concentrated in a small area. Individual objects were marked only when they were relatively distant from concentrations of other finds.

We found that the labels had to be attached to the finds with wire, because otherwise there was a danger that they would be swept away by the currents.

Much time was spent in relocating marked finds when plotting their positions and photographing them *in situ* due to the fact that most of the finds were very small in size. In the next season, therefore, the nine sectors of the zone will be subdivided into smaller units to make it easier to locate the finds.

The 1989 season yielded the anticipated results as regards mapping the zone and plotting the positions of the surface finds.

The 1990 season also yielded the anticipated results as regards the excavation of two trial trenches in order to study the area. We found that the involvement of the entire research team in the excavation of only one trench at a time did not allow for the optimal exploitation of the total time spent underwater daily.

Our choice of methods for this task proved entirely successful, and they were carried out in general in the usual approved fashion. Certain omissions and errors occurred due either to technical reasons (power cuts, false signals caused by reflections, etc.) or our inexperience, but these did not affect the final results. The employment of two different plotting systems proved to be especially useful when for various reasons one of the two systems did not produce the correct figures.

In the case of the iron frame for the stereophotography, we found that the material used for the frames was not rigid enough.

The use of a bottom-to-surface intercom proved indispensable for the operation of the SHARPS.

Although we are still at the stage of processing all the evidence, we already have, thanks to the Autocad graphics programme, a complete plan of the archaeological area with the positions of all the finds and rocks marked on it[1], (Fig. 7). We are also able to make drawn sections of any part of the zone and we know the relative heights (depths) of all the finds.

The positions of the main bulk of the finds on the plan made by entering and processing the data from the SHARPS with the Auto cad will be checked one by one on the photomosaic assembled from the photographs taken with the stereophotographic frame.

At the end of the two excavation seasons at Dokos nearly all the visible finds on the bottom that had been marked were raised, except for a number of them that had become concreted to the rocks. Some finds that were found outside the working zone, whose positions are plotted on the SHARPS plan, were also raised.

Recording the finds as soon as they were brought to the surface proved particularly useful and this will be continued more methodically in the coming seasons.

In addition we consider designating two teams each directed by an archaeologist and working simultaneously on two separate *loci* of the site.

After the completion of the excavation of the second trial trench, will be selected the most suitable and promising parts of the site for further digging.

The main participants of the two first campaigns of the research Dokos project (1989-1990) included: Dr. George Papathanasopoulos, director, Dr. Yannis Vichos, field director, Dr. Elpida Hadjidaki, assistant director, Nikos Tsouchlos, technical director, Phaedon Antonopoulos, dive master, Christos Agouridis, Haralambos Kritzas, Thanos Aronis-Webb, Roxani Margariti, George Koutsouflakis, George Valvis, Lucy Blue, Lilian Ray, archaeologists, Stavros Vossyniotis, mechanical engineer, Vasso Kyriakopoulou and Aristotelis Papadakis, topographers, Vassilis Koniordos and Yannis Baltsavias, architects, Kyle Jachney, photographer.

ARCHAEOLOGICAL RESULTS

In the course of the first two excavation seasons at Dokos more than 4000 finds were raised, mostly large and small sherds of Early Helladic wares, two fragments of a lead rod (probably belonging to an anchor's stock of later times), two stone anchors (see Fig. 5), several millstones and querns, a large number of obsidian blades as well as animal bone and teeth.

The obsidian and the animal remains were found, together with early Helladic sherds, mostly in the lower level of the first trial trench. These finds should not belong to the "closed deposit" of the Early Helladic II ceramic finds, that were raised chiefly from the top layer of the site; they are rather to be regarded as rubbish dumped from the shore, as would be expected in an area that has served as a natural harbour from prehistoric times till the present day.

The finds of Early Helladic II pottery are of great significance, regarding both the variety of sizes and shapes of the vessels they represent and the total number of pots comprising this sealed deposit, which is perhaps the richest sealed deposit of Early Helladic pottery ever uncovered.

The sherds that were raised represent all the known types of fine pottery as well as many types of cooking wares of the Early Helladic II.

They include many of the curious deep spouted vessels known as sauceboats in a variety of different shapes and sizes (Figs. 8a, 8b), as well as cutaway jugs (Figs 9), shallow and deep bowls (Figs. 10a, 10b, 10c), also in a variety of different shapes and sizes, amphoras (Fig. 11), plates, cups, jars, askoi (Fig. 12) and pithoi, and household utensils (Fig. 13), querns and grinders.

Another important fact that emerges from a preliminary examination of the pottery from Dokos is that the assemblage seems to contain certain Cycladic elements or traits.

All the finds that have been raised are currently being conserved and studied at the Museum of Spetses[2] (Fig. 14).

The study of the finds is being conducted by the two authors of this paper jointly with Prof. Yannos Lolos (pottery) and Mr. Christos Agouridis (querns and grinders). It is based on an extensive computer programme that will include drawing the objects (computer graphics, see Figs. 9a, 9b and 10a, 10b) and recording all the data of the project as well as comparative material. Drawing of the finds has been the work of the archaeologists Tonia Koutsouraki, Stella Demesticha and Alexandra Mari

This programme will ensure a speedy and efficient processing of the data and will facilitate the final study. An additional objective of the programme is the publication, both popular and scientific, of the project's results with the electronic means (CD-Rom) that will be widely used in the near future for an improved dissemination of research results and other knowledge.

The ambition of the Dokos project is not limited to the completion of the excavation of the Early Helladic II "closed deposit" which most likely represents the cargo of the oldest known wreck ever discovered; it extends to the application of revolutionary technology for the conduct of the research and the processing of primary and secondary data so that the Dokos project may serve, as a model and precedent for the subsequent underwater research in Greece and elsewhere.

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NOTES:

1. This paper was presented in August 1991 at the Symposium, during the 3rd excavation campaign at the Dokos cargo site. The topographical plan published here presents the surveyed artifacts of the 1991 campaign.
2. At the same time that the material from the EH II wreck is being processed, the study is underway of a series of pottery and other finds from the neighbouring EH II site of Ledeza on the north shore of Dokos, which are also in the Spetses Museum (Fig. 15). These finds came from earlier rescue collections made by Mr Adonis Kyrou on land and in the sea at the locality of Ledeza (Kyrou 1990, 71, 72, 250-251), and from the underwater survey carried out there by H.I.M.A. in August of 1991. For a preliminary study of the material from Ledeza see (Papathanassopoulos, Lolos and Vichos, 1995, 27-29).

ILLUSTRATIONS

1. a Map of the Argolic Gulf with the position of the Dokos island (drawing, K. Kazamiakis).

1b. Topographical plan of the Skindos bay and the promontory Myti Kommeni, with the positions of the cargo site and the prehistoric settlements on land (drawing, K. Kazamiakis).

2. A pottery fragment with its label B20 (photograph, K. Jachney).

3. Surveyor V. Kyriakopoulou plotting the positions of finds with SHARPS (photograph, K. Jachney).

4. Taking stereophotographs with the frame. On the bottom under the frame can be seen the photographic scales used for the photogrammetry (photograph, K. Jachney).

5a and 5b Drawings of the two stone anchors, one round, the other pear-shaped, pierced with one hole each (drawings, T. Koutsouraki).

6. Archaeologist Lucy Blue excavating with the air lift (photograph, K. Jachney).

7. Topographical plan of the cargo site (drawing, V. Kyriakopoulou).

8a. Four sauce boats of different type and size (photograph N. Tsouchlos).

8b. Drawing of an almost complete gigantic sauceboat with a strikingly small spout (drawing, T. Koutsouraki).

9. Neck and upper body of a beaked jug. Note the incised mark in the form of an M (drawing, T. Koutsouraki).

10a. One deep and one shallow bowl (phiales), after restoration (photograph, N. Tsouchlos).

10b. and 10c Drawings of the same type of the above vessels (drawings, S. Demesticha)

11. An almost intact amphora of medium size. Note the marine concretions in the inner part of the body (photograph, N. Tsouchlos).

12. A large part of an askoid vase with a flat handle and an incised mark (drawing, T. Koutsouraki).

13. An almost complete EH II brazier after restoration (photograph, N. Tsouchlos).

14. Conservation by mechanical treatment of a deep bowl at the laboratory of H.I.M.A at the Museum of Spetses.

15. Large EH II bowl from the underwater site of Ledeza at Dokos (photograph, N. Tsouchlos).

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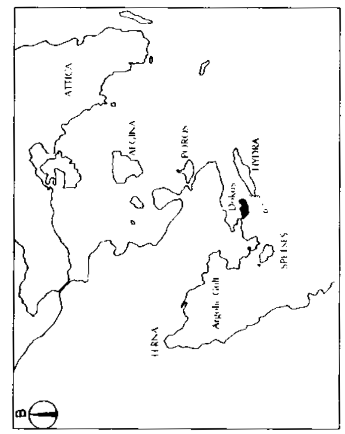
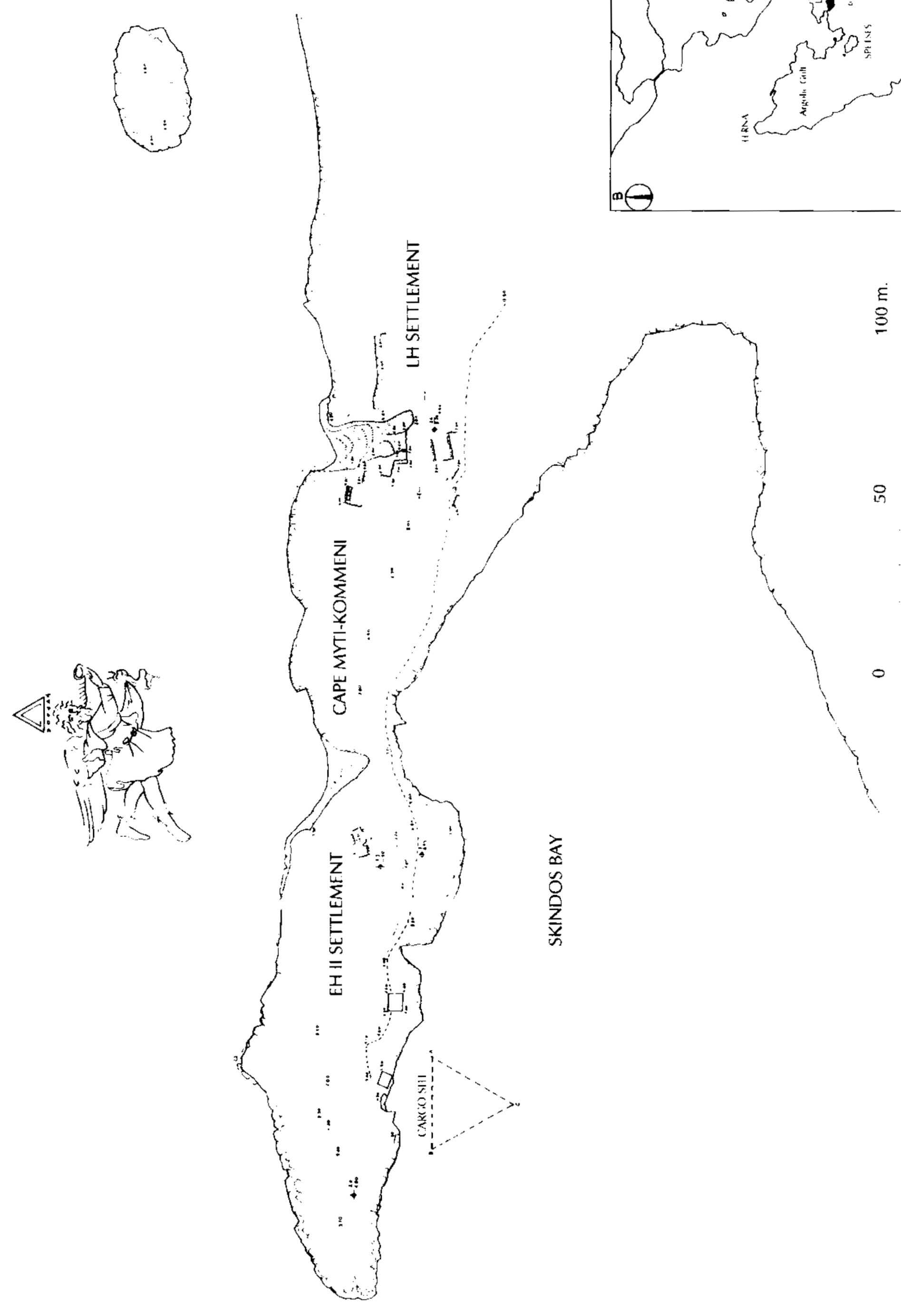


FIG. 1b


LH SETTLEMENT
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EH II SETTLEMENT
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FIG. 1a

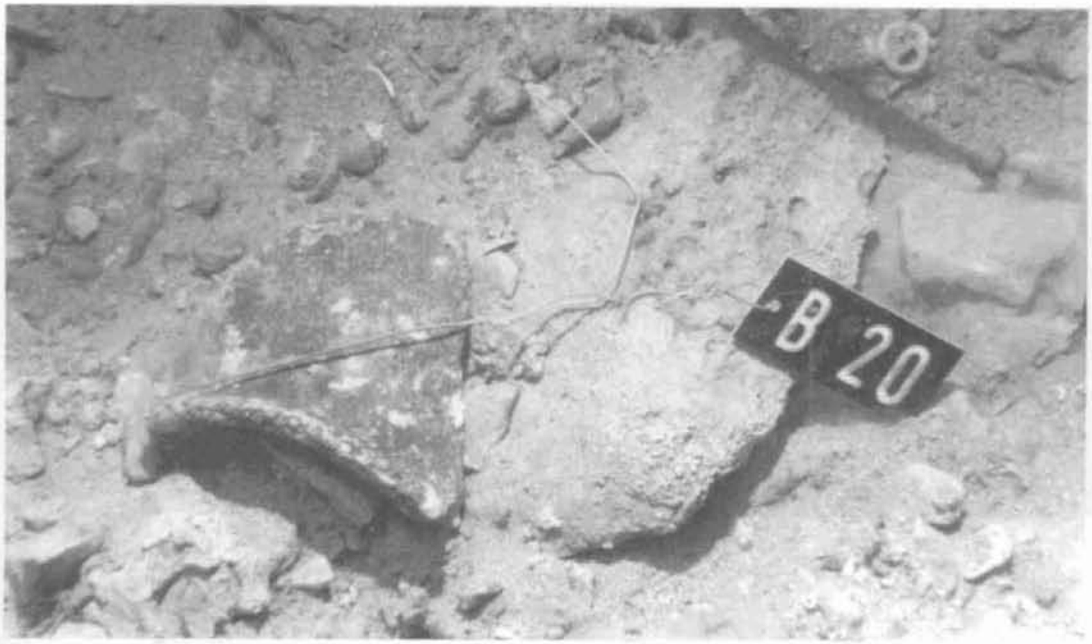

FIG. 2

FIG. 3

FIG. 4

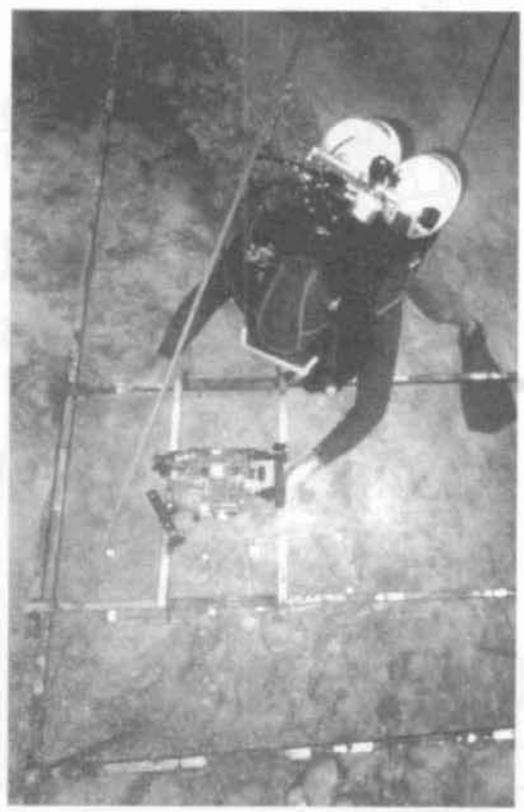

FIG. 6

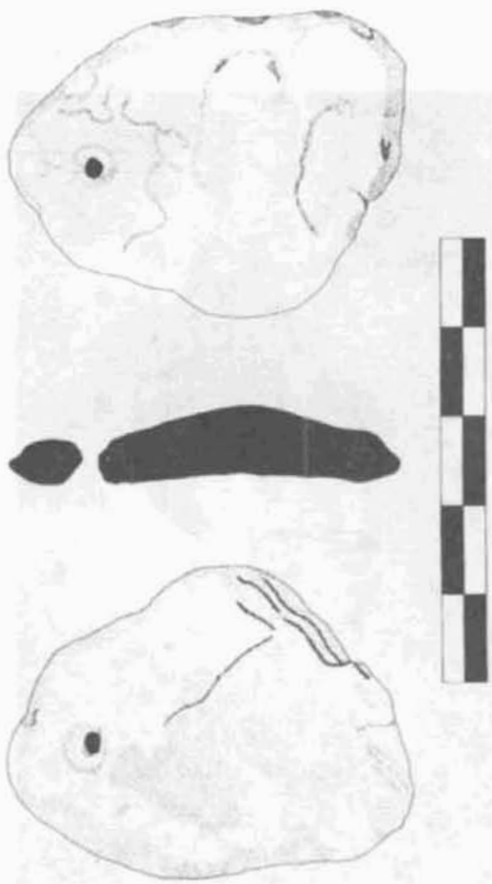

FIG. 5a

FIG. 5b

FIG. 7

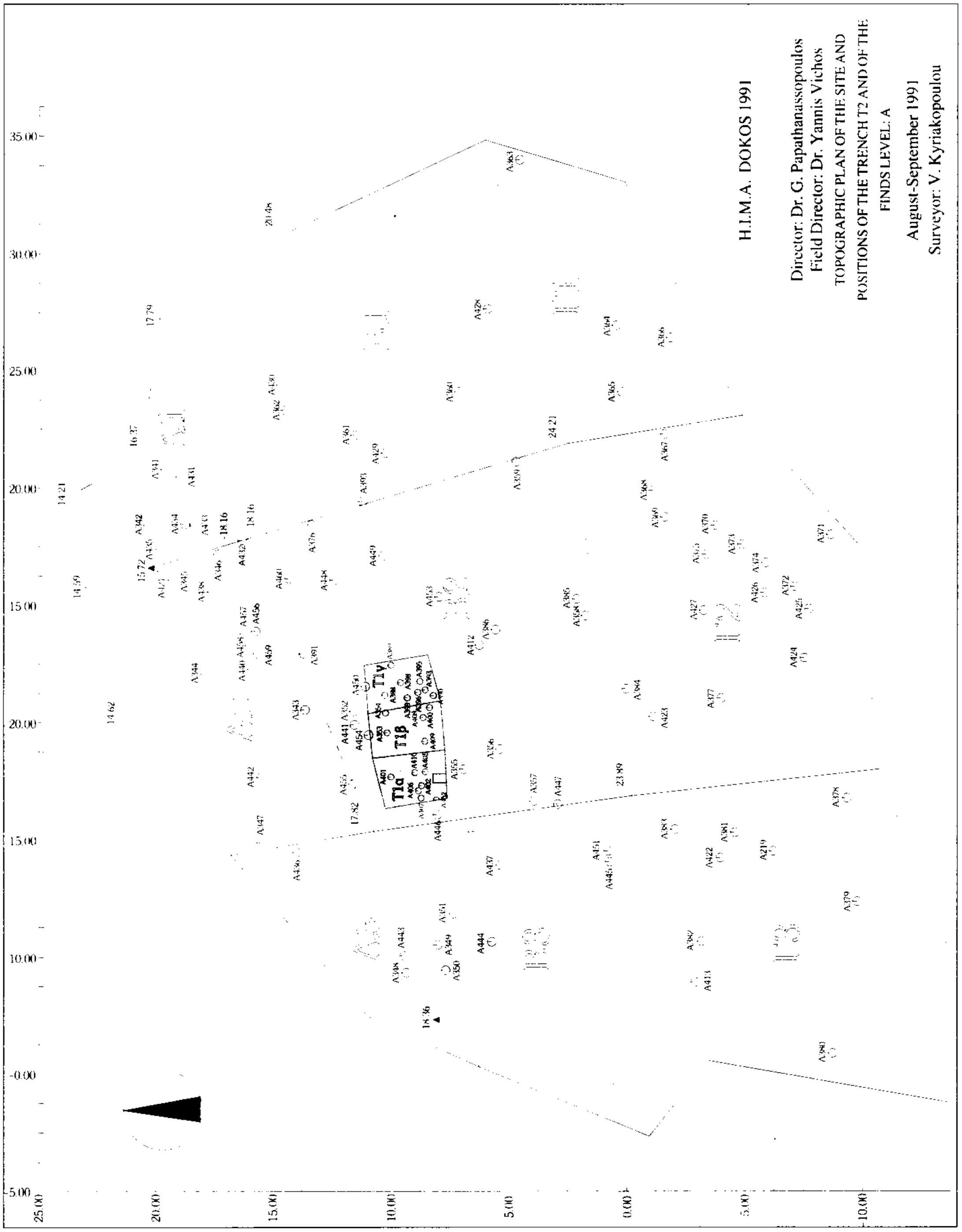
H.I.M.A. DOKOS 1991
Director: Dr. G. Papathanassopoulos
Field Director: Dr. Yannis Vichos
TOPOGRAPHIC PLAN OF THE SITE AND
POSITIONS OF THE TRENCH T2 AND OF THE
FINDS LEVEL: A
August-September 1991
Surveyor: V. Kyriakopoulou

