ΤΡΟΠΙΣ VII
TROPIS VII

HELLENIC INSTITUTE
FOR THE PRESERVATION
OF NAUTICAL TRADITION

7th INTERNATIONAL SYMPOSIUM ON SHIP CONSTRUCTION IN ANTIQUITY

PYLOS 1999

proceedings

VOLUME I

edited by
Harry Tzalas

ATHENS 2002

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Χορηγοί του Συμποσίου • Sponsors of the Symposium
Υπουργείο Πολιτισμού • Ministry of Culture
Νομαρχία Μεσσηνίας • Prefecture of Messinia

The 7th Symposium on Ship Construction in Antiquity was organized by:
The Hellenic Institute for the Preservation of Nautical Tradition,
in cooperation with the Ephorate of Underwater Antiquities, through the support of the Ministry of Culture and the Prefecture of Messinia.

The publication of the Proceedings was made possible with the financial support of the Ministry of Culture.

Published by the Hellenic Institute for the Preservation of Nautical Tradition.
Editor: Harry E. Tzalas.
Text preparation: Katerina Poulis.
Proof-reading: Peter G. Calligas, Charalambos Kritzas, John Phillipson and Christine Ayoub Sinano.
Electronic processing & design: Angelo Yfantis.
Printed by: Editions SCHEMA & CHROMA, 574 00 Sindos, Thessaloniki.

The editor would like to thank Peter G. Calligas, Charalambos Kritzas, John Phillipson, Michael Wedde and Christine Ayoub Sinano for their valuable assistance in the preparation of this edition.

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ISSN 1105-7947

Cover: Drawing from a rock-cut engraving of a ship with the inscription τὲν τριακόντερον, from the Merle K. Langdon and Aleydis Van Moortel contribution "An Early Attic Triaconter".

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FOREWORD

I feel that the foreword to the edition of the proceedings of the 7th International Symposium on Ship Construction in Antiquity should be short, as befits scientific encounters that have been held with success and during which all that should have been said has indeed been said. So, in the foreword to *Tropis VII,* I will limit myself to acknowledging the contribution of those who made that success possible. I will start with the Ministry of Culture of Greece and the Prefecture of Messinia, as without their financial assistance and generosity, the Pylos Symposium of 1999 would not have been as well organized nor would the participants have enjoyed such a pleasant stay. The personal interest of the Secretary General of that Ministry, Dr Lina Mendoni, an archaeologist herself, cannot be sufficiently stressed. Her interest was real and continuous, with unfailing assistance before, during and after the conference.

It must also be acknowledged that the event was jointly organized by the Hellenic Institute for the Preservation of Nautical Tradition and the Ephorate of Underwater Archaeology of Greece. The contribution of the Director of the Ephorate, Miss Caterina Dellaporta, was decisive at all stages.

This was the last conference for the twentieth century and it was decided to have, in addition to the usual sessions where scholars present their individual papers, special sessions devoted to underwater and nautical archaeology in the Mediterranean and the Black Sea. Scholars who had participated in, or could describe, such activities in a particular country or area were requested to contribute to these special sessions.

Because of the great number of papers presented, this edition has over one thousand pages and is divided into two volumes. So, *Tropis VII* consists of both a volume I and a volume II and there are two parts, part A and part B. Part A includes the general papers presented, while part B deals with underwater and nautical archaeology of the Mediterranean and the Black Sea. This is clearly shown in the Table of Contents.

It is hoped that this most recent edition in the *Tropis* series, with its 81 papers, will add new information in the field of ship construction in particular and marine archaeology in general.

In concluding, let me thank all those who have contributed to the organization of the Symposium and the editing of the proceedings; the participants-contributors, the members of the Organizing Committee and those friends and colleagues who are mentioned in the acknowledgements, as without their patience and perseverance you would not be holding these volumes.

Harry Tzalas

OBITUARY

During the editing process of the *Tropis VII* volumes, we heard the news that Professor Michael Katzev had passed away. It was a shock for my colleagues and myself, and we were all greatly saddened.

Michael had participated in our early Symposia and contributed to the *Tropis* series.

I, in particular, had the privilege of having benefited from the collaboration of Michael Katzev and his vast knowledge in ancient shipbuilding, throughout all the stages in the construction of the *Kyrenia II* replica.