FIG. 8a

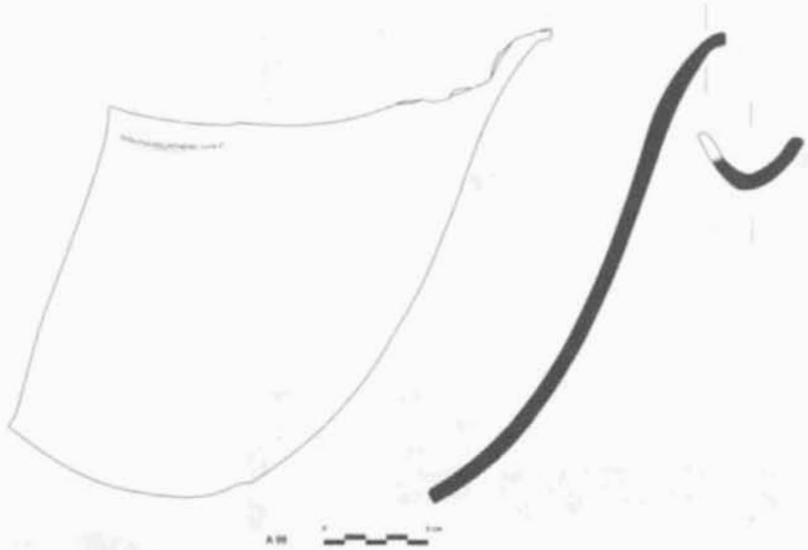

FIG. 8b

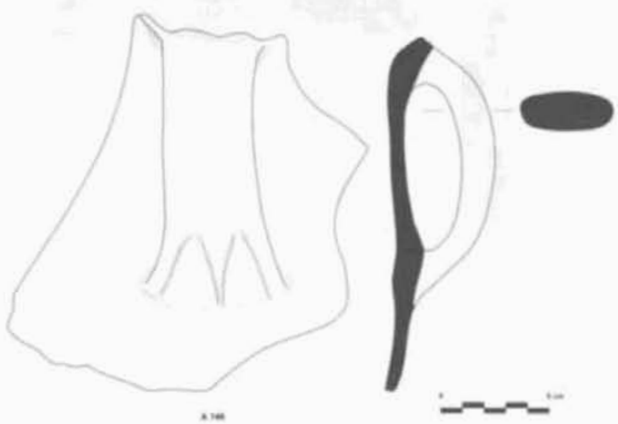

FIG. 9

FIG. 10a

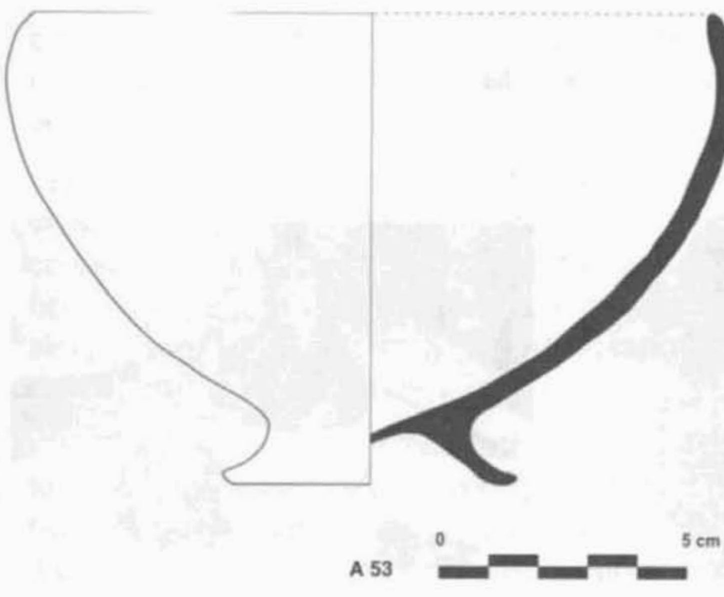

FIG. 10b

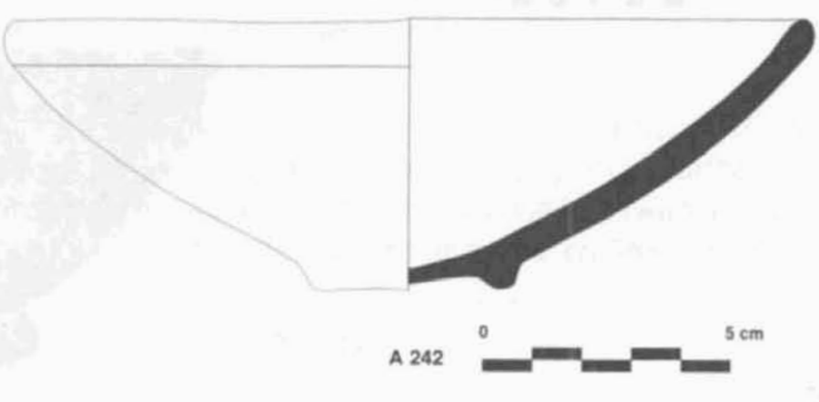

FIG. 10c

FIG. 11

FIG. 12

FIG. 13

FIG. 14

FIG. 15

BIRD-HEAD DEVICES ON MEDITERRANEAN SHIPS

Introduction

Ten years ago I published a study of the five Sea Peoples' ships depicted in the scene of a naval battle on the outer wall of Ramses III's mortuary temple at Medinet Habu[1]. I concluded that the type of Sea Peoples' ship depicted by the Egyptian artists derived from a contemporaneous Helladic galley design illustrated repeatedly in the art of the Late Helladic III B-C periods. This interpretation has been confirmed by the discovery of the most detailed version of this ship type to date, depicted on a krater found at Kynos and discussed at the previous symposium[2].

One of the most striking elements of these five depictions of the invaders' craft are the water-bird-head devices capping the stem and sternposts of the invaders' ship (Fig. 1). It seemed worthwhile to examine the origins and spread of these bird-head devices.

Little did I imagine at that time the extent of use of water-bird-head devices on Mediterranean craft. I had stumbled, quite inadvertently, onto a subject of considerable depth and breadth to which clearly insufficient scholarly attention had been given in the past. I found that bird-head finials, in a myriad of forms, served as symbolic - and prophylactic - devices on Mediterranean ships, beginning no later than the second millennium.

The bird-head devices that are the hallmark of Roman cargo ships are familiar to us all. These were depicted as a long-necked bird-head stern device, that usually faced outboard (Figs. 2:3:D). On occasion, this stern device faced inboard (Fig. 3:G). Together with these naturalistic representations, an abstract form of a horizontal stern bird-head's device facing inward also appears (Fig. 3:B)[3]. In the Imperial Roman period a variety of birds make their appearance as stern ornaments on merchant ships (Fig. 3: A, C, E-F).

It transpires, however, that *bird-head devices were also a standard device on warships of the Late Bronze Age, Iron and the Classical period.* Further more, a strong argument may be presented for identifying these bird-head devices as the immediate precursors of two specific devices that appear on Greek and Roman warships - the volute and the aphlaston.

Sea Peoples, "bird-head" and the Central European connection

One of the greatest enigmas concerning the Sea People pertain to their origins. The bird-head symbols may be of help in this regard. A connection, difficult to define as it might be, appears to exist between the Sea Peoples and the Urnfield cultures of Central and Eastern Europe. A possible Sea Peoples' ship, complete with a bird-head stem device with an up-curving beak, that is depicted on a crematory urn from Hama in Syria seems to support this connection (Fig. 4)[4].

The manner in which the bird-head devices are positioned on the Sea Peoples' ships at Medinet Habu - facing outboard at stem and stern - invites comparison with the "bird boats" (Vogelbarke) of Central Europe, a connection first noted by Hencken[5].

Bouzek dates the earliest Central European bird boars to the early Bronze D period (ca. 1250-1200 BC)[6]. These are ornaments from the Somes River at Satu Mare in northern Rumania and from Velem St. Vid in Hungary (Figs. 5-6). An ornament from Grave 1 at Grünwald, Bavaria dates to the Halstatt A 1 period (ca. 12th century BC). (Fig. 7:A). The motif continues to appear on Urnfield and Villanovan art (Figs. 7: B-E, 8-10). Bouzek suggests that a double bird-headed decoration on a Late Helladic III C krater fragment from Tiryns may portray a bird boat, although the painter may not have been aware of what he was depicting (Fig. 11).

Finally, a possible indication of the influence that the beliefs of the newly arrived Sea Peoples mercenaries had on the Egyptians during the Ramesside period is found in the tomb of Ipy where the deceased fowls from a papyrus raft with a bird-head stem decoration (Fig. 12). Bird boat-like craft that appear on two Syro-Palestinian seals of Iron Age date portray a god in a boat (Fig. 13)[7].

Several Late Helladic III C ship depictions have another element that may be related to European cult iconography. The Skyros ship's bird-head device has a vertical projection rising from the back of it's head (Fig. 14)[8]. A similar projection exists on one of the two drawings given by Marinatos for a stem ornament on a ship depiction from Phylakopi, on the island of Melos (Fig. 15: A); in the other depiction the stem ends in a bird-head with a extremely upturned beak identical to the beak of the Skyros ship's stem device (Fig. 15: B)[9]. This "projection" may represent horns on the bird's head or a crest. Horned birds and "animal-birds" are known from later European art (Figs. 16-17); bird heads with crests appear in Villanovan art (Figs. 18-19)[10].

Cyclic development of bird-head devices

The key to understanding the different forms - varying from naturalistic to abstract - in which bird-head devices may be depicted in the Mediterranean itself is to be found on ships portrayed on three Cypriot jugs dating to the seventh century BC (Fig. 20). On the first ship (A), a naturalistically depicted bird-head device, complete with eye, caps the stern and faces inboard. In the second ship (B), the bird's eye has disappeared and the head has become stylized. The final, abstract, phase appears on the third craft (C) where the sternpost has become little more than a complex curve. Even if this progression is due to nothing more than the abstraction of the bird head by the artist(s) who created these three ships, the bird-head devices on these ships show a clear and obvious connection.

To judge from the iconographic evidence this cyclic development of the bird-head devices was repeated constantly on ships in antiquity. Natural depictions gave way to stylized representations. These evolved into totally abstract froms that are little more than a curve[11]. These are repeatedly followed by a "rejuvenating" trend to return to the natural depiction of an actual bird's head.

If only the final, abstract phase of this constantly evolving bird-head form is studied, out of context of the entire cycle, the curved beak of these Mediterranean vessels may - and has been - interpreted as representing a bull's horn or other symbolic figure[12].

Each phase of this cycle blends into the next, and at times, we find two different stages of development on the same ship representation. These bird-head devices may point inboard, outboard, up or down. On the same ship they can appear at both extremities, as on the Sea Peoples' ships, or at only one end. The permutations are nearly endless.

Bird head devices in the Late Bronze Age

Bird-head devices on Mediterranean craft seem at present to have originated in the Aegean. The earliest known example of a bird-head device is on a fragment of a Middle Helladic ship depiction from Aegina (Fig. 21).

Ornaments representing entire birds also appear on the stems of ships, beginning in the 13th century and continuing down into Geometric times. One such device appears on the stem of a Late Helladic III B ship depiction from Enkomi (Fig. 22: A). The device on the stem of the Tragana ship, long thought to be a fish, has been demonstrated by Korrès to be a bird with upturned beak (B)[13]. These birds and bird-head devices clearly represent the same type(s) of water-bird commonly depicted on contemporaneous Mycenaean and Philistine pottery[14].

Homeric "beaked ships" and bird-head devices in the Iron Age

During the Geometric period bird-devices are, on occasion, affixed to the stem and sternposts of warships (Fig. 22: C-D, 31: C). Slightly later, in the Archaic period, birds appear at the bow and stern of a galley (Fig. 23). Devices in the form of bona fide birds are known both from antiquity (for example, the Minoan swallow device), as well as from modern ethnographic parallels (Figs. 24-26)[15].

During the Late Bronze Age the bird/bird-head device was nornally stationed on the stem and faced outboard, as for example the devices on the Gazi, Skyros and Kynos ships and a Late Helladic III C terra-cotta ship model from Tiryns (Figs. 14, 27, 42: A, C-D)[16].

By the 12th century the number, the direction, and the position of the bird-head devices began to vary on ships. At Medinet Habu, they appear for the first time - on a depiction of a seagoing ship - at the stern facing outboard (Fig. 1)[17]. The earliest-known bird-head device facing inboard appears on a Late Cypriot III askos/ship model (Fig. 28)[18].

During the Protogeometric period, the bird's long, up-curving beak becomes the center of attention. The bird's head itself virtually disappears as, for example, on the Fortetsa ships, as well as on a ship painted on a krater from Dirmil, Turkey (Fig. 30)[19]. This continues a propensity to recurve the device's beak, a feature that had already become visible in the 12th century BC. The Fortetsa devices find their closest parallels on a ship depiction from Kynos (Fig. 42: C). In Figure 30:A the devices from the latter are placed on either side of the Fortetsa ship for comparison (see also Figs. 14, 22: B, 42: B, D).

Homer describes his warships as being "beaked" or "crook-beaked"[20]. A similar word is the name of a seabird, perhaps a shearwater[21]. This term describes accurately the stylized/abstract bird-head devices, facing inboard from both the stem and sternposts that were popular in the Geometric period. In these devices emphasis was placed on the bird's beak. The devices on the warship-shaped fire-dogs from Argos are indeed sufficiently naturalistic so that the bird's head and beak may be differentiated (Fig. 31: A). In other Geometric ship representations, the head-beak has become one continuous curve (Fig. 31: B-C). Compare these to the abstract bird-head device capping the stern of the ship in Figure 20: C. The naturalistic, regenerating phase of the bird-head stem device appears on depictions of galleys dated to the last quarter of the 8th century BC (Fig. 32).

The stem device is usually portrayed horizontally and faces backward, toward the stern. A slight angle may differentiate the "head" from the beak (Fig. 33: D). More often, the device appears as one continuous compound curve. At times the stem ornament is shown in outline and filled with a hatched decoration (Figs. 31: B; 33: C)[22]. Earlier this motif appeared on a device from Kynos (Fig. 42: D).

The stem device on one Geometric galley begins in an inward-facing abstract bird-head; but it then recurves, copying the throat and head of a long-necked bird that stands in front of it (Fig. 33: C). This phenomenon is repeated later on an Archaic bronze fibula (Fig. 23).

By the 8th century the water bird-head device had ceased to be solely a Helladic tradition. A Phoenician warship, depicted in a relief from Karatepe, has an inboard-facing bird-head as a stern device (Fig. 34)[23]. Here, the naturally depicted head, complete with eye, is differentiated from the beak by a vertical line. Approximately contemporaneous to this is an early-7th-century Archaic ship whose stern terminates in a naturalistic inboard-facing bird-head device (Fig. 35)[24]. The beak is spoon shaped, as if seen from above.

During the 7th-5th centuries, the bird-head stem device is less common on Greek galleys. When it does appear it faces inboard with the beak positioned vertically (Fig. 36). At times, the beak is recurved over the bow, replicating a bird-head device like that on the Skyros ship placed on its back (Figs. 36: B, 14). The devices vary from smooth (Fig. 36: A-B) to angular (C). In the latter case, the head is differentiated from the beak. This vertical bird-head is rare in later times, although it's appearance on a small 2nd-century-BC craft indicates that the form is latent - but not forgotten (D).

During the 7th and 6th centuries, the stern device on Greek warships also undergoes a metamorphosis. The vertical, abstract bird head is rarely depicted (Fig. 37: B). The bird-head is now more often shown in a naturalistic manner, the eye and beak often differentiated. The heads face inboard and downward, but are shortened and recurve strongly, forming the outline of a volute (Fig. 37: A, C-D). A progression of Archaic bird-head stern devices dating to the 7th and 6th centuries illustrates how the volute may have developed from this particular form of bird-head device (Fig. 38). In other ships of this time, the sternpost bird-head device adopts a more angular shape and points downwards (Fig. 39).

The aphlaston

Appearing first in its developed form in the 5th century BC, the aphlaston became the hallmark of warships in the Classical, Hellenistic and Roman periods. It did not appear suddenly from the void. The *aphlaston* is best understood as a developed form of an abstract bird-head with multiple beaks facing inward from the stern. In the *aphlaston* the bird's eye was enlarged and became the so-called "shield" that normally appears at the base of the *aphlaston* (Fig. 40: B-C). An ethnographic parallel to this phenomenon is seen on a stem device in the form of an abstract frigate bird-head used to the Solima canoes of the Solomon Islands (Fig. 41)[25].

On Geometric galleys several strake ends sometimes project from the curving stem and sternposts (Figs. 22: D, 31: B-C, 33: B)[26]. As this is not due to a technical problem, the planks were evidently left to spring free for a reason. Similarly, in the 6th century, a second, abstract bird-head is sometimes depicted above the naturalistically depicted one [Figs. 37: (A?), C, 38: B-C(D?)]. Both of these phenomena may have led to the introduction of a multiple-beaked bird-head device.

Alternately, the *aphlaston* may have derived from the protuberances jutting from the upper or lower edges of the bird-head devices' beak and head. These items appear first in the 13th century on the Gazi ship (Fig. 42: A). In the 12th century they appear on the ship depictions from Tragana and Kynos (Fig. 42: B-E). In the Enkomi ship the protuberances and found on the inner face of the stem (Fig. 22: A). Horizontal lines, apparently representative of the same items, are painted on the stems of Helladic terra-cotta models ship (Fig. 27-28)[27]. In the seventh century BC, an identical set of lines appears on the lower edge of an inboard-facing bird-head device with a highly recurved, vertical beak (Figs. 20: C, 43).

Due to the limited size of the depictions, the protuberances comprise little more than lines or dots. Thus, the identity of these protuberances remains uncertain. Perhaps they represent rows of tiny bird-head ornaments affixed to the decorative devices surmounting the posts similar to the one nestling in the crook of a stern ornament on a Greek 5th century galley (Fig. 40: A).

Why multiply the bird's beak? This is best understood as a strengthening of the device's prophylactic power. Broodbank, in his study of ships on Cycladic "frying pans", notes that in primitive societies, the doubling of motifs must be read not as a numerical duplication, but as a doubling of the power and attribute of the image[28].

Ethnological parallels of the recent past are useful when trying to understand this phenomenon. Bird-head devices were used on the New Hebrides island of Atchin. The large seagoing canoes have devices at both stem and stern (Fig. 26: A); the smaller coastal canoes carry the device at the stem only (B). These devices appear in two forms, with one head or with a double head. Haddon notes:[29].

> The figurehead *(solub)* is lashed on the fore end of the hull of the smaller canoes. In the ordinary bird figurehead *(solub e res)*, to which anyone has the right without payment, the slit, representing the mouth of the beak, ends at the first bend (Fig. 44: A). A figurehead in which the slit is continued down the neck is called *solub wok-wak* (Figs. 44: B-C) and the right to this has to be bought from someone already possessing one. When a man gets on in years he feels the need of something superior to a plan *solub wok-wak* on his everyday canoe. He then goes to one whose figurehead is decorated with a pig or other figure and after having arranged a price one of the parties to the negotiation will make a copy of it. There is a third type *(solub war)* which resembles the *solub wok-wak* except that the tip of the under beak is reflected over the upper beak, doubtless to represent a deformed boar's tusk, hence its name.

In the *solub wok-wak* the single bird head of the solub e res has evolved into two separate bird heads. The multiplication of the beak enhances the value of the *solub wok-wak*. A similar phenomenon may have taken place in the ancient Mediterranean.

Clearly these bird-head images were not attached to ships because they were considered aesthetically beautiful, but rather for the magical properties with which they were thought to invest the craft[30]. The multiplication of the bird's beak may have been perceived as strengthening the protective magic of the device's deity.

The significance of the bird head

What significance did the ubiquitous bird-head device, in its many forms, have for the ancient mariner? Hornell, in discussing the tutelary deity of Indian ships, describes most clearly the basic need that primitive man felt for a prophylactic presence to guard his craft:[31]

> Among Hindu fishermen and seafaring folk in India and the north of Ceylon numerous instances occur indicative of a belief in the expediency of creating an intimate association between a protective deity and the craft which they use, be it catamaran, canoe or sailing coaster. The strength of this belief varies within wide limits; occasionally it is articulate and definite; more often it is vague and ill-defined, often degenerating to a level where the implications of the old ceremonies are largely or even entirely forgotten. In the last category the boat folk continue to practise some fragmentary feature of the old ritual for no better reason than the belief that by so doing they will ensure good luck for their ventures and voyages, a belief usually linked with a dread of being overlooked by the "evil eye".
>
> Outside of India similar beliefs were probably widespread in ancient times; to-day shadowy vestiges remain here and there, their survival due mainly to a traditional belief, sometimes strong, sometimes weak, in their efficacy to ensure good fortune or to counteract the baleful glance of the mischief minded.

Ethnological parallels suggest that devices mounted at the stem and stern were intended to endow the ship with a life of its own. Bishop, in describing the dragon-boats of south-eastern Asia, notes that the practise of attaching the carved head, and sometimes the tail, of a dragon, to these craft prior to ceremonial races originated in the belief that the devices magically transformed the boats into the creatures they represent[32].

This concept of the ship having a life of its own is illustrated by a ceremony reported by Hornell[33]. The Hindu ships that traded between the Coromandel Coast and the north of Sri Lanka had *oculi* carved on either side of the prow. The final rite prior to the launching of a new ship was termed "the opening of the eye". This was meant to endow the boat with sentient life and constituted it the vehicle of the protective goddess. The goddess would live in, and protect, the ship during sea voyages. The protective entity was thus installed in the craft, her individuality being merged with it. In India the protective deity is nearly always feminine. Hornell writes[34]:

> By this association of the boat with a female deity, the identity and sex of the protectress are merged with those of the boat itself; as we may infer that many other peoples have reasoned and acted similarly, this may explain the fact that ships are generally considered as feminine[35].

Returning now to the Mediterranean water bird-head device, it is worth pondering the identity of the deity which the device represented. It seems likely that it was a female deity[36]. Of particular interest in this connection is a Protovillanovan Type O European bronze razor from Italy, dated ca. the 9th century BC (Fig. 45). The razor, of unknown provenience, is in the abstract form of a female idol. Its head is formed by the handle of the razor; the neck is decorated. A double-axe, serving as a central motif, is decorated by a mirror-image figure with arms formed of bird-boats with inward-facing bird-heads[37]. Additional figures are positioned within the two cavities of the double-axe. These have legs made of bird boats with outboard and downward-facing bird-heads. Four additional water birds nestle at the corners of the figure[38]. In this case the symbolism strongly suggests that the bird-boat is symbolic of a female deity.

Modern manifestations of bird-head and bird-boats

We have followed the development of bird-head devices in the Mediterranean down to the Roman period. Bird-head devices continued to be in use into the latter part of the sixth century AD, when a Nile vessel is described as "wild-goose-sterned"[39]. Presumably, they did not cease at that time, however. Indeed, decorative devices reminiscent of bird heads, and bird boats, are still found today.

In present-day Greece devices capping the sternposts of some fishing boats are sometimes bird-head shaped (Fig. 46: A). On occasion the "beaks" of these ornaments are multiplied in a manner reminiscent of the *aphlaston* (B). Similarly, "bird-boat"-like ornaments have been recorded on modern-day Indian craft, as witnessed by Hornell's drawing of the decorated bow of a Ganges River cargo boat at Benares (Fig. 47). The same design in a degenerated form is recorded on the bow of a *kalla dhoni* recorded at Point Calimere, South India (Fig. 48). The relationship, if any does indeed exist, of these modern decorative motifs to the bird-head devices of antiquity remains to be determined.

Finally, what are we to make of this curious ship, sighted and described by W.J. Childes in this century?[40].

A sight of this kind I watched one summer evening on the coast of the Black Sea, when a long boat, whose bow was shaped like a swan's breast, put off from the shore. Her stern projected above the hull and was curved into a form resembling roughly the head and neck of a bird preparing to strike. Upon the mast, hanging from a horizontal yard, was set a single broad square-sail, and under the arching foot could be seen the black heads of rowers, five or six men on either side, and a bare-legged steersman placed high above them in the stern.

Acknowledgements

I have received valuable advice during various stages of work on this manuscript. My thanks go to Professors George F. Bass, J. Richard Steffy and Fred van Doorninck and Mr. Cemal Pulak for their many constructive comments on the material presented here. I am also grateful to Dr. Fanouria Dakoronia who graciously supplied me with photos of the Kynos ships prior to their publication.

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After Göttlicher 1978: Taf. 9: 149.

29. Bird-head stem of sternpost ornament of a ship model. From Maroni, Tomb 17, Cyprus. Late Helladic IIIA: 2.
After Johnson 1980: pl. LXIII: 132.

30. A. One of two ships depicted on a Protogeometric krater from Fortetsa, Crete. The bird-head devices capping the stem and sternpost are compared to the device on one of the Kynos ships (see Figure 42: C).
B. Ship painted on a Protogeometric krater from Dirmil, Turkey.
A after kirk 1949: 119 fig. 6. B after van Doorninck 1982B: 279 fig. 3.

31. Abstract bird-head ornaments in the form of a compound curve topping the stem and sternposts of representations of Geometric warships. 8th century BC.
A after Göttlicher 1978: Taf. 25: 338-339. B-C after Casson 1971: figs. 72 and 65.

32. Bird-head stem ornament on a Geometric aphract galley. Ca. 725-700 BC.
After Casson 1971: fig. 64.

33.
A. Bird in front of Geometric galley on an Attic krater. Ca. 760-735 BC.
B. Bird behind a Geometric galley on the same krater.
C. Long-necked bird before the bow of a Geometric galley. The ship's stem device copies the shape of the bird's head and neck. Ca. 735-710 BC.
D. Galley with stem and stern decorations in the shape of abstract birds' heads. Ca. 760-735 BC.
A and B after Morrison and Williams 1968: pl. 2: c-d; C and D after Casson 1971: 74 and 62.

34. Bird-head stern device on a ship depicted on an orthostat from Karatepe, Turkey. Ca. 700 BC.
After De Vries and Katzev 1972: 55 fig. 6.

35. Bird-head decoration on an Archaic galley. Ca. 700-650 BC.
After Morrison and Williams 1968: pl. 8: b.

36. A-C. Abstract bird-head stem decorations on Greek warships. A ca. 510 BC; B ca. 520-480 BC; ca. 400-322 BC. The device on ship B is compared to the bird-head device on the stem of the Skyros ship (see Figure 14).
D. Abstract bird-head stem decoration ca. 2nd century BC.
A and C after Morrison and Williams 1968: pls. 20: e, 27: a. B and D after Casson 1971: figs. 84, 176.

37. A. Bird-head stern decorations on Greek warships. Ca 530-480 BC.
B. Stern of an Archaic galley on an ivory plaque from the Temple of Artemis Orthia in Sparta. Ca. 650-600 BC.
C-D. Stern decoration on archaic Attic black-figure (C) volute krater and (D) hydria. Ca. 600-550 BC.
A after Casson 1971: fig. 90. B-D after Morrison and Williams 1968: pls. 10: d, 11: a, d.

38. Sixth-century BC stern decorations on Archaic galleys in the form of a bird's head develop into an inward curving stern volute. A-D ca. 550-530 BC; E-H ca. 530-510 BC; I ca. 510 BC.
After Morrison and Williams 1968: pls. 14: g, 13, 14: b, a; 17: d, c, a, e; 18: d.

39. Sixth-century BC stern bird-head devices on Archaic galleys. Note that in C the device has developed into an inward curving volute. A-B ca. 510 BC; C - D ca. 520-480 BC; E ca. 530-480 BC. F ca. 600-550 BC.
A to E after Morrison and Williams 1968: pls. 18: a, b; 21: b, d; 16: c; F after Casson 1971: fig. 83:

40. *Aphlasta* on Greek and Roman warships. A *ca.* 480-400 BC. B *ca.* 200 BC. *ca.* 2nd century AD. A after Morrison and Williams 1968: pl. 26: a. B-C after Casson

1971: figs. 108, 114.

41. Bow device of a *Solima* canoe in the form of an abstract frigate bird and other motives. Solomon Islands.
After Haddon 1937: 88 fig. 59: b.

42. Bird, or bird-head, devices with numerous projections extending out from the upper or lower surfaces. These projections have no structural purpose.
A. Bird-head on ship painted on the Gazi larnax. Late Minoan III B.
B. Head of bird device on the bow of a warship depicted on a pyxis from Tragana. Late Helladic III C.
C-D. Bird-head stem devices on ship depictions from Kynos. Late Helladic III C.
E. Stem of ship from Kynos. The stem's upper part is missing but the beginning of a curve and the protuberances on the stem's inboard side indicate that it was originally capped by a bird-head. Late Helladic III C.
A after photo by S. Wachsmann. B after Korrés 1989: 200. C-E after photos courtesy F. Dakoronia.

43. A row of protuberances appear on the lower (inboard) part of the beak of a bird-head stem ornament of a 7th-century BC ship depiction on a jug from Cyprus.
After Frost 1963: monochrome pl. 7 (opp. p. 54).

44. A. Single beaked solub e res figurehead.
B. Double bird-head solub wok wak figurehead.
C. Solub wok wak figurehead with a pig.
After Haddon 1937: 28 fig. 16: a-c.

45. Bronze razor in the abstract form of a female idol. The head is formed by the razor's handle; the neck is decorated. Embellishments include a double-axe decoration, water birds and anthropomorphic figures with arms and legs formed from "bird-boats". From Italy, provenance unknown.
After Bouzek 1985: 216 fig. 103: 11.

46. Stern devices on modern Greek boats at Ayia Galini, Crete. Photos taken 1980.
Photos: S. Wachsmann.

47. A. Decorated bow of Ganges River cargo boats, Benares.
B. Detail of inverted bird-boat-like ornament.
After Hornell 1970: 279 fig. 68.

48. A. Bow of a kalla dhoni with an abstract bird-boat-like ornament. Point Calimere, South India.
B. Detail of the ornament.
After Hornell 1970: 272 fig. 67.

NOTES

1. Wachsmann 1981; 1982. See also Wachsmann 1995: 25-33; in press A; in press B.
2. Dakoronia 1990: 122 fig. 2; 1995.
3. Casson (1971: 348 and fig. 147-center) identifies this as a "pennant on a short pole socketed into the top of the stempost". This is not a ship's light in the form of a torch. While ships carried lights in their stern, these were placed in lanterns (Casson 1971: 247-248 ns. 91-92).

4. Wachsmann 1981: 205-206, with additional bibliography listed there.
5. Hencken 1968: 568-570, 627. De Boer (1991) suggests a possible Thracian connection for the Sea Peoples.
6. Bouzek 1985: 178. The Br D may be somewhat higher than previously thought (Bouzek 1994: 217).
7. Culican 1970; Tushingham 1971.
8. Hencken 1968: 537 fig. 486.
9. Marinatos 1933: 173 no. 16 and fn. 1, 218-219. These sherds have been lost.
10. Hencken 1968: 519-531.
11. In Figures 30-31, 33: D, 36: A, C-D and 37: B, which depict ships with abstract bird-head devices, I have included for further clarification, copies of the bird-head device from Figure 20: A to illustrate the direction of the head in each case. Similarly, in figure 30: A copies of the bird-head device on one of the Kynos ships (Fig. 42: C) have been appended at either side and in Figure 36: B a copy of the device on the Skyros ship (Fig. 14) is included.
12. As, for example, does Artzi (1987: 80).
13. Korrés, 1990: 199-200, 202.
14. Furumark, 1941: 253 fig. 30. 255 fig. 31: nos. 36-52; Benson 1961; Dothan 1982: 201-202 figs. 61-63.
15. The festive bird shaped stem decorations portrayed on Late Bronze Age Minoan/Cycladic craft represent a swallow, as is evident from the bowsprit of one of the ships taking part in the festive race at Thera (Basch 1987: 107 figs. 192-193). These were apparently connected to the craft during festivities and were not a normal fixture on the bow. The Helladic ornament, on the other hand, represents a water bird and seems to have been a permanent fixture on the stem and sternposts of Helladic oared galleys.
16. Hencken 1968: 537 fig. 486; Wachsmann 1981: 202-203 figs. 17-18; Kilian 1988: 122-123; Dakoronia 1990: 122 figs. 1-2.
17. For photographs of the ships see Wachsmann 1982: 299-303 figs. 1-5
18. A similar, although earlier (Late Helladic III A:2), bird-head device that originally capped the stem or sternpost of a terra-cotta ship model was found at Maroni in Cyprus; however, it is unclear if this faced inboard or outboard (Fig. 29).
19. Kirk 1949: 118-119 fig. 6; Morrison and Williams 1968: 12 (Geom. 1); Casson 1971: 36, fig. 60; van Doorninck 1982.
20. Il. 18: 338; Od. 19: 182, 193.
21. Liddel and Scott 1953: s.v. ἡ κορώνη. It is possible that this is a deliberate play on the two similar words and that the term implies "having curved extremities that are bird-shaped" (Lenz, in press).
22. Morrison and Williams 1968: pls. 1: e, 2: a, 4: c.
23. Casson 1971: 57-58 fn. 80.
24. Morrison and Williams 1968: 73 (Arch. 2), pl. 8: b.
25. Haddon 1937: 88.
26. Morrison and Williams 1968: pls. 2: a, 4: a, c.
27. Casson 1971: fig. 29; Buchholz and Karageorghis 1973: 470 fig. 1720.
28. Broodbank 1989: 328.
29. Haddon 1937: 28.
30. Svoronos 1914: 127.
31. Hornell 1970: 271.
32. Bishop 1938: 415.
33. Hornell 1970: 272-273.
34. Hornell 1970: 275.
35. Interestingly, when Greek ship names become available in the 4th century BC, with the exception of the Argo, they are feminine in gender (Casson 1971: 346 n. 10, 350-354).

36. Egypt has been suggested as the ultimate source for the European bird and sun-disk design (Hopkins 1955: 78-80; 1957: 334-335). This seems most unlikely.
37. Compare a somewhat similar figure painted on a Daunian dish from Siponto in southeastern Italy of 6th-5th century BC date (Gimbutas 1989: 16 fig. 26: 8).
38. A better preserved, though less decorated, version of this motif is also known (Nefer: 10).
39. Casson 1971: 348: 15.
40. Clarke 1920: 51.

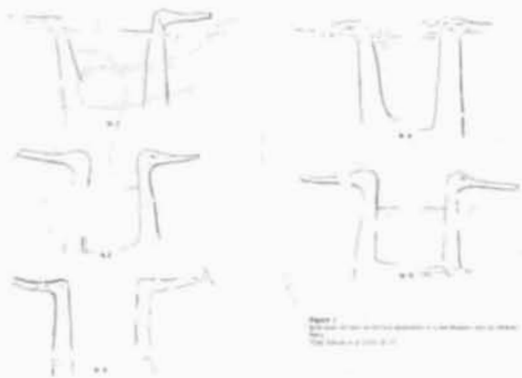


FIG. 1

FIG. 4A

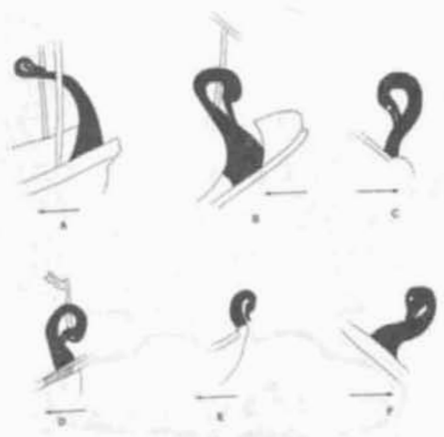


FIG. 2

FIG. 4B

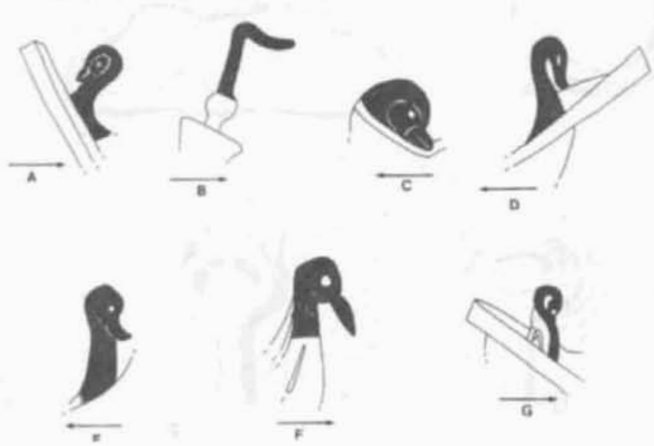


FIG. 3

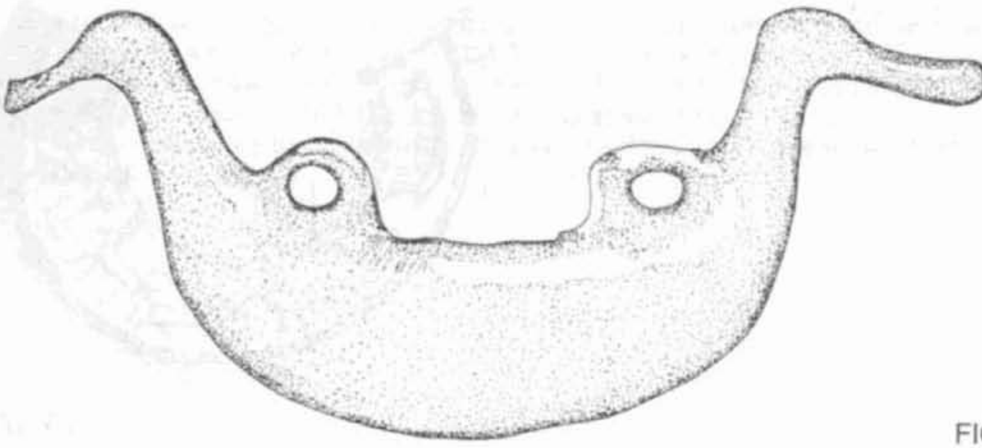


FIG. 5

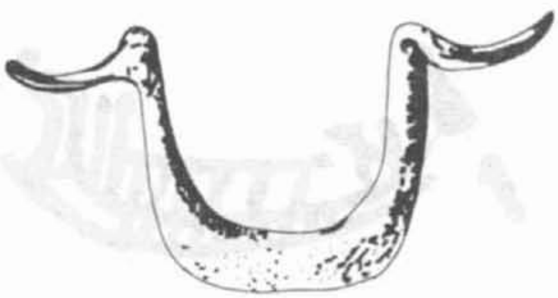


FIG. 6

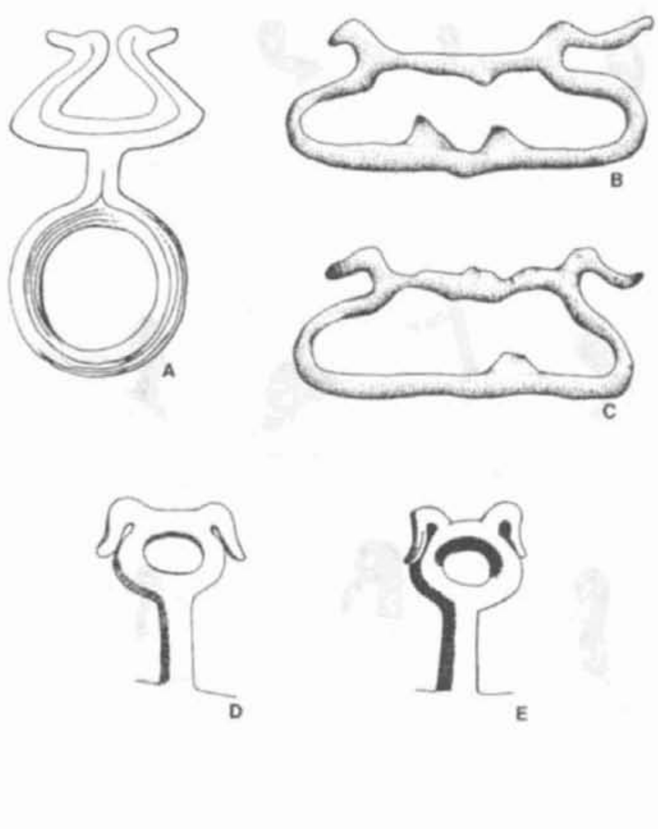


FIG. 7

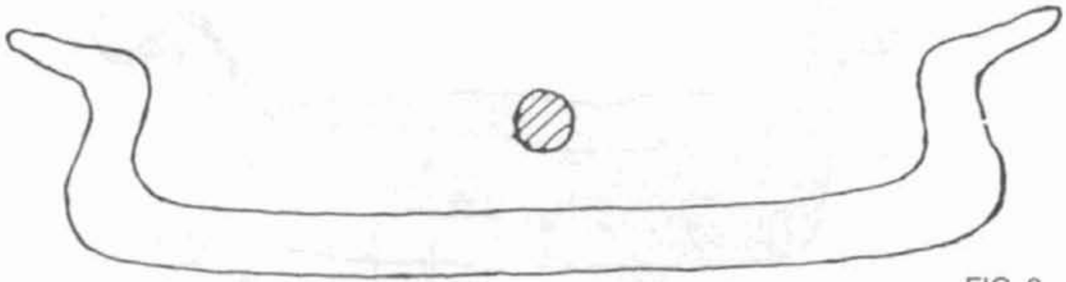
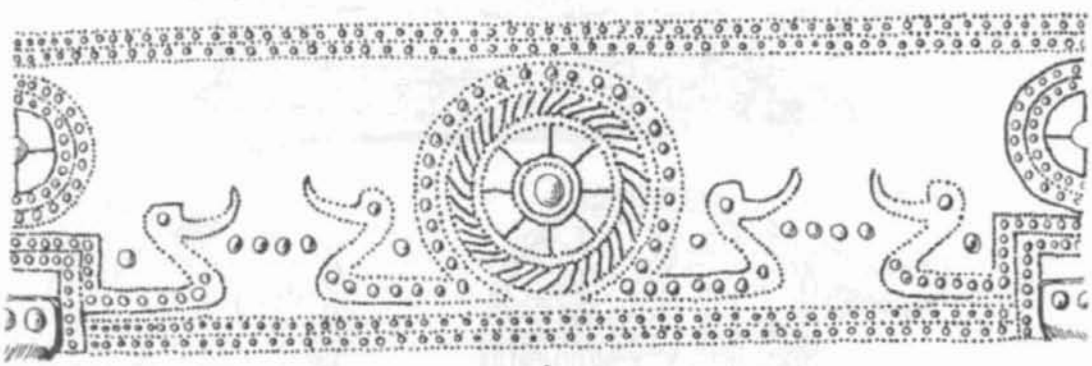
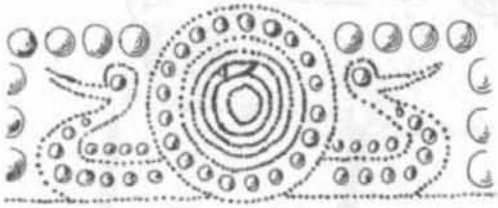