His name will certainly remain, and he will be remembered as a leading figure, in the history of underwater archaeology for his methodical excavation of the *Ancient Ship of Kyrenia,* the most prestigious find in the field.

The Organizing Committee for the 8th International Symposium on Ship Construction in Antiquity - Hydra, August 2002 - has decided that the conference will be dedicated to the memory of Michael Katzev, one of the great marine archaeologists of the twentieth century.

The Editor

EDITOR'S NOTES

The following contributions were made only verbally and no written text was sent to the editor:

Angelova, Kristina (Dr.), read Dr. Kalin Porozhanov papers "Some observations on local shipping and Roman marine activities along the West Pontic Coast" and "Underwater Archaeology in Bulgaria".
Babouin, Andrea, "Sources on Byzantine shipping: 4th through 10th Century".
Christopoulos, Menelaos, "Representation of a ship and Skylla on a sherd of H. Tzalas' collection – catalogue n° 647" [Will be published in *Tropis VIII*].
Dellaporta, Caterina, "The 16th century AD shipwreck at Zakynthos harbour: New data." [Will be published in *Tropis VIII* in an updated version].
Hall, Jerome, "The first-century CE boat from lake Kinneret".
Hatzidaki, Elpida, "A possible Minoan harbour in South Crete" is published in: *Crete 2000*, American School of Classical Studies, Athens (in press).
Kapitän, Gerhard, "Errors in the reconstruction of Cheops ship n°1?" [This contribution was read in the absence of Mr. Kapitän; because of limited space in the present edition it will be published in *Tropis VIII*.
Lianos, N. & **Samiou** Chr., "Ναυάγιο σαρκοφάγων στην Ν. Άνδρο".
Linder, Elisha, "The two so-called 'Phoenician Shipwrecks' discovered recently in deep waters by Robert Ballard off the coast of Israel – Maximum technology *versus* minimum archaeology".
Marcus, Ezra, "Evidence for prehistoric seafaring along the southern Levantine coast".
Rogers, Edward, "Boat construction in Old Kingdom Egypt: Evidence from tomb reliefs".
Rouskas, Yiannis, "Προέλευση και τεχνικές των 'καραβιών' της αποξηραμένης λίμνης Κάρλας".
Spathari, Elsi, "Πλοία της εποχής του Ομήρου από το Άργος".

Volume I
Part A

THIRD MILLENNIUM BOAT GRAFFITO FROM MEGIDDO?

The graffito appears on a stone, measuring some 20x40 cm. It was found among other such stones in an area which is assumed to have been used as a cult center from a very early time: the Neolithic period until the Iron Age. Arranged rows of stones, of about 30-40 cm in length were at first placed in an open area, a courtyard, which with time was incorporated into a high place. At first the courtyard was placed as joining temples 4050 and 4047, a, time as Kempinski felt (1989: 170-175), equalling that of the epsidal buildings, dated to the Chalcolithic and early Bronze I period, levels XIX and possibly XVIIIb, although recent excavations conducted seem to support the Early Bronze I period. The arrangement of such stones was noted in other places, such as Gezer and Dan, and it was felt that in later periods, the Late Bronze, these kind of cultic stones were placed upright.

Among the stones at Megiddo are representations of animals: quadrupeds, possibly deer or cattle, ox, fox, jackal and hyena. There are also human representations, interpreted as being hunters, although others exist as well, such as a group of headless figures, and a possible goddess figure bearing a scepter and musicians associated by some interpretation to her cult. Engberg and Shipton (1934: 30) point out similarities of figures on incised shards originating from Megiddo as well. It is there that Beck (1995:11) followed by Marcus (1999: 108-109) find representation of boats. Although Megiddo is situated ca. 25 km from the coast, it guards routes leading from the coast of the Mediterranean to the Jordan River and beyond. We would thus place it as part of the economic hinterland of the coast.

Beck felt that some of the forms which Kempinski represents as signs, or even logograms (fig. 1A) could be, when turned upside down, representations of boats (1989: 173). Her arguments are not completely convincing and her comparable material (fig. 1B) bears little resemblance to the inscribed boats or logograms (Beck 1995: 11). An Egyptian expansion to the area of Megiddo was noted already in the past and thus Kempinski's analysis might have been tainted by his enthusiasm.

The engraved stone presented in this paper (fig. 2) has been published in the past by the excavators of Megiddo (Loud 1948: Plate 273:5). But the drawing presents only part of what actually appears on the stone. Beck's treatment of the figure uses only the parts which were shown by Loud (Beck 1995: fig. 6a). The main figure is that of a human being with a lyre next to him. The man has a rather unusual face, which seems to suggest a bird beak or possibly a beard (fig. 3). The person seems to be at least partially naked wearing a wide belt; he holds his arms up with outstretched hands, accentuating the fingers. He is facing a lyre, which may or may not be part of the same composition. Behind him, or rather engraved under the figure and possibly the lyre, appears what might be taken as a boat.

We present here a possible reading of some of the engravings on the stone that have not been published previously, although a small part of it was noted in earlier studies, but were not addressed. Figure 4 presents a photo of the area on the stone under discussion as well as a photo of a rubbing done with lead. The appendage, which had not been addressed previously, seemed to have been an engraved boat on which the figure had been superimposed. It is quite likely that the lyre player was superimposed on the older engravings using, when possible, the older elements. The unusual wide belt on the naked figure is situated amid ship, hiding an important component in its wake. The lyre itself is situated on the right proximity, possibly the stem of the boat. That part of the lyre makes little sense in its position. It looks very much like a bunch of papyrus, which could well be a part of the previous engraving that had been incorporated into the newer composition. Papyrus was an available commodity for raft construction in 3rd Millennium Egypt. Such vessels may actually be presented in rock carvings assembled by Landström (1970: 16). One does have to admit, however, that the high extremity and the outward protrusion are not a common element.

We concentrated on the engraving surrounding the lyre player, but the stone presented here (fig. 1) has more engravings on it which we have not dealt with. The stones in Megiddo, including this one, bear signs of having been engraved repeatedly. A vertical incision, part of the several appearing on the stone, might be construed as being a part of a mast, but if it is, it is a strange one. Although Gerzian boats did appear with masts (Basch 1987: fig. 79-81), this case cannot be attributed to these types of boats. Beck points out that it is possible that adding to stones already engraved was a common practice among frequenters of cultic areas, a practice we have noted in later engravings which are associated with *ex-voto* (Basch and Artzy 1986: 235). Another element on these stones which is mentioned by both Kempinski and Beck are the enigmatic engraved lines which look a bit like a net on several of the stones. Beck (Beck 1995: 11-12) points to yet another place, Gezer, where these net-like engravings appear as reported by Anati (1963: 295).

In an attempt to reconstruct a possible chronology of the engravings, we would propose that the boat and the repetitive net-like engravings and others, which have nothing in common with one another, preceded the engraving of the figure of the lyre player. An attempt to verify the depth of incision carried out, by means of a computer program, surprisingly showed that the lyre might have been engraved by a different hand than the one which incised the lyre player.

Who were the people involved in the engravings? Amiran felt that there was an Egyptian artist involved in at least one of the incisions, one which presents a clothed figure holding a spear or a scepter appearing on one of the stones in Megiddo (Amiran 1972: 31, Beck 1995: fig. 5a). It is hard to accept this conclusion particularly when one considers the quality of the engravings, usually very simple line incisions. These seem to have been carried out by untrained hands, probably of people needing to express some form of religious philosophy in graffiti in either cultic or impressive areas, a common practice. They did not seem to have the models of their objects of their expressions available.

As to the dating of the engraving of the lyre player itself, although it may not have to do with the topic of the conference, it is of importance. The special facial characteristics of the figure have caught the interest of Beck who tried to compare it to a human figure appearing on a clay tablet in Uruk III (Beck 1992: fig.6c). If indeed that is to be accepted, the engravings on the stones bear testimony to the appearances of both Egyptian and Mesopotamian elements concurrently. This view, of the simultaneous appearances, may now be considered possible, bearing in mind the appearance of both Egyptian and Mesopotamian elements in graves dated to the period found on the route from the coast to Megiddo, ca. 7 km from the site (Yanai: personal communication). There is one more suggestion presented lately, that the pointed head of the lyre player is similar to bird-like faces found on several ancient rock carvings in Addaura in Sicily (Otto 1999:

18). This comparison places the lyre player in a much later period, namely 13th -11th centuries BCE, the time of the so-called "Sea Peoples". The immediate question, which should be considered before any such comparison could be entertained, is whether the stone was above ground and thus available to an engraver at that period.