FIG. 8

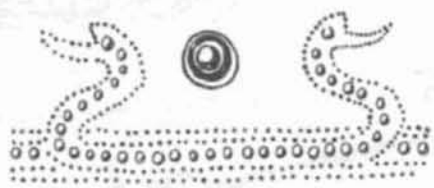
FIG. 9



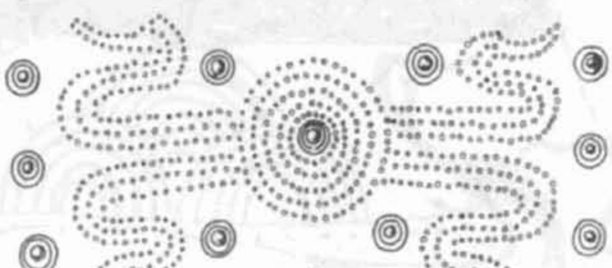
A



B



C



D

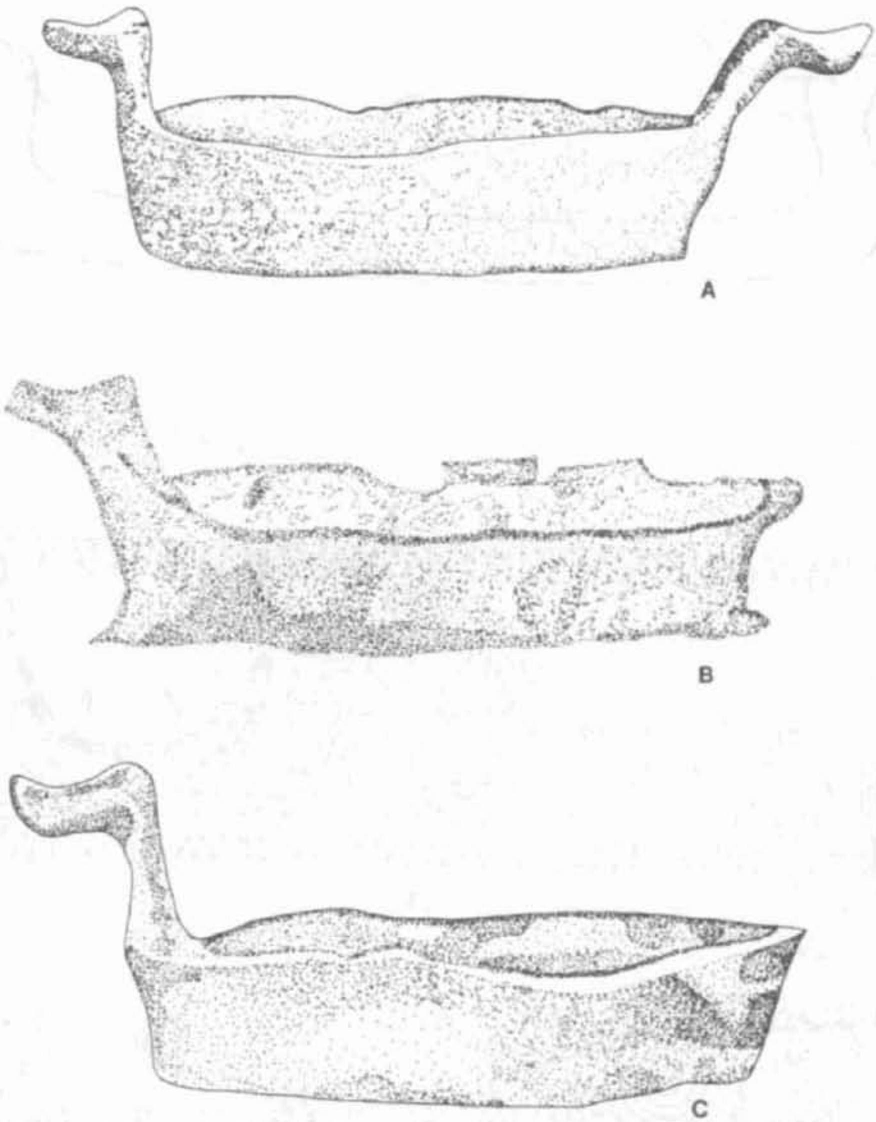


FIG. 10

FIG. 11

FIG. 12

FIG. 13

A B

FIG. 15

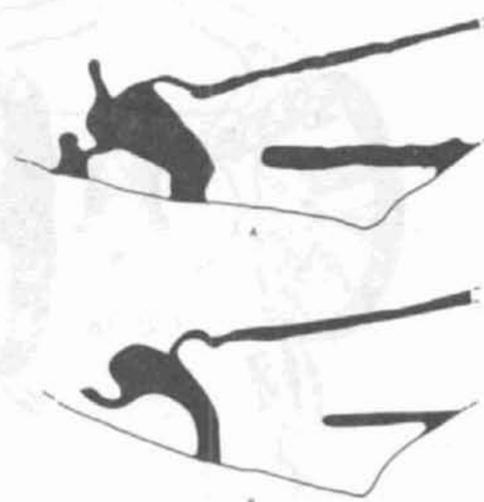


FIG. 14

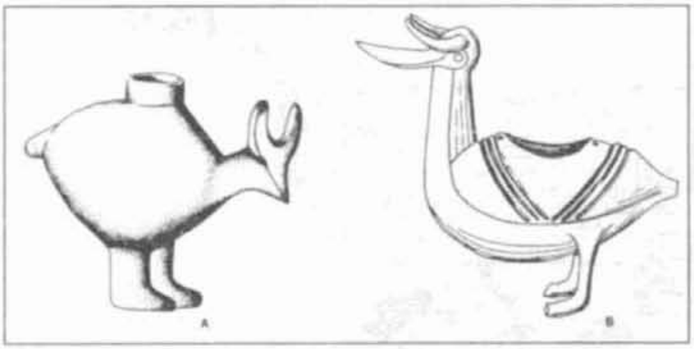


FIG. 16

FIG. 17

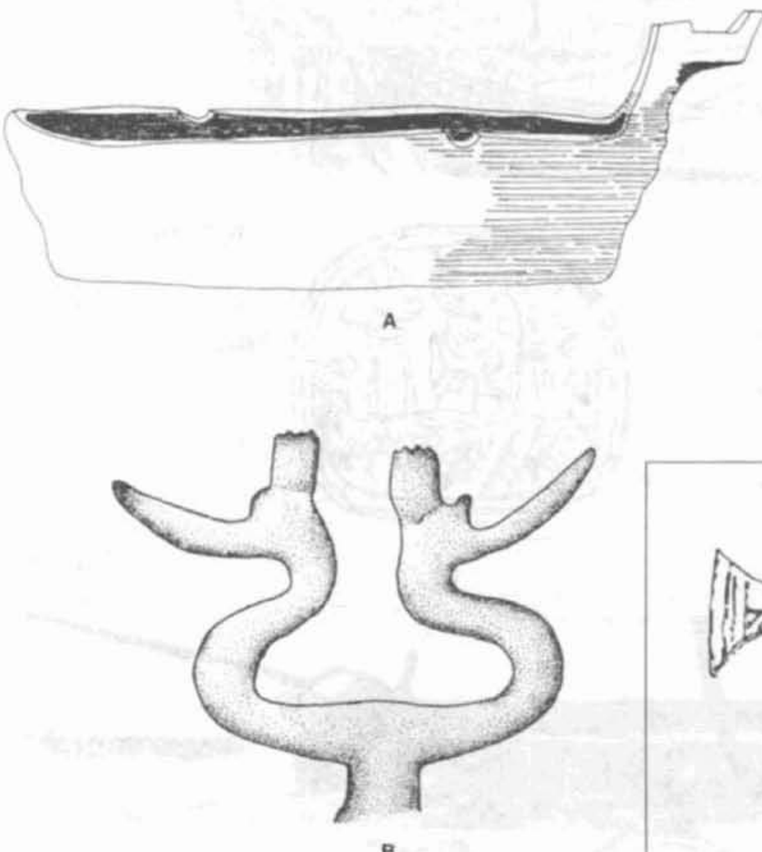


FIG. 18

FIG. 19

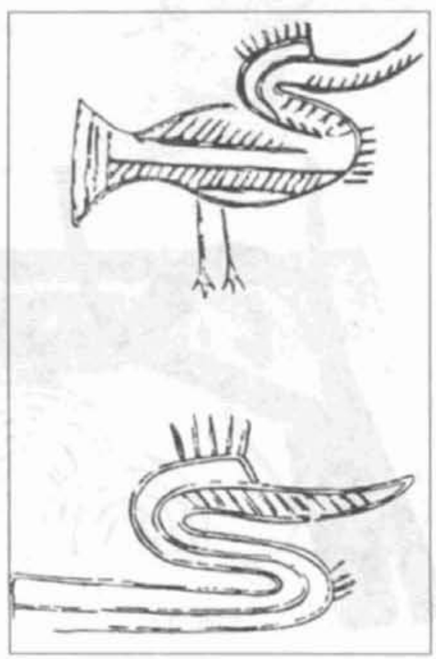


FIG. 20

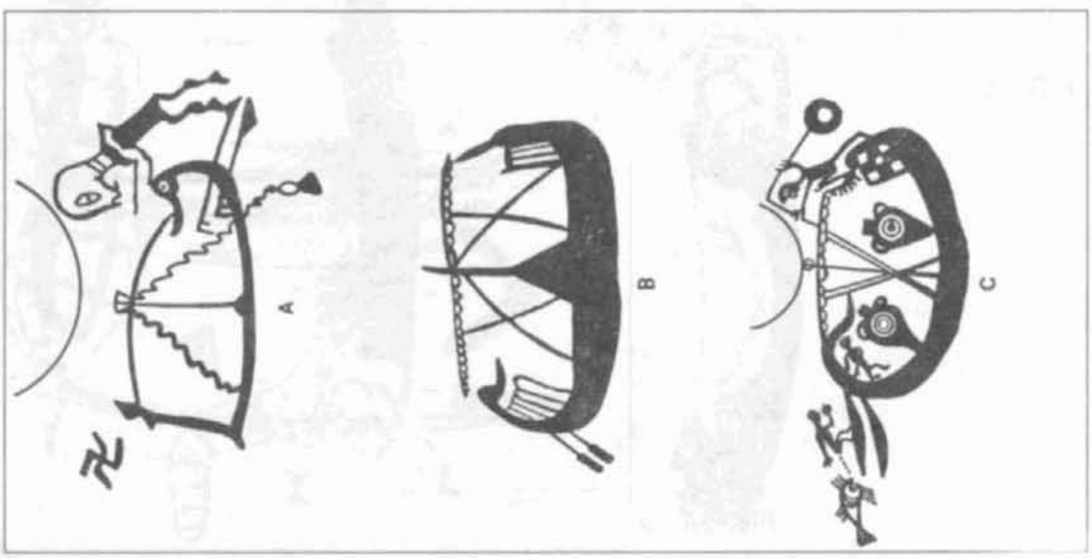


FIG. 21

FIG. 22

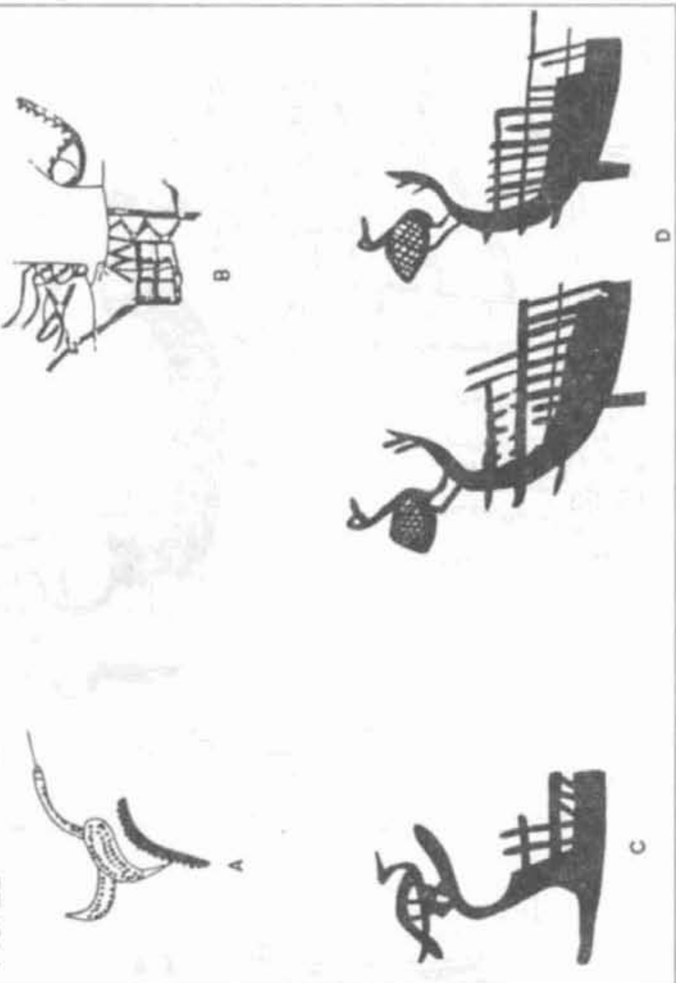


FIG. 23

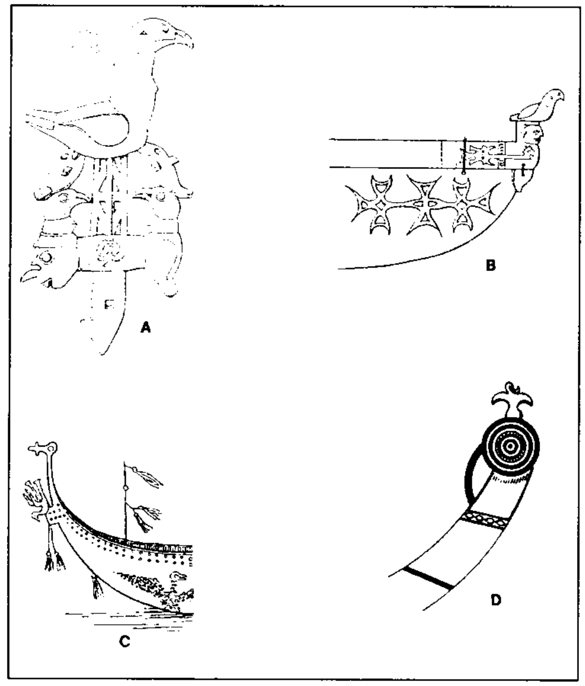


FIG. 24

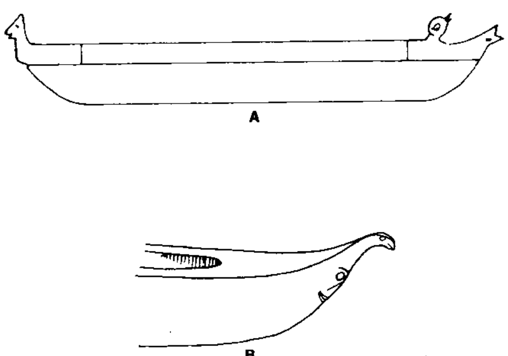


FIG. 25

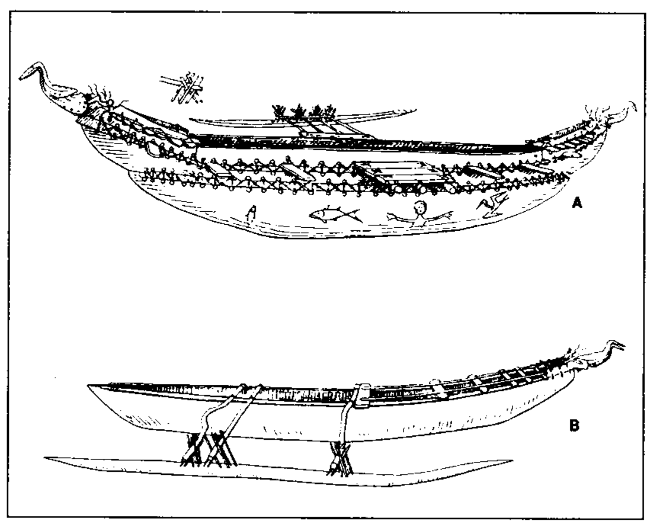


FIG. 26

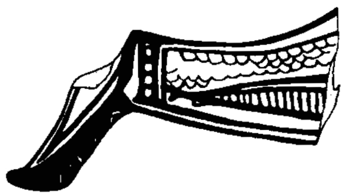


FIG. 29

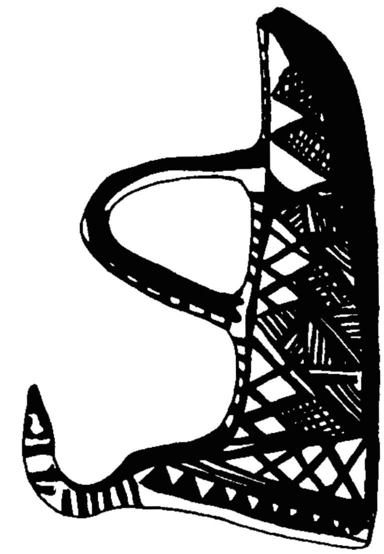


FIG. 28

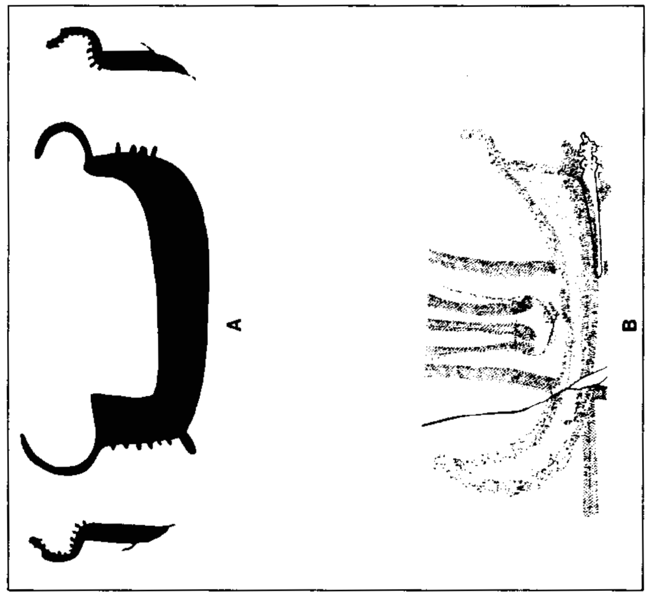


FIG. 30

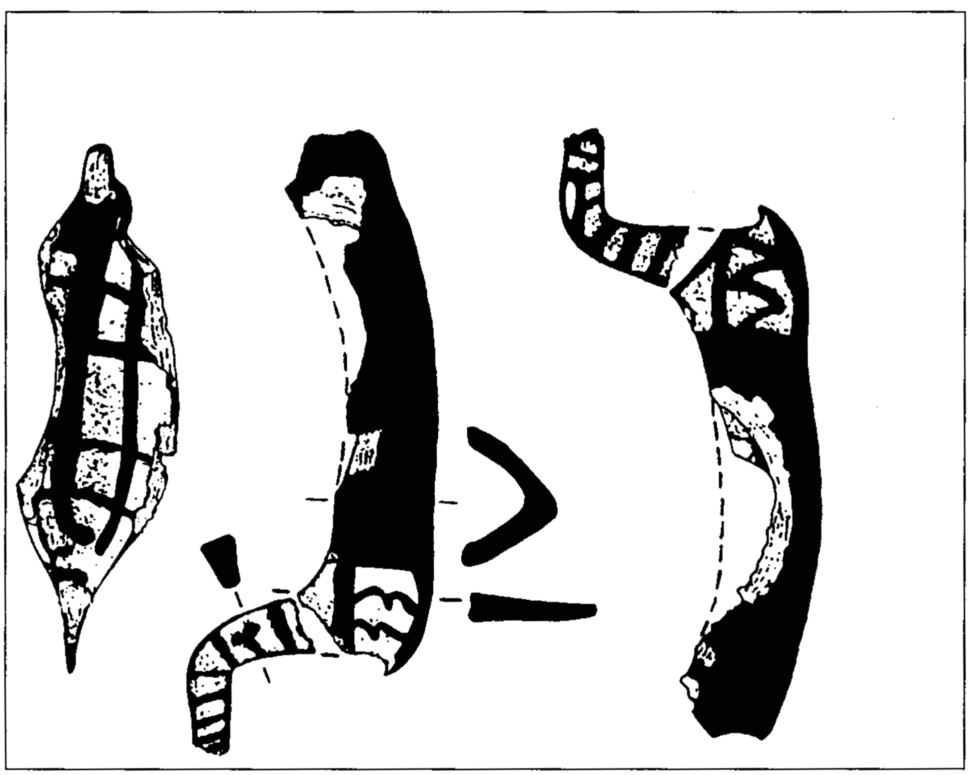
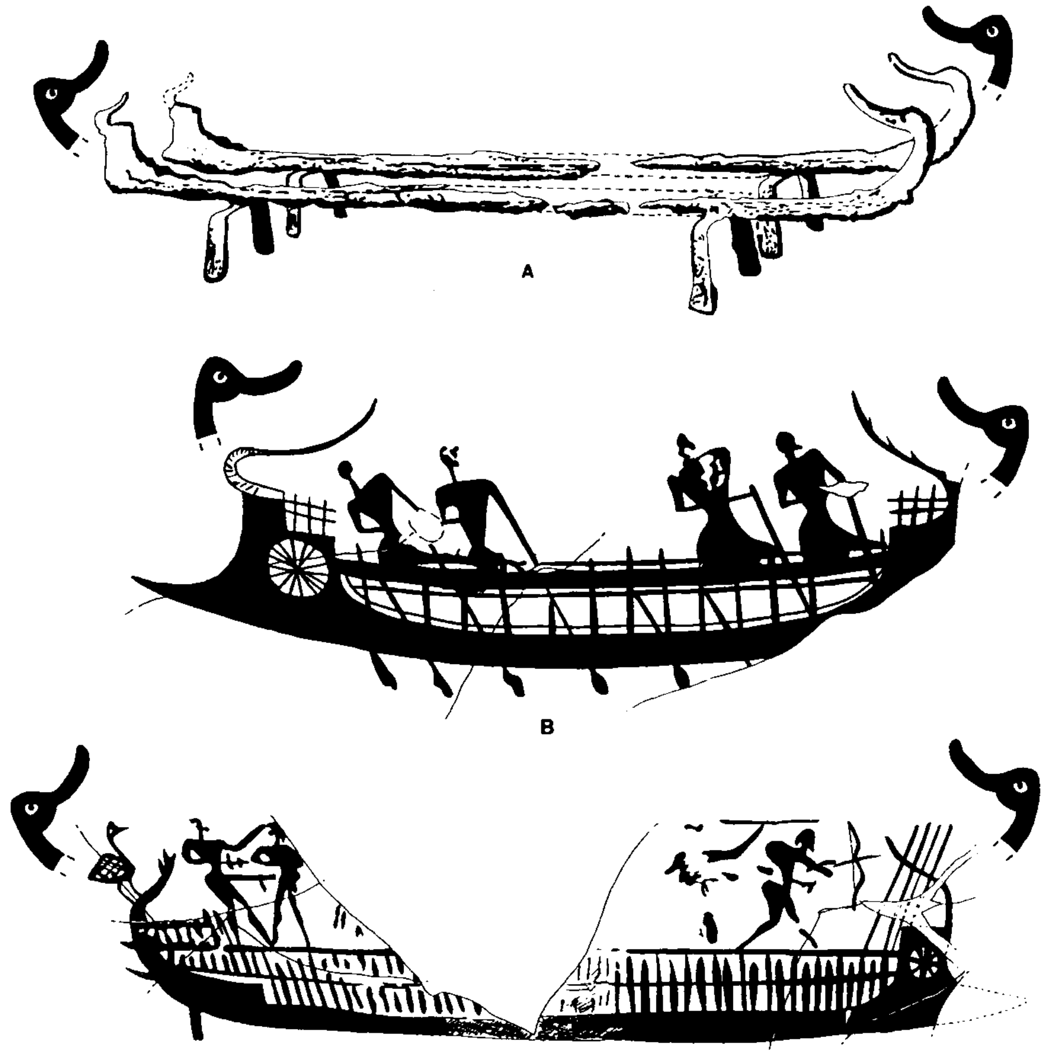


FIG. 27



C

FIG. 31

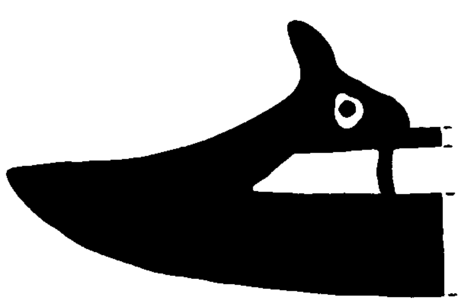


FIG. 32

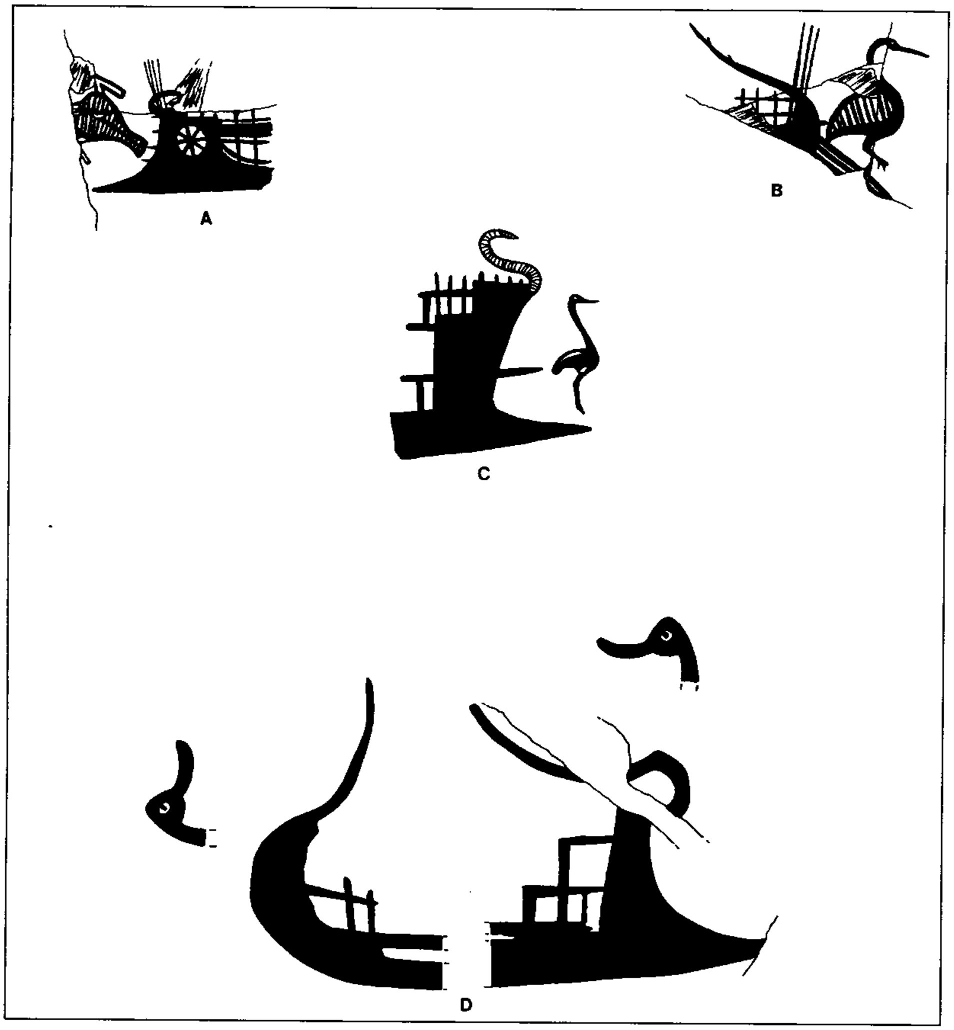


FIG. 33

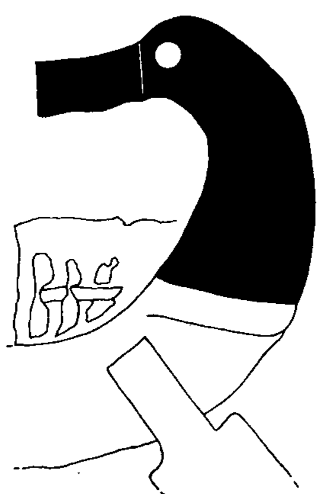


FIG. 34

FIG. 35

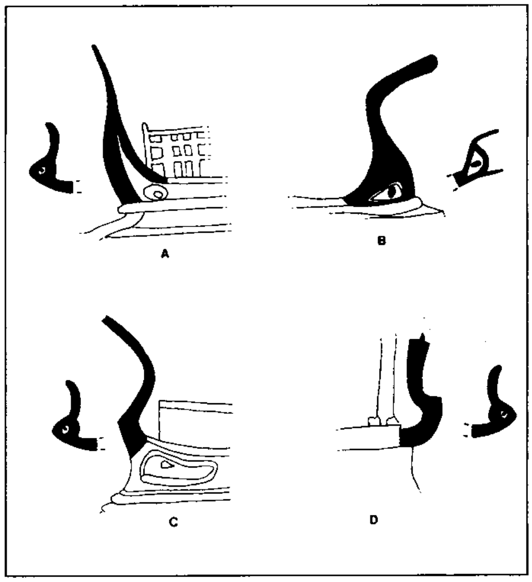


FIG. 36

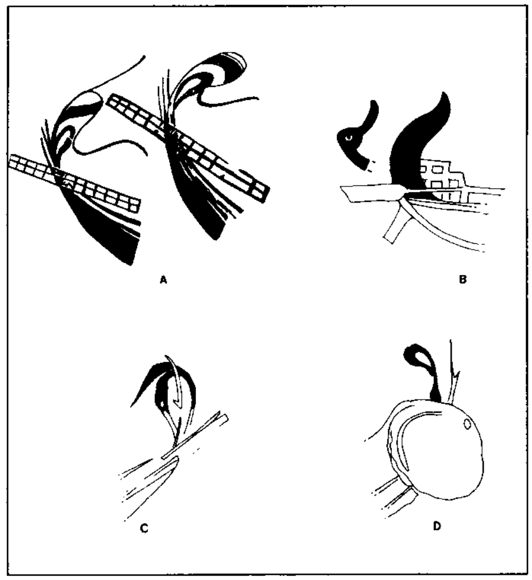


FIG. 37

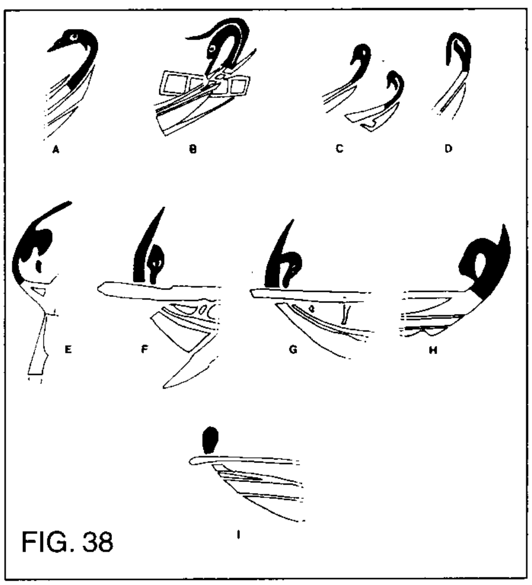


FIG. 38

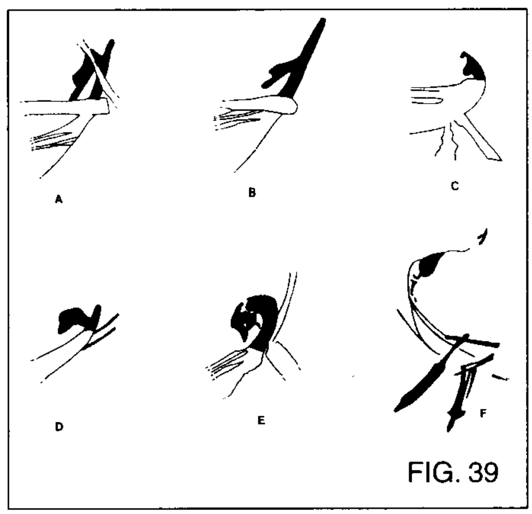
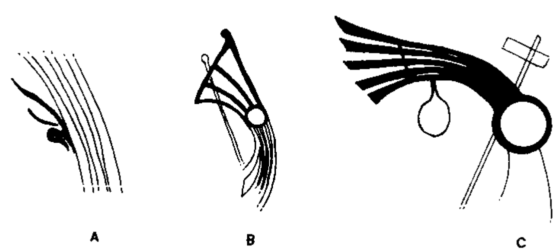