The title of this study is followed by a question mark. While possible boats from Megiddo were presented by Beck, Marcus, and lately here, they could be conceived as a 'scorpion's tail' (fig. 1A) or logograms on shards (fig. 1B). They appear only partially, but they seem to bear one important common denominator and that is the period and the area in which they appear. Thus they should be considered. Megiddo, during that period, and let us not forget its position, could well have borne signs of the Egyptian expansion. Present excavations carried out by the University of Tel Aviv could well throw more light on these questions.

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University of Haifa

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FIGURES

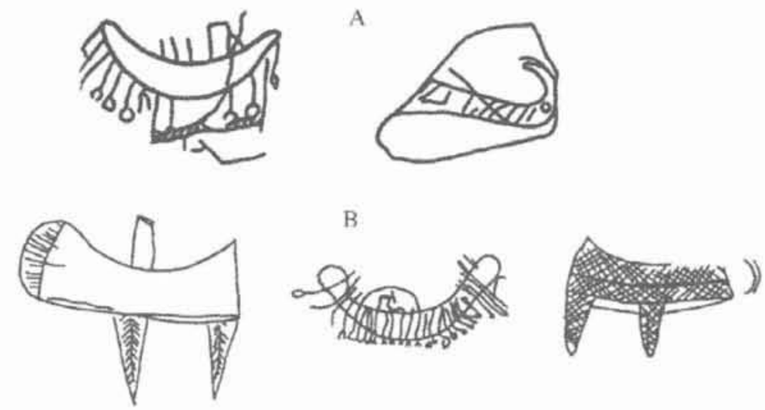

Fig. 1

Fig. 2

Fig. 3

Fig. 4

RECHERCHES SUR LES ENTAILLES CREUSEES DANS LE ROC SUR LES ILES DE PAROS, ANTIPAROS ET REMMATONISI

L'île de Paros et ses alentours proches ont connu une occupation quasi permanente attestée depuis le Néolithique. C'est une des îles les plus importantes des Cyclades, une des toutes premières cités qrecques à fonder, autour de 680 av JC, une colonie à Thasos, bien loin de là à 400km au nord face à la Macédoine, riche en bois et en minerais. Elle a cependant peu retenu l'attention des archéologues — sauf exceptions que nous signalerons — depuis les recherches faites par l'allemand O. Rubensohn au début du siècle. On trouve pourtant dans plusieurs sites dispersés autour de l'île de très curieuses excavations de rochers au bord de l'eau ou légèrement submergées de nos jours, entailles très longues, peu larges ni profondes dont personne n'a donné un compte-rendu exhaustif (ceux qui les ont remarqués d'un côté ignorent celles qui existent à quelques kilomètres de là de l'autre côté de l'île) et leurs interprétations souffrent effectivement d'un manque de vision globale de ces artefacts. Un travail de plusieurs années dans l'île nous a permis de relever six sites jusqu'à ce jour — et nous ne prétendons pas qu'une observation plus approfondie ne permettrait pas d'en relever d'autres mais nous allons néanmoins tenter d'en effectuer la synthèse ici dans l'état de nos connaissances.

1 Au sud-est de l'île de Paros (fig 1), se trouve le site de Drios. C'est le seul qui soit complètement émergé bien que se trouvant exactement au bord de l'eau. C'est aussi par conséquent celui qui a subi le plus de dégradations de par le développement des installations portuaires modernes et plus récemment purement touristiques, dégradations que nous avons pu remarquer allant s'aggravant au cours des dix dernières années. C'est ausi le seul où les entailles soient très rapprochées l'une de l'autre. Malgré une petite jetée moderne et quelques maisons qui coupent l'installation et peuvent faire croire à deux ensembles séparés, on voit se dessiner de longues entailles parallèles entre elles (orientation N/S +40°) d'environ 40 à 50m, ayant chacune environ 80/90cm de large et profondes de 40 à 50cm. L'espace entre chacune d'elles est de 1,20 à 1,30m (fig 2 et 3). Nous avons pu en compter une quinzaine plus ou moins décelables sous les diverses constructions qui se trouvent actuellement sur le lieu, une plage assez fréquentée de nos jours.