FIG. 39

FIG. 40



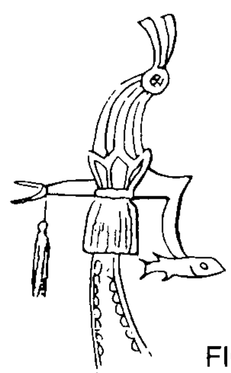


FIG. 41

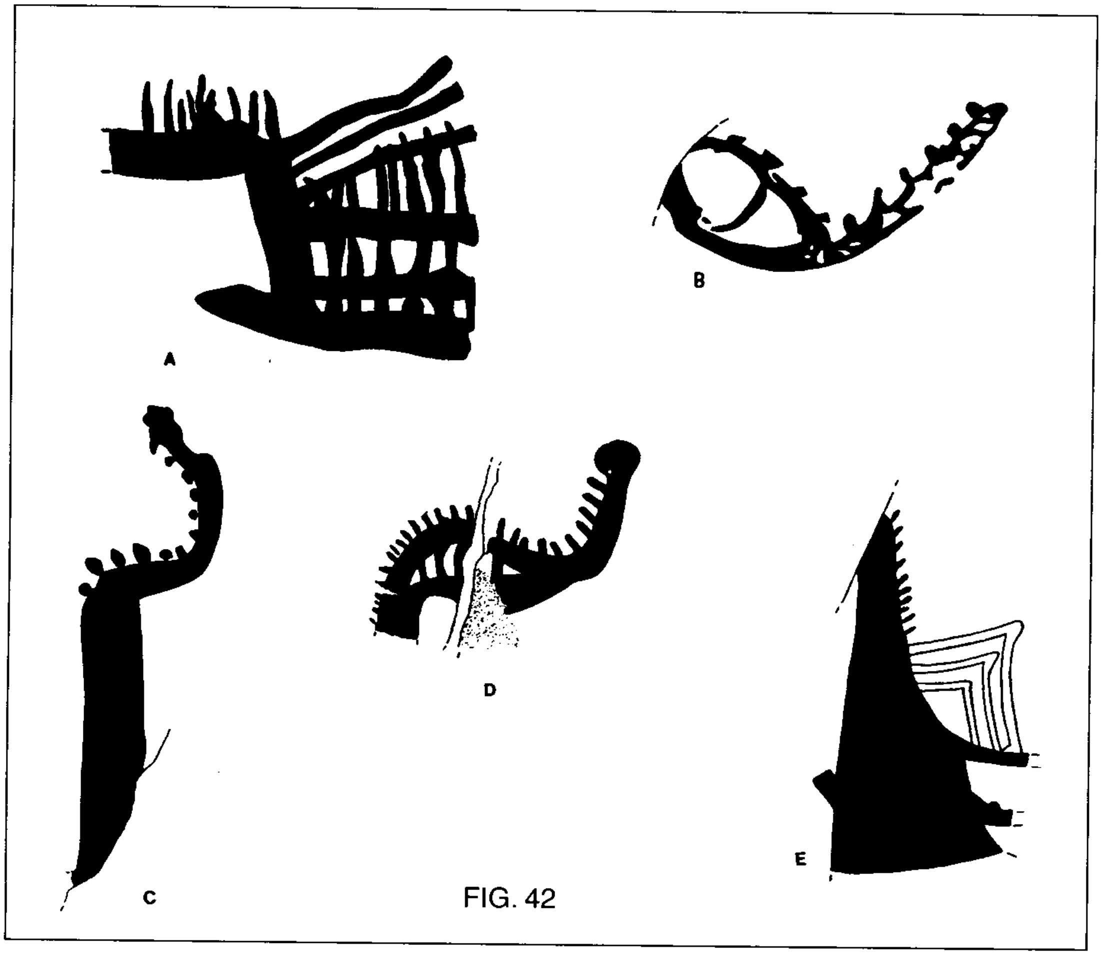


FIG. 42

FIG. 43

FIG. 44

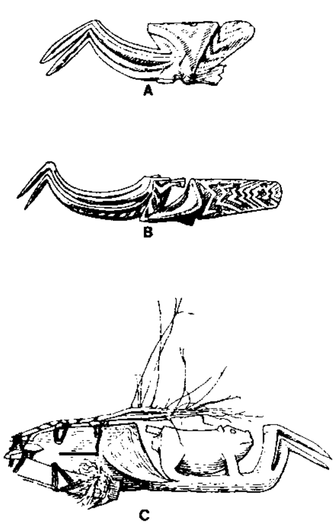


FIG. 45

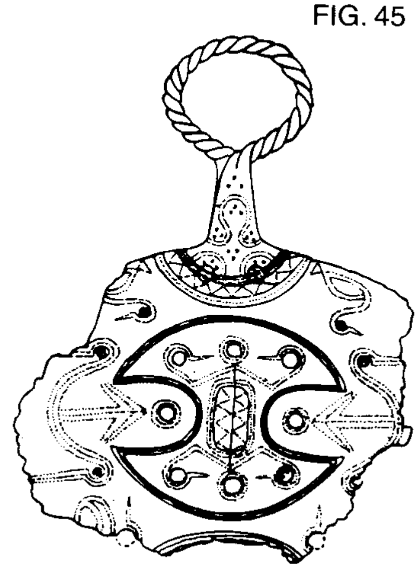


FIG. 46a

FIG. 46b

FIG. 47

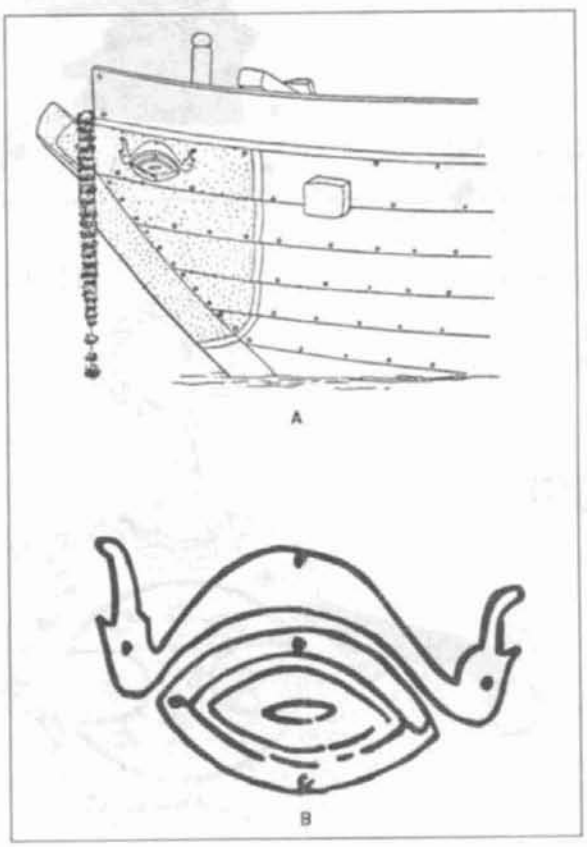
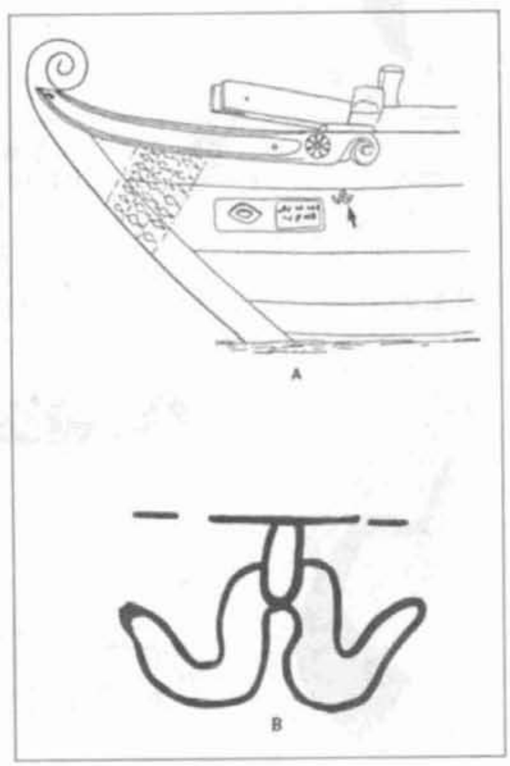


FIG. 48



RETHINKING GREEK GEOMETRIC ART: CONSEQUENCES FOR THE SHIP REPRESENTATIONS *

Introduction

Ship construction in the Geometric period constitutes one of the crucial phases of ancient Aegean naval architecture, both as trustee of the Bronze Age heritage, and as precursor to Archaic and Classical developments. The reconstruction offered by the specialists has been linked since the 1890s to an overall conception of Geometric art which has gone largely unchallenged since its initial formulation[1]. The present paper aims to re-examine this hermeneutical vision, show that it is inadequate when not false, and propose a revised reading with significant consequences for our understanding of Geometric ships and of the subsequent evolution towards the τριήρης[2].

The prevalent view considers it axiomatic that Late Geometric I artists - primarily the Dipylon Master - did not depict scenes in the Minoan-Mycenaean tradition of profile views[3]. On the contrary: the object represented was rendered through a combination of significant aspects, so as to mirror not what could actually be seen, but what the artist knew to be there, although not necessarily visible. Thus a horizontal surface, nominally a line in a profile view, could be raised into a plane view, while elements duplicated on the far side were brought forward to the near side[4].

To illustrate (Fig. 1A): single-axled chariots are rendered with the furtherside wheel brought onto the same plane as the nearside wheel, giving an erroneous impression of being double-axled. The floor of the chariot box is seen in plan, that is, tilted ninety degrees, and the charioteer (and warrior, if present), is perched on its upper edge. The side rail is moved backwards so as not to cut across the legs[5].

In *prothesis* (the mourning of the dead as the corpse lies in state) and *ekphora* scenes (the procession to the grave with the bier on a chariot) the alleged Late Geometric vision of things concentrates on three elements: the corpse, the bier, and the shroud (Fig. 2A). Since the Geometric artist is thought incapable of rendering the human body in a strict profile view, it is argued that it is seen from above. A plan view is also postulated for the bier, which surface rises vertically below the corpse, and for the shroud, which, although in reality spread over the corpse, is depicted raised above it.

This vision of three-dimensional objects is also extended to the pictorial structure[6]. A bird's-eye perspective is employed, placing participants further away from the viewer on a single compressed plane in superposed registers, and providing each file of mourners with its own base line[7].

Finally, the ship is rendered in a remarkably complex manner (Fig. 3): the hull combines two superposed profile views and one plan view. The near side is seen from the outside, the further side from the inside, and the thwarts and central deck connecting the two are seen from above[8].

Thus, the consecrated view suggests that the Geometric vase painter endeavored to depict depth of field within a pictorial vision which ignored the use of perspective. Instead of employing lines united at vanishing points, the main surfaces to have been affected are raised into visibility by use of a plan view. Planes further away from the spectator, instead of appearing smaller, and partly obscured, retain the same scale and are lifted above the main scene[9].

Criticising the traditional view

The generally accepted view of Geometric art, when critically analysed, raises serious problems, not only in regards to the interpretation itself, but also to the handling of archaeological data. The explanation given for Geometric pictorial structure may be compressed into a single statement: things are not what they seem to be. To read Geometric representations successfully it is necessary to turn to the scholar, thus implying that it is not the image itself which holds the key to its understanding, but the scholar[10].

This intrusion of the scholar effaces the borderline between refurbished fact and unsubstantiated fiction: personal predilections permit the scholar to reject conflicting data, redesign uncomfortable images[11], and generally to create readings which, when uncritically accepted by peers, enter the body of scholarly knowledge as factoids[12]. The framing assumption underlying this attitude is that the artist is liable to make mistakes, and that the scholar is capable of recognizing and correcting them. Yet to perceive an artist's error is dependent on there being available a body of data considered correct against which the error is highlighted. The existence of such a body is negated by the manipulative entry of the scholar into the hermeneutic equation. In the case under consideration here, the Geometric pictorial structure, the massive alterations rendered necessary by the traditional reading to attain the object or the scene originally observed by the artist should destroy any illusion of an objective reconstruction.

It is here argued that a reconsideration of Greek Geometric art is an urgent desideratum, and that it must be undertaken within an epistemological framework which explicitly states that the image is correct unless sufficient evidence to the contrary can be generated by the body of examined data itself. To alter a well-known dictum: error is never to be presumed unless proven[13].

Even without the objectional carte blanche which the basic conception of pictorial hermeneutics offers the scholar, the traditional view faces a serious challenge if objectively analysed[14]. The very sherds upon whose testimony the reading was founded presented contradictory evidence which had to be refuted through auxiliary hypotheses (when not merely ignored)[15]. A brief review of the problems created by the current conception of Greek Geometric art follows, divided into four sections based on the major objects/ scenes depicted: chariots, biers, shrouds, pictorial structure of prothesis and ekphora scenes. Each section concludes with an alternative reading which makes no use of scholarly filters by which to distort the material. It accepts the data on face value, and attempts to understand the images on their own terms[16]. Once conclusions can be drawn, the ship representations can then be reinterpreted[17].

The chariot

The accepted view postulates that a chariot is depicted with two wheels, a cross-hatched surface representing the floor of the box, with charioteer and warrior standing on its upper edge, and a loop-like rail at each end. This pictorial configuration appears but rarely. More frequent are chariots exhibiting traits in conflict with this canon, such as chariots depicted with a single wheel (Fig. 1B)[18], legs hidden behind the cross-hatched surface (Fig. 1C), the purported floor reduced to a long narrow rectangle (Fig. 1D).

Chariots with a single wheel are explained as a “formelhafte Abkürzung für einen Zweiradwagen”, a reading thought to be supported by the prevalence of single-axled clay models of chariots[19]. Yet the same scholar accepts the chariot carrying the bier on the krater NM 990 as two-axled[20], although it employs, abstraction made of the removal of the rails so as to accommodate the bier, exactly the same pictorial means as the chariots appearing in the procession in the lower register[21]. This “Abkürzung” is, according to other scholars, caused by insufficient space for the canonical rendition[22]. The single-wheeled chariot can also be treated as a stylistic device, "ein nur dekorativer Wechsel der Räderzahl"[23]. Finally, the second wheel may derive from necessity: the lengthening of the chariot body to carry charioteer and warrior requires an additional wheel to support it[24].

It is clear that a single rigid remplate cannot be imposed upon Geometric art[25]. But it is equally obvious that greater sensitivity is required to understand the image. And greater methodological rigor. The two-wheeled chariot appears in the Late Geometric I period. In Late Geometric II it is exceedingly rare, at a time when the chariots are single-axled, depicted in profile, and directly related to Archaic and Classical chariots[26]. Occasional appearances of single-wheeled chariots in the earlier period[27] suggest forerunners of the single-axled type, rather than exceptions to a purported representational system[28].

It is not possible to definitely refute the traditional view on the basis of the wheels alone. A number of disturbing inconsistencies in regards to the chariot box do greater damage. If the cross-hatched surface represents the floor of the box tilted up into the view of the spectator, a certain consistency could be expected, especially since the consecrated reading postulates such a behavior. The number of exceptions to this "rule" are remarkable (or frightening, for a traditionalist). Particularly significant are the krater-fragments Louvre A547[29]: on one sherd both charioteer and warrior clearly stand behind the screen since their calves are obscured by it (Fig. 1C), whereas on another, the charioteer is treated in a like manner, while the warrior, on a smaller scale, stands on the edge (as the traditional view would demand)[30].

This reduction in size of charioteer and warrior[31] is balanced by a reduction in the height of the cross-hatched surface[32]. The cross-hatching is replaced, due to lack of space, by parallel vertical lines, or, as on Louvre A517[33], is filled in (Fig. 1E). This latter case is particularly interesting since the feet of both charioteer and warrior are behind the screen. A similar occurrence is manifest on the Late Geometric II amphora Folkwang K969[34], which also shows a siderail running across the legs (Fig. 1F).

This phenomenon, so at variance with the traditional view, may find a plausible explanation when the chariot with crew is viewed as a profile image, and placed in its context: muscular legs are a mainstay of Geometric human figures, regardless of their size[35]. Hiding the legs would suggest a diminishing of the man's force, while shrinking his stature to place him on the screen created an unwanted contrast to the warrior's foot: the screen had to yield. The presence of the rail attached to the aft edge of the screen even when the latter has been reduced to nothing (Fig. 1D, 1E) indicates that a screen is at the root of this modification.

It is therefore suggested that it is the sidescreen, not the floor, of the chariot which is depicted by the cross-hatched surface. The removal of one of the pillars upon which the traditional view is founded casts doubt on the other, that concerning the repositioning of the wheel. By reading the evidence on face value, two types of wheeled transport are attested to for the Geometric period, the single-axled chariot also known from epic poetry, and the two-axled wagon, alluded to by poetry and imagery[36].

The bier

The suggestion that the cross-hatched area of the chariot is not the floor tilted ninety degrees into view can be tested against the bier which is constituted by an analogous surface. The treatment of the bier shows no single consistent pattern which would unconditionally support the traditional view. A diminuation of the width of the surface is observed, similar to that affecting the chariot sidescreen, particularly in the work of the Dipylon Master, who as the probable creator of the Late Geometric I pictorial style could be expected to adhere to the purported pictorial principles. This renders it necessary to seek an alternative explanation.

Two parameters determine the appearance of the bier, the width of the horizontal surface, and the number of legs, two or four. The additional legs are nearly always a smaller pair placed inside the main legs, as if in an attempt at perspective drawing. A general reading in terms of the traditional view is rendered inapplicable by instances where the bier is clearly seen in profile[37]. A partial application would be possible for such cases where the surface is wide, were it not for incompatible traits, some of which may be cited here.

The treatment of the legs offer a starting point: the upper end is usually subscircular or triangular, detached from the leg proper by a narrowing, indicating the part to which the frame-members are attached (Fig. 2B). When the horizontal surface remains within this upper part, it is unlikely that it represents more than the frame or the material which forms the bed surface as it is folded around the frame (cf. Fig. 2C). The fact that a second pair of legs appears in cases such as these indicates that the additional legs do not impose a perspective aspect. They should rather be compared to the multiplication of verticals such as horses' legs[38].

Lest the instances of wide surfaces expanding beyond the upper end of the legs be thought conclusive evidence, a number of observations should be considered.

The sherd NM 812[39] from a krater depicts a bier with a wide cross-hatched surface, but the corpse is under a shroud (cf. Fig. 2D for the bier): it may be surmised that the artist has attempted to show the dead in profile without employing the normal formula for the human body, identical whether standing or lying[40].

A second observation notes the behavior of the pattern employed to cover the horizontal surface of the bier. On three occasions it flows out into the space between the two legs at either end of the bier. On Metropolitan 14.130.14 (Fig. 2H) and NM 18062 this appears in an embryonic form[41], whereas on Brussels A1506 the entire area is invaded (Fig. 2E)[42]. Here, the bier is reduced to the containing lines for the cross-hatching. When compared with two neck metopes on amphoras, Cleveland 1927.27.6 and Baltimore 48.2231 (Fig. 2F)[43], it becomes plausible to suggest that the artist is employing the pattern on the bier as a filler[44].

A third, different, line of thought is significant for the rebuttal it offers to the traditional view. Since the discussion of the chariot referred to Archaic and Classical chariots, it is permissible to look forward in time at later bier-like furniture. The Geometric bier is, in fact, a forerunner of the standard κλίνη shown in countless symposion scenes[45]. Frequently, the κλίνη has its frame and the top of the legs obscured by the wide overhang of the blanket upon which lies the symposiast (Fig. 2I)[46]. The edge of the blanket is decorated with tassles, which also appear on a Geometric vase[47]. On one occasion, similar dowel holes are cut at the top of the legs of a Geometric and a Red Figure representation[48]. It is therefore not inconceivable that the supposed flipped-up bier surface is in fact the overhang of the blanket upon which the corpse is occasionally explicitly shown to be lying (Fig. 2G)[49].

The analysis of the bier suggests two possible explanations to the cross-hatched, or otherwise decorated, surface: either a decorative extension of a pattern, or as depicting a concrete object, the blanket under the corpse. The first alternative, although it makes an issue of statistically insignificant but visually blatant images, is of interest when examining the shroud.

The shroud

The Geometric artists treated the shroud in essentially two fashions, either as a large rectangular surface filled with a checkerboard pattern, or as a formless area delimited by a circumscribing line, attached to the bier at each end, and filled with cross-hatching[50]. The first form appears to have been introduced by the Dipylon Master. It covers the entire area between the corpse and the upper edge of the metope. It frequently extends to the left and right into the empty space above the mourners immediately next to the bier. In such cases, the shroud may be held by the mourners (Fig. 2A).

The extensions and the holding by the mourners particularly on the earlier vases, allied with a tendency by the checkerboard to expand into otherwise unoccupied space, suggest an alternative explanation to the traditional view. When composing the prothesis image within the central metope, the artist was faced by the large empty space above the corpse. The Dipylon Master, so it is suggested here, grasped upon a ritual performed during the mourning, the revealing of the corpse by raising the shroud, and employed the pattern woven into the shroud, a checkerboard, as a filler[51].

The extensions left and right depend on the available space[52]. On Metropolitan 14.130.14[53], this space extends downwards to a level just below the top of the bier (Fig. 2H). The checkerboard has, in addition, risen from immediate vicinity of the bier so as to form a large horizontal decorated surface with vertical extensions above an area which includes the bier and corpse, as well as one standing mourner to the right[54]. A more obvious loosening of the bonds attaching the shroud to the bier is exhibited by NM 18062[55]: the checkerboard is no longer associated with the bier. It has become a patterned border at the top of the metope[56]. A similar detachment is observed on NM 990[57], although here it is less manifest since the shroud does not extend beyond the area above the bier.

The comments occasioned by the analysis of the bier and shroud point in the same direction, towards an explanation founded on the pictorial structure of Late Geometric vase paintings. Again it should be noted that the greater hermeneutical force is provided, in the reading offered here, by the exceptions. In absolute terms, this is not unassailable, but these instances serve to point out, by exaggeration or caricature, the intentions invested by the artist in these large uniformly decorated surfaces.

The use of pictorial space

The evidence briefly discussed above militates against the traditional view of Geometric space administered in terms of a "bird's-eye perspective", as being insufficient to explain the processes subjacent to the creation of representations on large Late Geometric vases. An explanation which is in greater accordance with the evidence must be generated from a global view of the image.

The Geometric artist worked in two dimensions[58], on a flat surface, which he endeavored to fill as completely as possible without loss of clarity due to thoughtless cluttering with subsidiary elements. This was attained by translating concrete objects into decorative panels filled with patterns more restful than the profusion of fillers placed between men, women, horses, and chariots. Occasionally the chariot box, but primarily the bier with its overhanging blanket below the corpse, and the shroud, raised above the deceased by the mourners, served this purpose[59]. In the later half of the period, when sexual differentiation of women was achieved through clothing, the skirt came to serve the same purpose[60].

The examination of the chariot and the bier suggests a strict profile approach to physical objects. This is in accordance with the conception of Geometric pictorial space as rigidly two-dimensional, indicated by the use of the shroud as a decorative surface. Depth of field and perspective do not enter into Greek vase painting until much later, and not in a very satisfactory manner: the inherent two-dimensionality of the flat, curving surface of the vase was never dominated in the manner that free painting is thought to have achieved depth and perspective[61].

The illusion of space thought to be present in Geometric vase painting by virtue of the placing of figures on various levels is little more than an illusion of scholars. The seated or standing mourners placed in panels above the main scene are not there to indicate that they are standing on a plane situated deeper into three-dimensional space, but merely to fill the available surface with patterns related to the central image[62]. This approach to pictorial space grew naturally out of the gradual conquest of the vase surface by the decorative system based on metopes[63]. The various elements in the Late Geometric painter's repertoire are part of an overall strategy of decorating previously empty two-dimensional space[64].

The ship

If this re-evaluation of Late Geometric pictorial vase painting is acceptable, the traditional view becomes an erroneous attempt at reconstructing the naval architecture of this time. A strict profile view, as suggested by the chariot and the bier, renders a reading as double-leveled ships inevitable[65]. The thick line above the hull becomes the deck supported by stanchions, as indicated by figures using this line as their baseline (Fig. 3C, 3E)[66]. The figures shown crossing this line indicate that the deck does not cover the entire beam (Fig. 3A, 3B), but should rather be considered as running along the gunwale, leaving a central lane open for rapid movement within the vessel, and for operations involving the mast[67]. A quarterdeck, midway between the level of the lower rowers and the deck can be postulated at the bow and at the stern on the basis of figures shown in an intermediary position[68]. The Late Geometric ship could be rowed from both levels (Fig. 3D, 3F)[69], or from one or the other[70]. Tholepins were provided for the lower level, whereas the upper oars took purchase on the continuation of the stanchions above deck level, providing the necessary stagger between the levels (Fig. 3A-C)[71].

The minority view of Geometric ship architecture[72] depends for its acceptability on decked hulls having been introduced some time before the Late Geometric I period since it is unlikely, given the slow rate of change evidenced by naval construction in the ancient world, that two so portentious stages were attained in rapid succession[73]. Single-level, partially decked vessels are attested to for the Bronze Age, in the Late Minoan I A period by the large ships on the West House miniature wall painting in Akrotiri, which have at least a stern quarterdeck, possibly also a deck at the bow, and in the Late Mycenaean III period by the Pyrgos Livnaton ships, doubtlessly longitudinally decked[74].

The deck is attested for the Middle Geometric II period by virtue of the ships on the Metropolitan 34.11.2 krater (Fig. 4C, warriors on deck not depicted)[75]: every second vertical line rises above the gunwale line to support a slightly raised deck. The height does not appear sufficient to allow the rowers to take cover below it, thus rendering the position of the deck, along the gunwales or down the center, problematic[76]. Insufficient data are available to extrapolate on the developments in hull construction more fully and propose reconstructions, but enough is extant to perceive the major lines: the longitudinal deck appears towards the end of the Late Bronze Age, survives the evidential gap preceding the Middle Geometric phase, where it is once again manifest, and is then further developed in the Late Geometric I period with the addition of a second level of rowers.

A recent find adds a further aspect: the ship on the pyxis from Toumba grave 61[77] is depicted with three parallel horizontal lines above the hull (Fig. 4A). Tholes are painted, but no stanchions. Nonetheless, the general pattern is sufficiently alike than seen on Late Geometric I two-leveled ships to suggest an intimate relationship[78]. Whether the three lines serve to render more than lateral protection for the rowers is uncertain, but a function as part of a deck construction cannot be excluded. The date: Middle Geometric I, in absolute terms 850-825 BC[79].

The Toumba pyxis does not constitute proof for whichever interpretation is preferred by virtue of its status as a chronologically and geographically isolated find, but it does indicate that future discovery may well rewrite conclusions drawn on the currently available database[80].

Conclusions

It is suggested here that the traditional interpretation of Late Geometric pictorial structure is incapable of accounting for the full range of data in a satisfactory manner. Too many conflicting details are left unexplained. Perhaps even more damning, the consecrated reading, if retained, diminishes the worth of the Dipylon Master, long considered one of the foremost personalities in the history of Greek art. The purported tilting of horizontal surfaces appears only in his work and that of his immediate followers: by Late Geometric IIA, vase painters had returned to the conception of pictorial space which had prevailed for centuries before the Master, and which was to dominate Greek vase painting until its demise in the early fourth century BC. The Dipylon Master becomes a freak interlude with no continuation. His sole claim to fame would be his monumentality and the formulaic composition[81].

The proposed alternative view points out flaws in the traditional conception, suggests more appropriate hermemeutical approaches to specific objects depicted, and attemps to place the Late Geometric developments within a coherent overall explanatory framework which takes into account the nature of vase painting. By necessity short, and thereby incomplete, the present paper owes the reader a more fully argued account. Such an undertaking must carefully analyse the genesis of the traditional view, note alterations undertaken by single scholars during its century-long reign as the consecrated explanation of Late Geometric vase painting[82], criticize individual texts, and discuss all the available evidence in detail. Nevertheless, these lines contain sufficient objections to necessitate a profound rethinking of Greek Geometric art.

To conclude with the ships: the present paper does not prove the existence of Greek two-leveled ships as early as circa 750 BC. But if the above analysis is correct, adducing a second level best accounts for the observed pictorial phenomena. The question raised does not yet concern technical prowess or rower arrangements[83]. It concerns the logical structure of the arguments, the use of the evidence, and the resulting presumed artistic vision. These three aspects of the account given by the textbooks are deficient, unacceptable, and inadequate, respectively, in their attempt to explain the pictorial structure of Greek Late Geometric vase painting.

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NOTES

* The present paper represents a fully rewritten text based on an appendix in the author's doctoral dissertation (Wedde 1992), a paper presented at the Archäologisches Seminar der Universität Mannheim, and the oral version read at the symposion in August 1991, as well as further considerations. It replaces the above-mentioned appendix and prepares a major work on the subject, presently being undertaken. A pendant on decks appears in *Tropis V* (cf. n.80). Remarks by Prof. Dr. Wolfgang Schiering, Prof. Dr. Reinhard Stupperich, and the students of the seminar in Mannheim have been helpful. As usual, Mrs. Ethel Wedde and Ms Nina Wedde have read, discussed and criticized the text. The author would also like to thank Mr. Harry E. Tzalas for the opportunity to speak, and for accepting the unforeseen circumstances causing a belated submission of the text with understanding and sympathy, and Prof. Dr. William M. Murray, Prof. Dr. David Samuel, Cmdr Alec F. Tilley, and Mrs. Eve Black for encouragement.

Periodicals are abbreviated as laid out in the *American Journal of Archaeology* 90, 1986, 384-394, and 92, 1988, 629-630, with the exception of:

MM *Mariner's Mirror.*

Further abbreviations used:

BM the British Museum, London.

NM the National Archaeological Museum of Athens.

1. Concerning the ship representations, it appears to have been first formulated by Pernice 1892, 1900. Williams 1949-50:128-129, 1958:122-125, Morrison/Williams 1968:12-17, Gray 1974:86-90, Basch 1987:161-184 argue in favor. General works on Geometric art adhering to the traditional view abound; an enumeration would by necessity be incomplete, and prove nothing unless discussed. It is therefore reserved for the work mentioned above.
2. The ancient Greek word is retained in preference to the latinized "trireme" since a ship type designated "trireme" existed in Roman times, although not necessarily related to the Greek vessel in more than general form and name.
3. The few examples of Bronze Age images not employing the profile view are hermeneutically insignificant (for instance the well seen from a conceptual rather than a perceptual angle on the north wall of the West House at Akrotiri [Morgan 1985:8-9 and 8 fig. 1], and the chariot depicted from above with the wheels flat on the ground on the larnax from Kavrokhori Maleviziou Irakleiou [Rethemiotakis 1979:231 fig. 3]). A closer analysis of this problem will have to be undertaken elsewhere.
4. For good formulations, cf. Morrison/Williams 1968:12-17, Basch 1987: 161-162.
5. Concerning the rail, cf. Wiesner 1968: 68-70.
6. "Pictorial structure" is defined as the system which rules how the various components of the image are organized within the confines of a two-dimensional support. For a discussion, cf. Wedde 1993.
7. Cf. Ahlberg 1971:268-280, esp. 277; with frequent reference to Brunnsåker 1962. For

related statements concerning Minoan art, cf. Walberg 1986: 120, Laffineur 1990: 247, and elsewhere.

8. Cf. Basch 1987:163-164 and 168-170 figs 341, 345, 346 for a reconstruction.
9. As space is lacking for an analysis of the terminology employed for these phenomena, and its history, it is preferable to speak of "the traditional view" or "the consecrated reading" and similar terms.
10. It may be objected that good parallels for these alleged phenomena appear in Egyptian art (for a concise account, cf. Brunner-Traut 1990:7-14, with examples discussed id.: 15-40). A rebuttal favoring an internal Greek development notes the following problems with the comparison: the Dipylon Master and his associates recreate pictorial art in Greece after a period of purely geometric patterns at a time when the evidence for systematic contact with the East either goes back to the Late Bronze Age, or has yet to begin in the so-called "Orientalizing" period. Whether or not a collective memory, refreshed by intermittent direct or indirect contact, reintroduced the Egyptian aspective approach, never known from the Bronze Age in the form the traditional view imposes on Geometric art, is besides the point: the explanation proposed must account for all the data. Aspective art is an insufficient explanation for Geometric art. It should also be noted that the Geometric pictorial style grows naturally out of the basic characteristics of Geometric vase painting in general.

The author has previously militated against the scholar usurping the role of yardstick for the interpretation of archaeological pictorial evidence (cf. Wedde 1992: Chapter One). A fully systematic study constitutes a future work.

11. An example is given by Köster 1923:84-95 who stresses the awkwardness of the Geometric artist, working without the benefit of a standardized pictorial system, and argues that each image must be translated into terms familiar to the scholar. Cf. also the hopefully one day infamous quote by August Jal, cited by Basch 1985:413. Kirk 1949:123-125, on the other hand, exudes reasoned belief in the artist's ability to accurately depict a ship.
12. On factoids, cf. Maier 1985: 32.
13. With apologies to Lucien Basch (cf. Basch 1985:413). Basch states that "*error is always to be presumed unless the contrary is proved*" (his italics). This view has been repeatedly criticized by A.F. Tilley (Tilley 1990:193, 1992:55). "Never" and "always" are, of course, exaggerated formulations.
14. Internal inconsistencies within individual accounts cannot be ignored: thus Brunnsåker 1962:206 accepts a profile view for the chariot and the bier, but prefers a plane view for the shroud and the corpse, in addition to arguing copiously in favor of the bird's-eye conception of space. The traditional view can only survive if it is correct in all its elements.
15. Examples will be given below; they concern mainly the chariots.
16. Only the most eloquent evidence is cited (full references will be given in the work mentioned in the initial note). A number of issues have had to be insufficiently treated or ignored here due to restrictions in length imposed by the format. The illustrations referred to are taken when possible from Ahlberg 1971, from Basch 1987 if ships. When the image is included among the figures appended to this paper, this is noted. It should be mentioned that material will be cited from all four Late Geometric sub-periods, IA, IB, IIA, IIB, with chronological arguments entering only where deemed significant. The Late Geometric period covers barely two generations, and exhibits a substantial overall stylistic unity with many tendencies active through-out the timespan. The fifteen years available for each phase approaches the kind of segments common to Black Figure and Red Figure, developments in Athenian pottery production believed to be more securely dated than any other. Too optimistic an attitude towards the dating process will obscure the tentative

nature of typological and chronological seriation and raise often subjective criteria to the status of scientific procedure. As will be seen below, there is room for caution.

17. The traditional view implicitly or explicitly connects hermeneutically chariots, biers, shrouds, and ships, occasionally also horses, and human figures, rendering the interpretation of the ships dependent on the former. Cf. Williams 1949-50:128, Williams 1958:122, Morrison/Williams 1968:13-14, Basch 1987:162. If alternative readings can be proposed for the other components of Geometric images, the ships cannot alone buttress the traditional view.
18. The following convention is employed: "wheels" refers to the number of wheels that are visible to spectator, whereas "axle" indicates the number of axles regardless of the number of wheels depicted. Thus, the traditional view postulates two-wheeled chariots which have a single axle. The alternative reading considers the number of wheels to indicate the number of axles in a one to one relationship.
19. Wiesner 1968:66, cf. also id.:68, and Hinrichs 1951:55. By referring to the clay models, Wiesner and Hinrichs merely establish that the models are one-axled.
20. Wiesner 1968:67-68. Wiesner considers it bigger and sturdier, as does Greenhalgh 1973:34-35: the identical pictorial means are ignored in favor of a slight difference in size. NM 990 is illustrated by Ahlberg 1971:fig. 54. For a second instance, cf. Universität Bonn 16 (id.: fig.55a, b).
21. Hinrichs 1955: 133, who, however, suspects a more formal equation.
22. Williams 1958: 124, Morrison/Williams 1968:13.
23. Hinrichs 1951:55. Brunnsåker 1962:208n1 also sees a possible formal variation.
24. Brunnsåker 1962:194n6, Greenhalgh 1973:34.
25. As Basch 1987:161-162 correctly notes.
26. The attempt by Greenhalgh 1973:22 to read two wheels into the concentric circles depicting the wheel on Berlin 3203 (Davison 1961:fig.48 a-b) and Philadelphia MS 5464 (id.:fig.49) ignores their manifestedly decorative secondary function, as suggested by the identical shields carried by the soldiers. Greenhalgh 1973:34 also sees two conventions for the representation of horses, one, or two or more. Since a chariot with a central shaft cannot be drawn by one horse, the single horse is a chiffre for two. From this convention he deduces another, namely the representation of both wheels on a single-axled chariot. The horse-convention merely indicates that there was a convention regarding the horses.
27. Nicholson 46.41 (Ahlberg 1971:fig. 14a, c, d; here Fig. 1B) employs identical means for the two chariots, yet the left one (with charioteer and warrior) has a single wheel. If two wheels had been *de rigueur*, the painter could have suppressed some mourners to the left of the bier, as he did to the right so as to accommodate a chariot with two wheels. If the suggestion by Marwitz 1961B:40 that the painter of Metropolitan 34.11.2 (Ahlberg 1971:fig.1) worked from left to right can be extrapolated upon, the painter of Nicholson 46.41 would have begun with the one-wheeled chariot.
28. The existence of two-axled funerary wagons in near-contemporary Hallstatt contexts is interesting (cf. Barth *et al.* 1987), although not a compelling parallel.
29. Ahlberg 1971:fig.13b, top left corner and second register right.
30. Id.:fig.13c. The chariot is two-wheeled. One-wheeled variants with the lower legs obscured appear on "Eretria" no nr (Davison 1961:fig. 101) and Louvre A522 (frieze under the *prothesis* scene; Ahlberg 1971:fig.16a-c).
31. Nicholson 46.41 (id.:fig.14c; here Fig.1B) depicts the passengers stunted in size.
32. Cf. Robertinum 59 (id.:fig.55c), Metropolitan 14.130.14 (id.:fig.25a-e), NM 802 (id.:fig.7d), Louvre A522 (id.:fig.16a-b; here Fig. 1D).
33. Id.:fig.4a-b.
34. Id.:fig.41a, b, e, f. This is one of the rare Late Geometric II two-wheeled chariots referred to above.

35. In Homer, a man's fighting force is characterized by breath in his chest and strength in his knees (cf., for instance, *Ilias* 9.610, 10.90). On knees, cf. Onians 1951:174-186.
36. The argument in favor of the two-axled wagon is less well documented than the existence of single-axled chariots. Some further notes may be helpful. The two-axled vehicle is known in four instances from the Bronze Age: a clay model from Palaikastro (Wiesner 1968:31 fig. 3b), a Linear A sign from Tylissos (id.: 39 fig.6b), a stele from fragment the Shaft Graves in Mycenae (Crouwel 1981:pl.39), and a larnax from Ierapetra-Episkopi (id.:pl.33). In *Ilias* Book 24 Priamos brings Hektor's corpse back to Troy, in *Odyssey* Book 6 Nausikaa takes the washing to the sea in a two-axled wagon. It is also interesting to note that in Europe the Hallstatt wagon is completely replaced by the LaTène chariot in funerary contexts - the same development as is reflected by the Late Geometric I and II vase painting. Two-axled wagons are rare in post-Geometric times, the Vari clay model being a notable exception (Karouzou 1984:135).
37. As on the sherds NM 4310 (Ahlberg 1971:fig. 19), or the amphora Ny Carlsberg Glyptothek 2680 (id.:fig.29c).
38. Horses harnessed to a chariot are represented by a body common to all, separate neck and heads, and a forest of legs below. With four horses, cf. Folkwang 969 (id.:fig.41e-f); with three, cf. Odos Peiraios (id.:fig.8), Nicholson 46.41 (id.:fig.14c), Louvre A541 (id.:fig. 15b) etc. Kyrieleis 1969: 108 notes that the κλίνη is depicted with four legs because it has four, not by virtue of an attempt at perspective.
39. Ahlberg 1971: fig.18.
40. Cf. *prothesis* scenes in general and fighting scenes with fallen warriors. The manner of treating the human body could be considered proof for a reconstructed image on line with the traditional view: legs, buttocks, arms and head in profile, chest *en face*. Not so: it is here considered that the artists were obliged to present the chest in a different aspect by the nature of the human body when depicted by simple means. It should be noted that Greek art before and after the Geometric period employs the same convention.
41. Id.:figs 25f and 24b respectively.
42. Id.:fig. 21b.
43. Id.:figs 36c and 37c respectively.
44. The krater Metropolitan 34.11.2 (id.:fig. 1e) indicates that this is not exclusively a late phenomenon: on this Middle Geometric II vase (on the date, cf. n.75), the space between the leg-pairs is filled with cross-hatching.
45. The word κλίνη designates both a bed or couch for the living and a bier or stretcher for the dead.
46. Particularly well-known, and early, examples are the Eurytos - and the Tydeus-kraters (Arias/Hirmer/Shefton 1962:pls 32, IX; XII, 33).
47. Cf. Folkwang K969 (Ahlberg 1971:fig. 41c): cf. Froning 1982:67.
48. Compare Metropolitan 14.130.15 (Ahlberg 1971:fig.22c) and the Red Figure kylix Louvre G467, conveniently united by Richter 1966: figs 330-331. A search for further parallels will follow in the detailed study under preparation.
49. Cf. Firenze, Museo Archeologico 86.415.85 (Ahlberg 1971:27a), Ny Carlsberg Glyptotek 2680 (id.:fig. 29c) Benaki 7675 (id.:fig. 46b), Louvre CA 3283 (id.:fig. 47b), possibly also Vlastos Coll. (id. fig. 44). Cf. also Kyrieleis 1969:107-108.
50. As this latter type is less relevant to the discussion to follow, it may be relegated to the notes. The best example is Berlin 1963. 13 (Ahlberg 1971: fig. 31a). The surface may be reduced to a loop over the corpse as on BM 1912.5. 22.1 (id.:fig. 45a, c-d). This amorphous area, rather the antithesis of the strictly ordered pictorial structure preferred by the earlier painters, can also carry a checkerboard, thus tying it to the Dipylon mode, cf. NM 18474 (id.:fig.34) and Cleveland (id.:fig.36c).
51. This reconstruction of a moment in the rites concerned with mourning is purely

hypothetical. It does not imply that Geometric art captures specific moments. An alternative explanation would see the hands touching the shroud as subsequent to the area having been filled by the checkerboard. When Hinrichs 1955:132 speaks of "das Zurschaustellen des Lakens" she errs: it is the corpse which is revealed. On the meaning of the checkerboard pattern, cf. Marwitz 1961A, Lambrinoudakis 1975.