2 Au nord-est de l'île se trouve une grande presqu'île qui porte plusieurs sites intéressants (fig 4). Sur la plage appelée encore de nos jours Santa

Maria, on trouve, cette fois ci légèrement submergé comme tous ceux dont nous allons parler ultérieurement (40 à 50cm sous la surface), l'ensemble le plus étonnant : deux très longues stries d'environ 150m. La première seule est bien vérifiée (fig 4bis); à 6,40m de part et d'autre de cette entaille, on voit des trous de 80 à 95cm de longueur, de même profondeur (environ 50cm) et espacés entre eux de 1,40m. L'ensemble est colossal car si on peut attester l'existence d'une deuxième entaille de l'autre côté de la deuxième série de trous (2ème entaille que nous n'avons pu qu'entr'apercevoir et non pas mesurer) nous aurions un ensemble de 150m de long sur plus de 25m de large. Toujours parallèle à la côte, l'orientation est approximativement E/O. De l'autre côté de la plage se trouve un petit ensemble assez particulier lui aussi puisqu'il comporte une entaille de 80cm de large dont on peut mal déceler la longueur et des grands trous de 2m sur 0,50 formant des bassins communiquant.

3 De l'autre côté de cette presqu'île se trouve le site le plus complet autour de la petite presqu'île d'Oikonomos (Economou): cinq séries situées de part et d'autre du cordon littoral qui relie la presqu'île à la terre ferme (fig 5): à gauche deux ensemble de cinq (B et C) se faisant face plus deux autres encadrant un ensemble de trous (A). La largeur des entailles et des trous est identique à celles de Drios et Santa Maria (sauf une «double» d'environ deux mètres de large), leur longueur est d'environ 40m. Leur espacement entre elles varie de 1m à 3,5m (fig 6 et 7). De l'autre côté du cordon littoral, 15 longues entailles de dimension «standard» (80-90cm sur 40m)(D) font face à trois autres sur *la presqu'île même* (E).

4 En continuant plus vers l'ouest, juste avant la ville de Naoussa, se trouve une plage (Agh. Anargiri) avec une petite île fermant la baie là aussi. L'ensemble est moins impressionnant mais C. Photion[1] y a noté des installations portuaires sur l'île même que nous n'avons pu vérifier; a contrario on trouve d'un côté cinq entailles bien érodées dont seuls quelques mètres sont visibles et une de l'autre coté de la plage, toutes parallèles entre elles avec la même orientation N/S. Par contre nous n'avons pu retrouver la n°7 qui n'a pas la même orientation (fig 8).

5 Nous devons maintenant nous rendre tout à fait de l'autre côté de l'île de Paros, au delà de la baie de Parikia, face à la côte ouest où se trouvent l'île d'Antiparos et les îlots de Saliagos et Remmatonisi (fig 9).
A Antiparos même, sur la côte est d'une petite presqu'île du nord de l'île, nous avons relevé cinq entailles que nous avons pu suivre sur 65m de long, larges de 90cm, parallèles à la côte avec une orientation N/S (fig 10).

D'un côté nous avons trouvé deux trous de 90x60cm formant une ligne parallèle à 1 mètre des excavations. La distance entre chacune de celles-ci est variable entre 2 et 3m.

6 Juste en face de ce site, se profile l'îlot de Remmatonisi. Son aspect verdoyant contraste avec tout l'environnement aride des Cyclades, mais il est complètement artificiel car l'île est en fait privée et appartient à Mme Goulandris. C'est grâce à sa courtoisie que nous avons pu retrouver sur la cote ouest de l'îlot, juste en face du site précédent, séparées par un chenal de 300m, cinq excavations apparentes sur plus de 30m, parallèles avec la même orientation N/S +10° que celles d'en face; elles sont larges de 1m à 1,30m et espacées de 2,50m à 4,30m. Une photographie aérienne de l'île que nous a fait parvenir ultérieurement Mme Goulandris montre, outre les entailles face à Antiparos que nous avons pu relever, deux autres ensembles sur les côtes sud et est. Sur la côte sud on en devine trois qui sont en fait la continuation de l'ensemble précité (même largeur, même orientation) mais, ce qu'il y a de plus curieux, tout un ensemble *perpendiculaire* à cet ensemble (et donc parallèle à la côte, orientation Est/Ouest). On décèle 6 grandes lignes qui semblent de la même largeur mais l'ensemble est recouvert d'autres stries non continues, qui ne sont pas toutes peut être artificielles. Sur la côte est, on retrouve un petit ensemble parallèle à la côte de cinq ou six entailles sur pas plus de 20m de long.

La première constatation que nous pouvons faire après cet exposé de chaque site, c'est qu'il est indubitable que ces artefacts sont contemporains et participent tous d'une même fonction, probablement maritime. Sauf l'exception de Drios, exception qui doit pouvoir avoir une explication géologique liée à la spécificité du site, leur situation à 40-50cm sous l'eau indique une montée générale du niveau de la mer dans les temps historiques. Les entailles situées du côté d'Antiparos et de Remmatonisi ont été repérées pour la première fois par l'équipe de J. Evans et C. Renfrew travaillant sur ce problème de l'élévation du niveau de la mer[2]. En effet pour expliquer l'existence d'une civilisation sur le minuscule îlot (sans eau) de Saliagos, il fallait que celui-ci fût à l'époque –il y a six mille ans – relié à l'une ou l'autre île, Paros ou Antiparos. Les études de morphologie sous-marine qu'ils ont effectuées montrent le peu de profondeur de ces parages et un changement de cinq mètres du niveau de la mer permettrait à Saliagos d'être rattaché à la fois à Paros et Antiparos (fig 11). Un scénario d'un changement de 2m qu'ils ont également dessiné permettrait à nos entailles de se situer juste en bord de mer en une période intermédiaire entre 4000

av JC, datation de la civilisation mise au jour par Renfrew, et nos jours.
Les autres traits communs à l'ensemble des entailles rocheuses relevées sont:

- le parallélisme des ensembles, même lorsqu'ils sont simplement associés entre terre ferme et île ou presqu'île faisant face: à Oikonomos par exemple. Par contre Remmatonisi fait exception et c'est le seul ensemble où toutes les côtes de l'île, du moins celles qui s'y prêtaient et n'étaient pas trop exposées comme la côte nord, ont été utilisées.
- Ce qu'il y a de plus troublant c'est qu'on trouve la même structure à des échelles différentes: les très longues entailles de Santa Maria sont de même largeur et profondeur que les autres mais leur espacement entre elles et entre elles et les trous est deux à trois fois plus grand.
- Elle sont toutes dans des endroits protégés d'un point de vue maritime, souvent des ports attestés tout au long de l'Antiquité et des temps modernes (Drios et Santa Maria).

En fait lorsqu'on considère ces ensembles, l'idée qui ressort est de l'utilisation maximum de plates-formes rocheuses se trouvant le long des côtes pour en tirer la plus grande longueur possible – utilisation maximum en longueur et non pas en général car, sauf à Drios, les intervalles entre chaque strie sont souvent importants. Si les stries avaient été creusées non pas parallèlement à la côte mais perpendiculairement, elles auraient été beaucoup plus courtes car les à-plats rocheux suivent en général le rivage et ne se projettent pas comme des éperons. Mais malgré cette disposition grossièrement parallèle au rivage, ces entailles ne sont pas fermées au bout mais ouvertes sur la mer puisqu'elles occupent le rocher jusqu'au bout. Si l'on avait voulu en faire des bassins fermés, il aurait été facile de n'en creuser qu'une partie. Or quand on peut voir parfois un côté fermé, l'autre est toujours ouvert et donne sur un espace libre.

Quelles sont les hypothèses qui ont été suscitées par ces artefacts? Nous allons les énumérer et en faire une critique à la fois technique et historique, si possible.