52. Contrast NM 804 (Ahlberg 1971: fig.2b) and NM 802 (id.:fig.7b). Cf. also Sèvres (id.:fig.3c), Louvre A517 (id.:fig.4a, c), Odos Peiraios (id.:fig.8b), Louvre A541 (id.:fig.15b), etc. This would suggest that Hinrichs 1951:35 is incorrect in explaining the extensions as the overhang on the short sides. Note, however, a similar reading by Kyrieleis 1969: 114-115.
53. Ahlberg 1971: fig.25f.
54. Cf. Agora P4990 (id.:313textfig.2).
55. Id.:fig.24b. Cf. Brussels A1506 (id.:fig.21b), on which a rectangle on the left filled with a rhombus pattern appears to fill the same function. There are some scant remains of a second rectangle to the right.
56. Marwitz 1961A:11-12 is tentative on this point: "wo das Tuch sich über die ganze Breite der Schulterzone erstreckt, so dass es fast wie ein Ornamentstreifen wirkt".
57. Ahlberg 1971:fig.54a.
58. Cf. Brunnsåker 1962:203.
59. On NM 990 (Ahlberg 1971:fig.54), there is an alternation of crosshatched (chariot box, bier) and checkered (platform for the bier placed on the chariot, shroud) surfaces rising like a stabilizing pillar through the middle of the metope.
60. As, for example, on Baltimore 48.2231 (id.:fig.37c). Surfaces filled with patterns also appear on Louvre CA 1940 (Rombos 1988:pl.50a), BM 1916.1-8.2 (id.:pl.50b), and the sherd K83 in the British School at Athens (id.:pl.48a).
61. The raising of figures onto a higher level in the pictorial space appears to have been pioneered by Polygnotos, and is reflected in the Red Figure krater by the Niobid Painter (Arias/Hirmer/Shefton 1962:pls 173-175). When objects are depicted in perspective on vases, the lines to not converge on a single point, as illustrated by Richter 1987:324 fig. 438. Wall paintings, as evidenced by Roman copies, exhibit proof of a better understanding of perspective.
62. Brunnsåker 1962:208 argues otherwise but is inconclusive concerning the ships, accepting both two-leveled hulls and raised farside rowers. Brunnsaker's basic argument (id.:209-210) is that the picture is a translation from reality, yet he recognizes that real space is not represented, only a created, fragmentary space. Thus he shows an obsessional preoccupation with "real space", although he considers the Geometric figure style as "abstract to an exceptional degree in Greek art" (id.:189). Some of his comments (examples on id.:210-213) are irrelevant to the question of the Geometric artist's treatment of space. The borders of the metope, within which figures and objects are arranged, define the Geometric pictorial space, not an actual depicted space. There ensues a distinct overevaluation of three-dimensional space as practiced in perspective art (cf. also Brunnsåker on the Pithekoussai krater, id.:216-220). Similar fits of rationality are evident in Kirk 1949:125 regarding the oars and their relationship to the keelline/waterline, in Williams 1949-50:129 on the oars having to be depicted as reaching the water below the hull if an upper level is to be accepted, and in Williams 1958:123-124 concerning the absence of stanchions to support a deck.
63. Cf. Kraiker 1954, Hurwit 1977:17-22.
64. The loss of textile evidence, as well as representations on wood, as carriers of images otherwise unknown from the pottery and the metalwork should not be underestimated, but remains an unknown.
65. Numerous scholars would disagree: their accounts must be reserved for later discussion in a larger format. Among more recent studies, cf. Kirk 1949, Williams 1949-50, 1958,

Morrison/Williams 1968, Basch 1987 etc. The issue is connected with that concerning the invention of the and τριήρης is therefore avoided here.

66. Cf. NM no nr. (Basch 1987:167 fig.337; here fig.3C), Louvre A530 (id.:172 fig.356; here Fig.3E); cf. also the man on the right edge of Louvre A528 (id.:166 fig.336). The stanchions are often omitted for clarity: cf. id.: 172-173 figs 354-359 (here Figs 3D-F).
67. Louvre A534 (id.:166 fig.333; here fig. 3B), A527 (idem figs 334-335; for the latter, here Fig.3A). The longitudinal position of the deck suggested here is hypothetical, and in need of a thorough analysis.
68. On Louvre A528 (id.:166 fig.336) a man is shown standing at half height in the bow, either on a small deck or on a step halfway between the thwarts and the deck, which runs out into the forecastle, as indicated by the enemy warrior with the arrow through this throat. The helmsman is either standing on the level of the thwarts, as on Louvre A540 (id.:171 fig.350) and NM no nr. (idem fig. 352), or on a small quarterdeck below the main deck, as on Louvre A530, (id.:172 fig. 355; here Fig.3F) and Brussels no nr. (id.:173 fig. 357).
69. Louvre A532 (id.:172 fig.354; here Fig.3D).
70. Upper: NM no nr. (id.:166 fig. 338), Louvre A517 (id.:172 fig. 353). Lower: Louvre A530 (id.:172 fig.355; here Fig.3F), Brussels no nr. (id.:173 fig. 357), Athens no nr. (id.:173 fig.358), Louvre A532 (id.:173 fig.359).
71. Tholepins: cf. the material united at id.:166-167 (cf. Figs. 3A-C). The rowers on Louvre A517 (id.: 172 fig.353) are not shown using the stanchions as tholepins, but this appears to be the case with the single extant rower on NM no nr. (id.:166 fig.338).
72. The present author is by no means the first to propose a two-level reading: cf. Casson 1971:49-60, 71-76, who, however, does not attempt to argue against the foundations of the traditional view. The interpretation as a deck prevailed in the earliest literature, cf. Cartault 1882-84:48, Assmann 1889:1596, Torr 1894:18-19, and was maintained by Köster 1923:87, and Kirk 1949:127-130 (although in his catalogue, Kirk occasionally adopts the reading as the far side of the hull [cf. his nrs. 28, 35a, 40], not always in a systematic manner. Note also that he rejects five "apparent biremes", [nrs 28, 29, 31, 32, 40] as products of "overambition and a faulty perspective-technique" [id.:129] and "artist's error" [id.:130]).
73. *A terminus post quem non* of c. 700 BC is provided by the sherds NM 265 (Basch 1987:182 fig.384) and NM 266 (id.:183 fig.385; here Fig. 4G) from the Akropolis which allow no doubt as to depicting two-leveled ships.
74. The Akrotiri ships: Marinatos 1974: col.pl.9 (cf. Wedde 1992: Section 4.6). The Pyrgos Livanaton ships: Dakoronia 1987.
75. Basch 1987:178 fig. 374. On this vase, cf. Marwitz 1961B. Marwitz (id.:47) dates the vase to the Late Geometric II period, and is followed by Morrison/Williams 1968:30 and Basch. Davison 1961:130 places it, with reservations, before the Dipylon group. Coldstream 1968:23, 26, 349 correctly dates it to Middle Geometric II. Schweitzer 1969:39 places the vase after the skyphos Eleusis 741 and just before NM 804 by the Dipylon Master, to which he assigns a date of circa 770 BC. Cf. also the initial publication and the first half of the eighth century dating by Richter 1934:169.
76. Kirk 1949:97, Casson 1971:52 consider the ship on the skyphos Eleusis 741 (Fig.4B) to be decked. If correct, this could suggest that a further two vessels are likewise decked, on a cup (Basch 1987:176 fig. 368) and on a hydria (idem fig.369). The date proposed by Young 1939:77-79 (late eighth-early seventh), Morrison/Williams 1968:32-33 Geom.26, 27 and 28, and Basch 1987:176-177 (Late Geometric II) is too low. Cf. also Brunnsåker 1962:189n2. Kahane 1940:473, 481-482 dates them to his Streng Geometrisch, in absolute terms circa 850-800, Kirk 1949:96-97 to the end of Strict Geometric, Coldstream 1968:22 to Transitional Middle Geometric II/Late Geometric I, circa 760 BC. Davison 1961:106-107 follows Young, but also suggests (id.:130) a date shortly before the Dipylon group. Himmelmann-Wildschütz 1962:79 argues for the earlier date.

77. Kalligas 1987:83 fig.1; cf. Popham 1987:354 fig.1, 356-357 figs 3-4, Catling 1986-87:14 fig.18.
78. The spherical pyxis is a local Euboean product (Kalligas 1987:77, Popham 1987:356): the possibility that a different pictorial language to that employed in Athens is at work should not be excluded.
79. Kalligas 1987:77, Popham 1987:355.
80. A more detailed study of the evidence for decked ships in pre-Classical times is proceeding slowly. It will include a discussion of the criteria deemed essential for recognizing decks in profile renditions of ships. The overview of the Geometric evidence presented here is by necessity brief.
81. Middle Geometric pottery reintroduces the human figure, and presents the first major compositions. The formulaic composition appears already in the Bronze Age through the use of specific components in areas reserved for them (although formally they are less rigid than the Late Geometric pictorial vocabulary); cf. Wedde 1993.
82. Kyrieleis 1969:106-115 notes discrepancies in the traditional view concerning the κλίνη and the shroud, but does not attempt to go as far as the present paper.
83. This issue necessitates a careful look at the development from πεντηκόντορος to διήρης to τριήρης, as well as alternative systems (a rudimentary attempt is made in Wedde 1992: Chapter Five).

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ILLUSTRATIONS

1. Late Geometric chariots
A NM 990 (drawing by author from Ahlberg 1971:fig.54a).
B Nicholson 46.41 (computer scan from id.:fig.14c).
C Louvre A547 (computer scan from id.:fig.13b top left).
D Louvre A522 (drawing by author from id.:fig.16b).
E Louvre A517 (computer scan from id.:fig.4b).
F Folkwang K969 (drawing by author from id.:fig.41e).
2. Late Geometric *prothesis* scenes and biers
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B Benaki 7675, bier (from Laser 1968:19 fig.1e).
C Odos Peiraios, bier (from id.:fig.1f).
D NM 812, bier (from id.:fig.1a).
E Brussels A1506, bier (from id.:fig.1k).
F Baltimore 48.2231, bier (from id.:fig.1o)
G Ny Carlsberg Glyptotek 2680, bier (from id.:fig.1d).
H Metropolitan 14.130.14, *prothesis* scene (from Ahlberg 1971:fig.25f).
I Eurytos-krater, symposion scene (drawing by author from Arias/Hirmer/Shefton 1962:pl.IX).
3. Late Geometric ships
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B Louvre A534 (from id.:166 fig.333).
C NM no inv.nr (from id.:167 fig.337).
D Louvre A532 (from id.:172 fig.354B).
E Louvre A530 (from id.:172 fig.356).
F Louvre A530 (from id.:172 fig.355).
4. Evolution of Geometric ship architecture
A Toumba Grave 61 (from Kalligas 1987:83 fig.1).
B Schematic drawing by author based on Basch 1987:177 fig.372 and 176 fig.368.
C Metropolitan 34.11.2 (drawing by author from id.:179 fig.375).
D Schematic drawing by author based on id.:174 fig.360.
E Schematic drawing by author based on id.:168 fig.341.
F Schematic drawing by author based on id,:177 fig.370.
G NM 266 (from id.:183 fig.385).

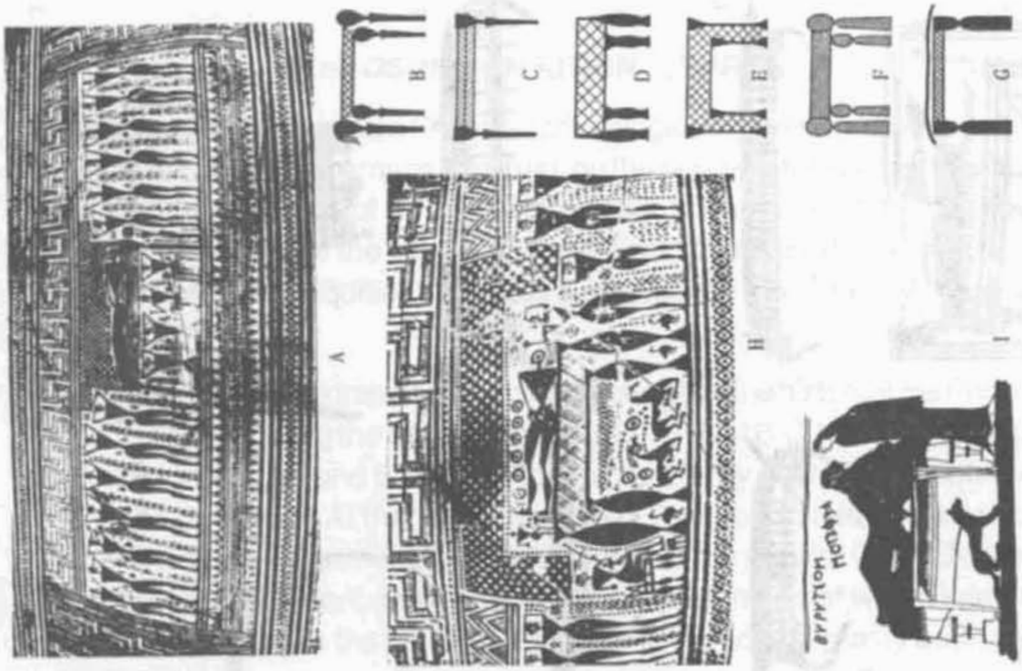

FIG. 2

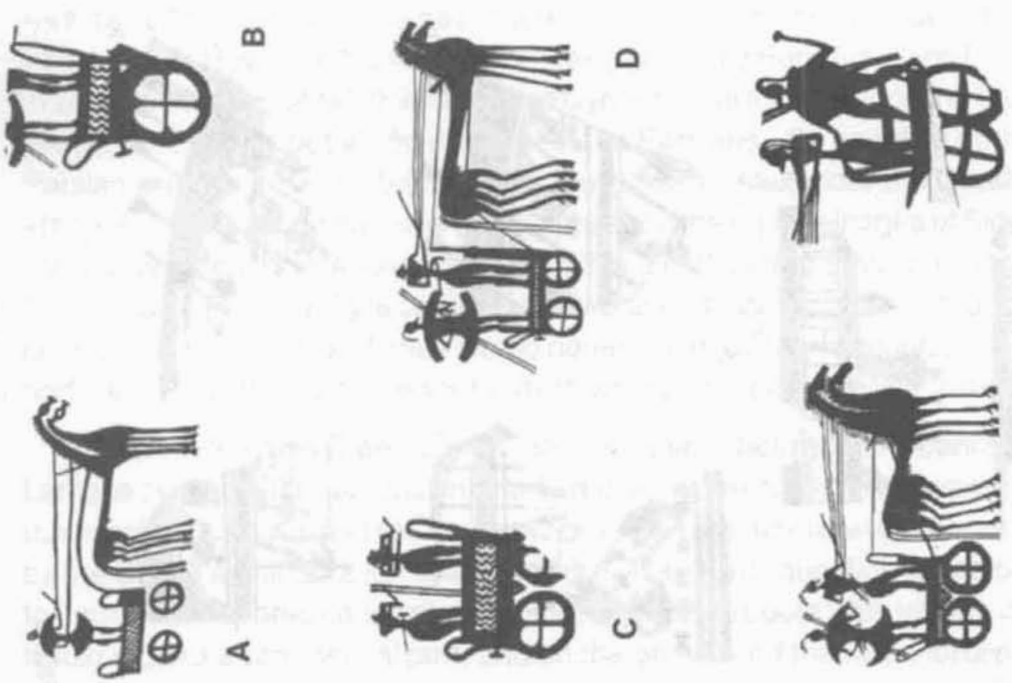

FIG. 1

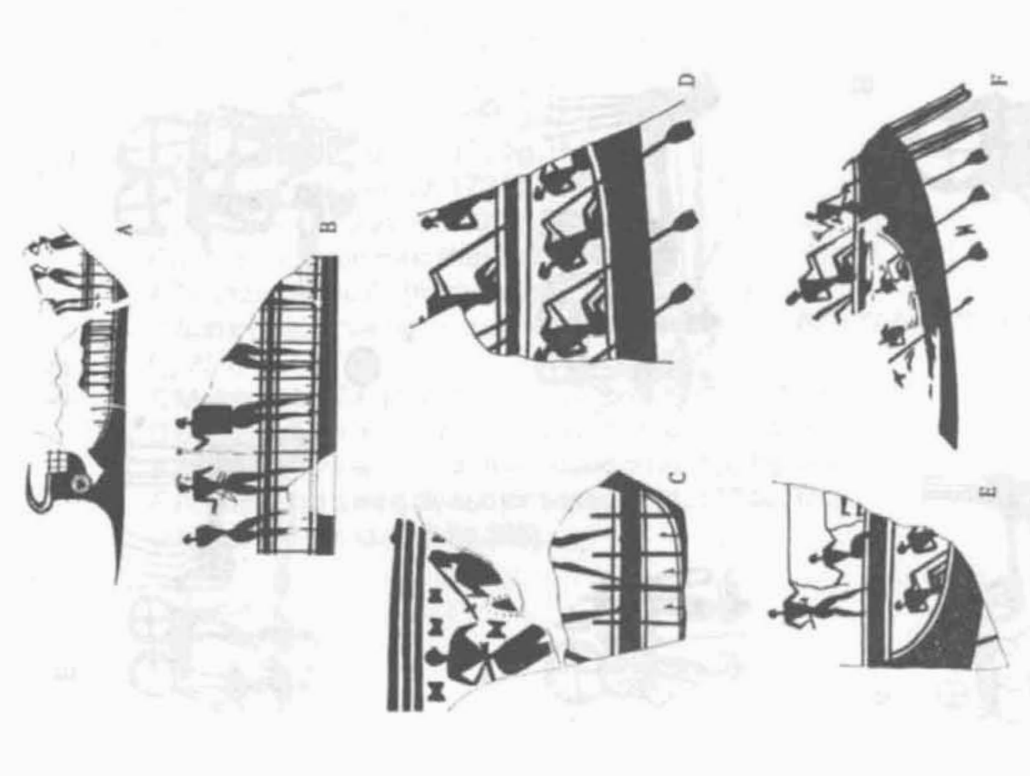

FIG. 3

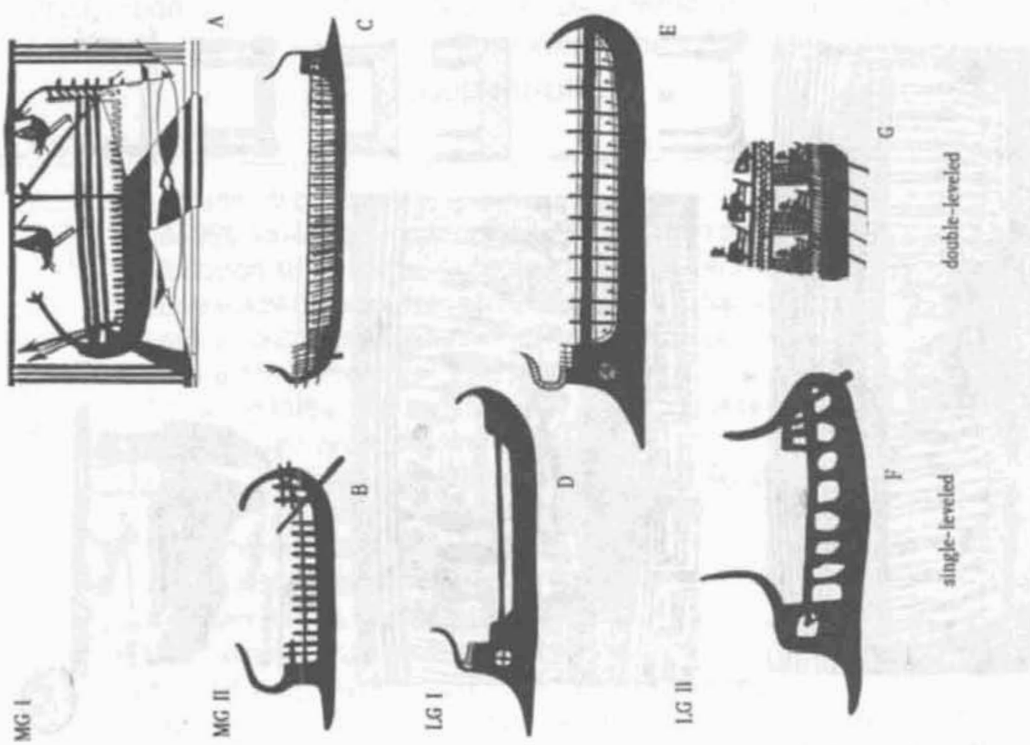

FIG. 4

NEOSOIKOI IN KITION, CYPRUS

For about fifteen years a French archaeological mission[1] has been exploring the site of Bamboula, in Larnaca (Cyprus), on the northeastern edge of the ancient city of Kition, the capital of a Phoenician kingdom from the 9th to the 4th cent. B.C. The importance of the city was also attested by excavations carried out by the Department of Antiquities in Cyprus since 1959 in the area called Kathari, to the north of the city[2].

The literary and epigraphical sources[3] substantiate the history of the Phoenician kingdom of Kition during the Classical period (5-4th cent B.C.), and archaeological discoveries at Kathari and Bamboula for the past thirty years have confirmed its importance (Figure 1). At that time, the area of Bamboula sheltered a sanctuary dedicated to Astarte, seemingly identified here as the Cypriot Great Goddess of Fecundity, and to Melqart, a male god some characteristics of whom equate him with Herakles who was the patron of the royal Phoenician dynasty both in Kition and in Tyre.

THE HARBOURS OF KITION

It is unanimously admitted that the main feature of the Phoenician power was its connection with the sea; trade and navigation were essential to the Phoenicians. However, the literary sources (especially Herodotus and Diodorus) indicate the existence of Phoenician and Cypriot naval forces during the Classical period, which were put at the disposal of the Persians - for example during the Persian wars, in the early 5th cent.- or the Greeks - Alexander the Great in the 4th cent. The figures of triremes which appear on the royal coinages of Sidon and Byblos[4] are clear references to the significance of such a naval strength. The Phoenician cities, e.g. Tyre on the mainland and the island of Tyre, Sidon on its promontory or Arwad off Tartus would generally enjoy two harbours, one to the north and the other one to the south which would be used according to the winds.

Such might have been the situation in Kition, but recent urbanization in Larnaca prevents us from making certain it since the coast line is now straight due to natural silting up and sea-level changes, or as a result of the works undertaken by the British administration in 1879-1880[5]. The actual question would be then to figure out the precise locations of the ancient harbours: the trading activity would require a commercial port, and on the other hand the naval forces would need to be sheltered in a military harbour. However, when describing the coast of Cyprus, Strabo states that Kition had a κλειστὸς λιμήν (XIV, 6, 3), that is a closed harbour[6].

The trading harbour was most likely an open anchorage place, traces of which will probably never be found. On the other hand, recent discoveries have allowed us to locate the site of the military harbour which was in use during the Classical period. Badly damaged structures were uncovered in 1985 to the north of the open terrace of the sanctuary on the Bamboula, and remained for some time difficult to interpret: they were finally identified as the remains of ship-sheds (νεώσοικοι, νεώρια) with inclined planes or ramps to support the ship hulls.

The structures initially cleared were set in a large rectangular area (squares G-L/8-9 of the grid), and countless fragments of tiles let us assume that it was roofed[7]; it was also established that it was a building for public purpose dated to the Classical period (late 5th cent. B.C.?) and probably related to Melqart's sanctuary which it limited to the North (Figure 3). The extension of the excavation allowed us to discover ramp-shaped structures and to suggest that they might have supported ship-hulls; the assumption of a roof built on pillars was established[8].

Several ramps (6, possibly 7) were cleared in 1988, and the general interpretation thus confirmed (Figure 4); new evidence was brought up on the orientation of the ramps, the stratigraphy of the building, its datation in the Classical period, etc. The 1989 and 1990 seasons of excavation allowed us to clarify several detais of the building techniques and to elucidate the three chronological phases of the building[9].

A water-table at the altitude 1.60/1.80 m above sea-level used to flood the lower parts of the excavation (Figure 2), and we had to turn to water-pumps, which was made possible in 1990 thanks to the efforts of the Municipality of Larnaca; however, such conditions oppose an easy development of the excavation, and its final completion will probably take longer than we would have wished.

The exact plan of the ancient city of Kition (Figure 1) is hard to make clear as it is hidden by the modern town of Larnaca, and suffice it to say that the hillock of Bamboula is located in the eastern part of the city, not far from the present coastline. The maps drawn in the 19th century[10], and more precisely the sketch-plan by the French consul Auguste Dozon published in the first volume of the *Corpus des Inscriptions Sémitiques* in 1881[11] show a small pool linked to the sea by a narrow channel near the Bamboula hill - the marsh and the channel having been filled up by the British drainage works in 1879-1880. One may reasonably assume that it was the latest trace of the ancient closed harbour, still visible if not useful.

DESCRIPTION OF THE REMAINS

The section of the harbour structures of Kition-Bamboula so far cleared extends over ca 525 square meters, but it can fairly be assumed that they would have spread much more widely in antiquity.

The southern limit of the harbour structures is the northern retaining wall of the courtyard of the Classical sanctuary; the courtyard extends to its South and its floors of the Classical period are preserved at a level ca 5.50 m; the harbour structures stood to its North at a level ca 2.50 m, and the visible face of the retaining wall (i.e. its northern face visible from the harbour complex) was about 3 m high: it is made of dressed stones covered with a thick plaster coating. Every 6 metres the retaining wall is strengthened with interior (=South, buried under the terrace) and exterior (=North, visible) buttresses which delineate a northern bay, or space, in which the ramps for the ships have been built. Six ramps have been completely or partially cleared so far. To the West, remains of a returning wall, that is contiguous to the main retaining wall, might indicate the western limit of the architectural complex; to the East, on the contrary, there is hardly anything left as a result of the dismantling of the Bamboula hill in 1879 - 1880, and the likelihood that more ramps might have existed on this side should not be discarded.

These ramps are in quite a different state of preservation, and when preserved, exhibit three architectural stages. Actually, the most impotrant and best preserved one is the earliest stage, dated to the 5th cent. B.C.

Early phase.

Each long and slightly trapezoid ramp 11 m in its south - north length (when fully preserved) and about 2 m wide, east - west. Their maximum height is 1.90m to the South, and they slope down northwards at a slope of *ca* 13°. They consist of a facing wall on each side, east and west, built with dressed stones and undressed blocks carefully joined with a white plaster, and a rubble filling mixed with plaster too; the whole structure is covered with a thick and even coating of white plaster on which some stains of red painting are still visible. On each side of the sloping surface of the ramp one can see a deep, rectangular groove meant to wooden beams on which logs were used for towing the ship. A small protuberance can be seen on the southern end of each ramp, at the base of its highest point: it most likely was the wedging socle for a post meant to support the precariously balanced ram of the ship.

Along a six meters balance alternating with the ramps, three unconnected walls are alligned on a south - north axis facing each buttress of the main wall; they are 0.80 m wide and *ca* 3.50 long (average), the interspace between two walls being av. 2.50 m. They were used as massive pillars on which the supports of the roof stood, each bay/ramp being roofed individually. One may reasonably assume that the lower part of these massive pillars was used to wedge oblique struts which helped support the hull of the ship when it was laid on top of the ramp.

Circulation from the ramp - bay to the other one was made possible to the south through a long east - west passageway, 1.20 m wide, running along the full length of the retaining wall on its northern face. In the internal between two buttresses, the passageway is lined by long basins (vats?), 0.60 m wide from the retaining wall to the passageway, each basin being edged with a parapet made of standing slabs along the passageway; the function of these structures remain uncertain. One should notice, too, in the upper part of the inner face of the buttresses, nicely fitted holes perhaps meant for horizontal wood beams to which the ropes which fastened the ship might have been fixed.

The south - north circulation would take place in a narrow passage between the ramp and the pillar - walls (*ca* 0.80 m). One could step up from the southern passageway on three large steps built with nice slabs of marmaro on each side of the ramp; then a path of hard - packed surface is gently sloping down northwards to the harbour itself, the waters of which having been most likely leaping a few meters ahead of the northern end of the ramp.

We have already mentioned the roofing; one should suggest a double - slope roof of tiles above each bay of a ramp. The wood framing, six meters broad, was laid on wood poles standing on top of the retaining wall and the group of the three walls which divide a bay from its neighbors.

Second phase.
The second stage in the development of the harbours structures corresponds to a significant re-shaping of the architectural complex and can be dated to the 4th cent. B.C.

The main change is a widening and, moreover, a lengthning of the ramps; they are now about 15m long and 3m large, the eastern ramps being 2.50m high and the western ones 3.20m. These adjusments might be either a consequence of a change in the size of the ships, or the result of a variation - fall - in the seal-level which would have required a lengthening of the ramps: no firmer suggestion could be offered yet. The repair was made in two different techniques. The three ramps to the east were doubled on each side of the ramp by new walls made of rubble and plaster, with an interior filling or rubble; the floor was a hard-pached surface, not plane but steeply convex. The three ramps to the west were repaired in a similar way, but the doubling walls were erected with mudbricks. Using such a lower quality and less resistant material would point to a hasty repair, with limited financial means as well.

The lengthening and raising of the ramps resulted in a change of the surrounding floor levels. To the very north, the hard-packed surface near the harbour was probably preserved, but the floor levels of the southern section of the building were raised. In order to do so, small retaining walls of undressed stones were built on an east-west axis at the northern end of the first row of pillars, and the whole southern sector was filled in; on the contrary on what was evidenced by the passageway of the stage, the floor levels of the second phase are not even, and there is a difference in height between the lower floor levels to the east and the higher ones to the west. Slabs of marmaro were laid on the floors along the pillars of the first row to the south (they had been raised up as well); these slabs might have been used as a solid base for the struts which helped support the hull of the ship on the ramp. There is slight evidence that the roof might have been repaired, too; however, it should have been quite similar to the previous one.

Third phase.

Further repairs were carried out during the 4th cent. B.C., too, and they are clearly visible on the westernmost ramp only; however, flimsy remains in the central part of the building might be an indication of a larger extension of the third phase. The excavation of the western sector is not completed yet, and the restitution of this phase is still tentative. To the very south, the floors around the once-more raised ramp are at the same level as the top of the retaining wall and, consequently, of the terrace; the highest point of the ramp is 1.50m above this floor level, that is 4.70m above the floors of the first stage and 2.20m above the contemporary highest point of the ramps. The northern part of the westernmost ramp has not been excavated yet, but since the slope seems to be regular and almost the same as that in the second stage, a total length of 17/18m is likely. There is no indication of any roof in the very damaged remains of this last phase, but a roof should have sheltered the ramp.

Interpretation

Many different sites around the Mediterranean shores have previously yielded remains of structures from different periods which might be interpreted as ramps for ship hulls; one of the most famous is indeed the *cothon* at Karthago, but it is about two centuries later than the harbour of Kition[12]. The interpretation of the remains presented above is primarily based on a comparison with the Classical remains uncovered in Piraeus, north of the Zea basin, by W. Dörpfeld in 1885; we can see there a similar alternation of ramps sloping down to the basin of the harbour and bases supporting a roof, as well as a massive wall of dressed stones which closes the building[13]. The dimensions can be easily compared, at least for the width, with the 6m interval between the axes of each ramp. However, in contrast to the ramps at Piraeus the total length of which was reconstructed in order to fit with the 30-35m long triremes, the ramps at Kition never exceeded 15m. Should we assume that the extremities of the ramps of Kition have been destroyed for ever, or should we suggest that they were built for a part of the ship only?[14]. An answer may come from further excavation.

The structural composition of the *neosoikoi* at Piraeus and Kition is basically identical in spite of several differences in the details and the building techniques: sustaining walls for the roof at Kition, vs square individual bases at Piraeus; a double-slope roofing for each ramp at Kition, vs the proposal of the architects for a double-slope roof for two ramps at Piraeus, etc. However, in the expectation of the complete excavation of the Kition complex, we feel authorized to offer a reconstitution based on the Piraeus example: Figure 3.

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NOTES

* We express sincere thanks to Professor Homer Thompson who kindly suggested several improvements of our English translation.

1. French excavations under the direction of M. Yon since 1976; see preliminary reports in "Chronique des fouilles et découvertes archéologiques à Chypre", *BCH* from 1977 onwards; see also the publication volumes *Kition-Bamboula* I to IV, 1989 to 1992 (ERC, Paris; more volumes are in preparation).
2. Cypriot excavations under the direction of V. Karageorghis from 1959 to 1985; see reports in the "Chronique", *BCH*, same dates; see also the publication volumes *Excavations at Kition* (*Fouilles de Kition*) I to V, 1974 to 1985 (Nicosia); vol. VI is in preparation.
3. Forthcoming publication: *Kition-Bamboula* V. Testimonia. The Phoenician were edited by V. Karageorghis and M.-G. Guzzo-Amadasi, *Fouilles de Kition* III, 1977.
4. L. Basch, *Le musée imaginaire de la marine antique.* Athens 1987 (Phoenicia: 328-335).

5. A full description of these works will be found in J.-F. Salles, *Kition-Bamboula* IV (in press: 1992).
6. For the demonstration that the triremes of the Classical times had to be towed and dry docked in ship-sheds, see M. Yon, "Kition et la mer" *Actes du Colloque de Ravello* 1989 (in preparation).
7. "Chronique", *BCH* 110 (1986): 853-855.
8. "Chronique", *BCH* 112 (1988): 827-830.
9. "Chronique", *BCH* 113, (1989): 824-826; 114 (1990): 962-967.
10. K. Nicolaou, *The topography of ancient Kition*, Göteborg, 1976.
11. *CIS* I, Paris 1881: 35.
12. References in M. Yon, *Colloque Ravello* 1989, *supra* n.6.
13. A model is exhibited in the maritime museum at Zea; plans drawings in N. Papahatsi, [*Pausania Ellados periegesis*: in Greek], Ekdotiki Athinon 1974, fig. 25: 100-101 (=plan W. Dörpfeld 1995, fig. 33: 106), fig. 30: 104, fig. 34: 107 (see also Sounion, fig. 16 and 17).
14. The suggestion that these shelters were not intended for triremes, especially in a Phoenician harbour in Cyprus, but for shorter war-ships should not be discarded.

ILLUSTRATIONS

1. Sketchplan of the ancient city of Kition - from CIS I, 1880: 35.
   1. Kathari
   2. Bamboula
   3. Marsh and channel still visible in 1880
2. Neosoikoi at Kition-Bamboula, to the north of the Cypro-Classical sanctuary (1990 sounding in the watertable).
3. *Neosoikoi* and classical sanctuary at Kition-Bamboula: a suggested restitution.
4. *Neosoikoi* at Kition-Bamboula: ramps of the first phase (photo 1990).

FIG. 1

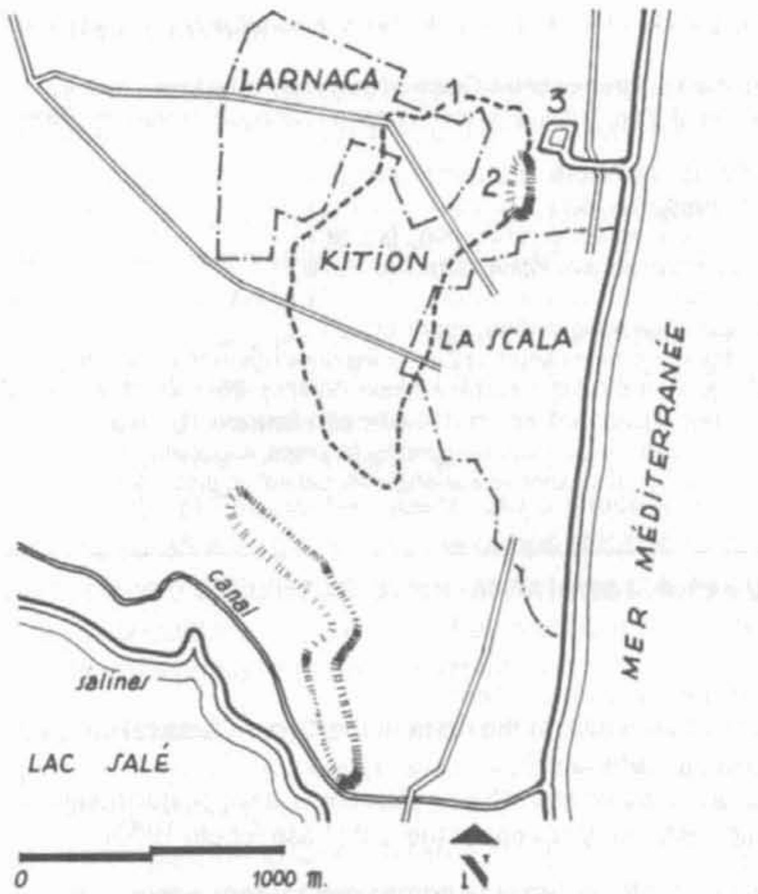
LARNACA
1
2
3
KITION
LA SCALA
MER MÉDITERRANÉE
canal
salines
LAC SALÉ
0
1000 m.
N

FIG. 2

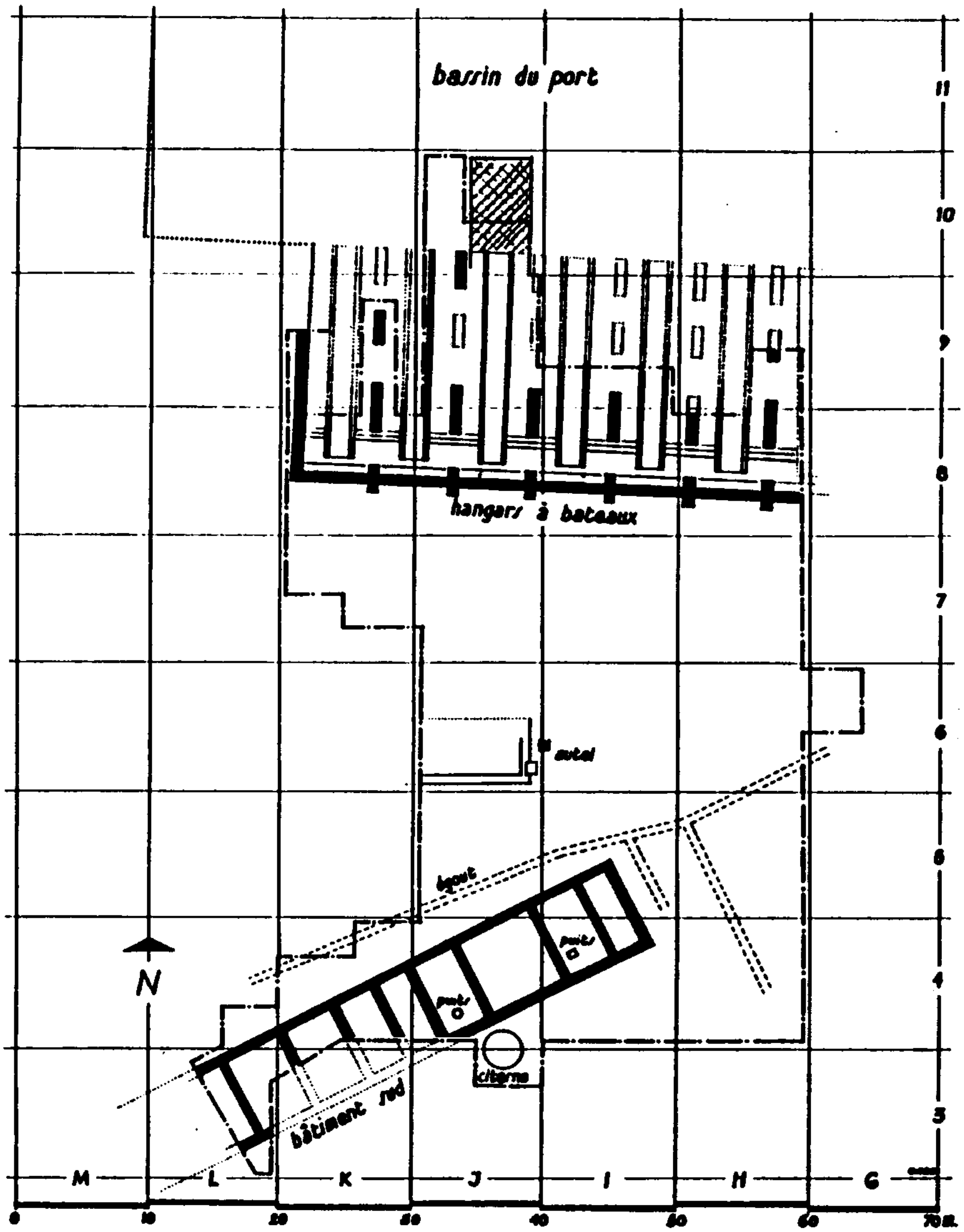
bassin du port
hangars à bateaux
autel
égout
puits
puits
citerne
bâtiment sud
N
M
L
K
J
I
H
G
0
10
20
30
40
50
60
70 m.
11
10
9
8
7
6
5
4
3

FIG. 3a

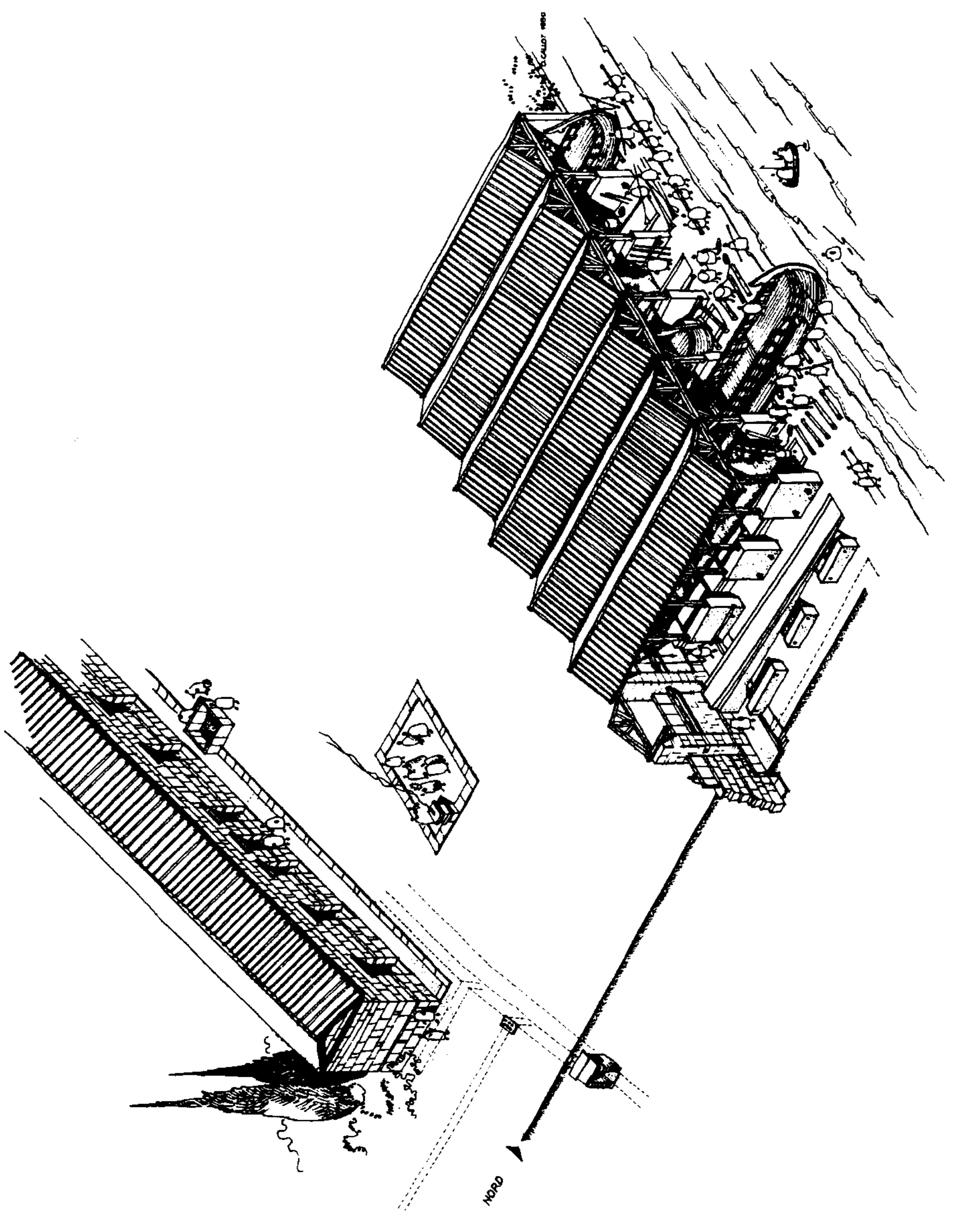

FIG. 3b

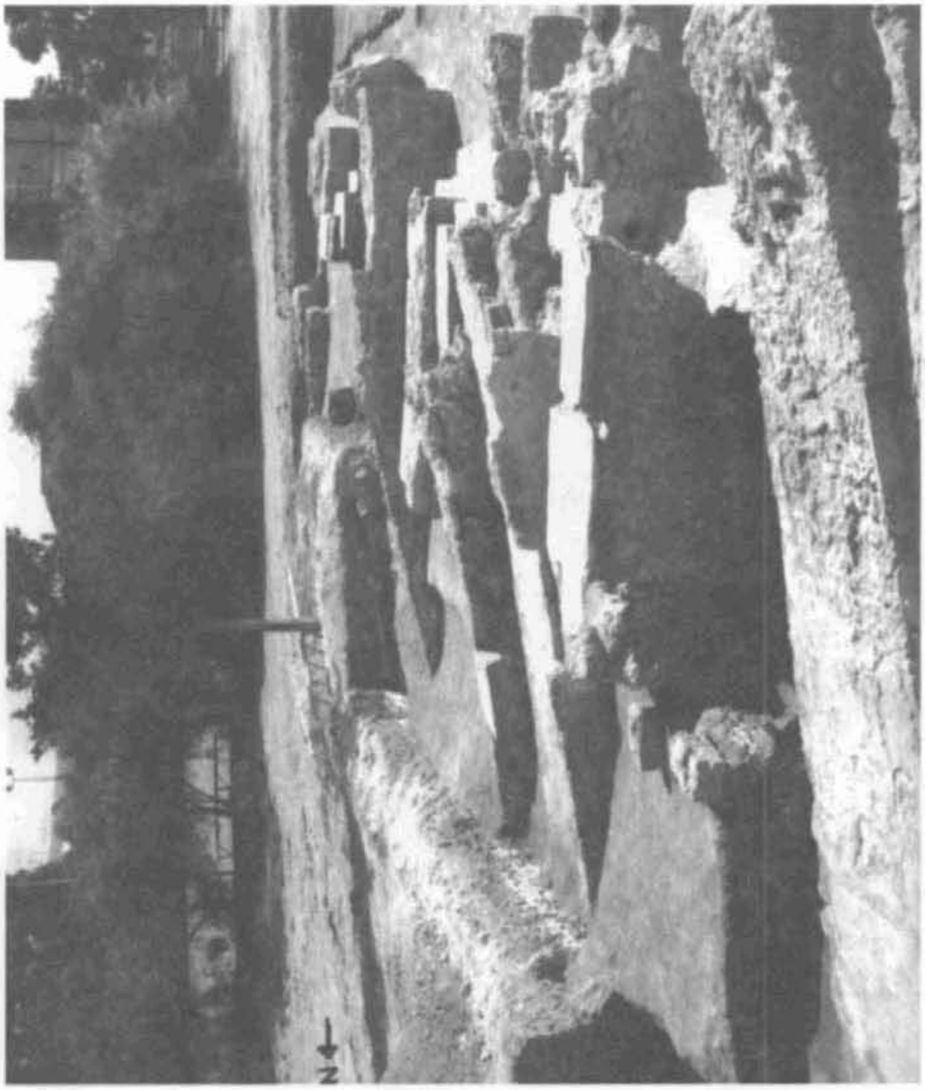

FIG. 4