Le commandant Graves qui a fait la première bonne carte de Paros en 1842, en fait pour la première fois mention en citant d'ailleurs à côté les vestiges de Filizi et d'Oikonomos beaucoup plus visibles à l'époque que de nos jours. Il les appelle «trous à sel» (salt-pans, qui a d'ailleurs en Anglais le sens plus général de 'salines')[3]. Le premier archéologue, O. Rubensohn qui, nous l'avons dit, s'occupe de faire des relevés scientifiques sur l'ensemble de l'île, nettoie un de ces «canaux» mais reprend telle quelle l'hypothèse de Graves en les appelant «salines»[4]. D'un strict point de vue d'efficacité, cela peut sembler bizarre: le propre des salines est d'être à la fois les plus plates et étendues possibles. Si la nécessité se faisait sentir d'en faire sur un site rocheux – ce qui est déjà contre-performant en soi – des grands bassins rectangulaires seraient plus appropriés. D'autre part, nous l'avons dit, les stries sont ouvertes sur la mer et cela semble difficile à concilier avec cet usage. D'un point de vue des références historiques, le meilleur naturaliste de l'Antiquité, Strabon, qui ne manque pas de signaler les curiosités, soit contemporaines à son époque soit plus anciennes, dont il a pu entendre parler, ne parle jamais de telles entailles. Il se réfère surtout à des «fleuves salés» et les seules «salines» qu'il mentionne sont en Troade «où le sel est naturellemnt asséché par les vents Etésiens»[5].

L'hypothèse la plus curieuse se trouve chez C. Renfrew qui y voit des tranchées pour la culture de la vigne (vineyards). Il est vrai que le relevé qu'il en fait ne correspond pas à ce que nous avons trouvé (fig 12) et il indique des «vineyards» là où nous n'avons vu que des champs de terre et non des rocs creusés, sur Antiparos. Néanmoins l'hypothèse de creuser des rochers en bord de mer pour faire pousser de la vigne a de quoi surprendre quand on sait que ce plant est parmi celui qui réclame le plus de profondeur pour ses racines par rapport à sa hauteur (cinq à dix fois) surtout quand la terre ne manque pas sur les deux îles de Paros et d'Antiparos. Nous nous sommes néanmoins intéressés à ce que disait ce grand connaisseur de la vigne antique qu'est Pline l'Ancien (d'autant que nos auteurs datent ces «vineyards» de l'époque hellénistique, point trop éloignée de celle de Pline). Pour cet excellent connaisseur qui consacre presque deux livres de son Histoire naturelle à ce sujet, le terrain doit être exposé au soleil et le plus vaste possible et pour planter la vigne, il faut effectuer un bêchage à trois pieds (environ un mètre) de profondeur[6]. Les seules mentions où l'eau de mer est associée au vin, c'est pour déplorer que les vignes plantées trop près de la mer donnent un mauvais goût à celui-ci et également l'usage de couper les vins d'eau de mer ou de plonger les vases dans la mer pour le faire vieillir artificiellement[7]. Les «canaux» pourraient-ils être des sortes d'entrepôts baignés d'eau de mer pour ces jarres de vin vieillies en accéléré? L'hypothèse serait amusante mais il semble difficile de croire qu' un tel travail de creusement du roc s'avérerait nécessaire alors qu'une simple grande cuve d'eau de mer, où même un bassin protégé par un mur suffirait amplement. Mais nous avons voulu insister sur cette hypothèse et comme les «vineyards» deviennent parfois des «vine trenches», voire des «wine trenches», nous sommes allés voir du côté de la fabrication elle-même du vin et des pressoirs. Un ouvrage récent[8] montre effectivement des installations dans ce but directement creusées dans le roc. Ce sont des manières très anciennes de faire le vin mais qui dans certains cas se sont perpétuées. Mais ces trous ovoïdes ou le plus souvent rectangulaires pour recueillir le vin ont une moyenne de 1m^2 et sont accotés à des surfaces où on écrasait les grappes en pente douce vers eux. La configuration de nos entailles ne peut donc là non plus être rattachée à cette technique.

Les stries pouvaient-elles être des carrières? Là aussi la configuration peut sembler inopportune: lorsqu'on a procédé à la taille d'une première série de pierres, pourquoi laisser un ou plusieurs mètres de la même bonne pierre inutilisée et se fatiguer à faire une autre strie au lieu de continuer sur la même ligne? Par contre il est plus que probable que les pierres ainsi obtenues par le travail des entailles aient été utilisées par ailleurs (c'est le cas signalé dans les pressoirs cités plus haut — et c'est même la raison pour laquelle la forme rectangulaire était préférée). Il serait extrêmement instructif de vérifier le type de matériau utilisé dans les sites proches d'Oikonomos, Filizi et Kargadousa pour voir les similitudes.

Danièle Berranger qui a fait une étude historique et prosopographique de Paros[9] — donc non essentiellement archéologique évidemment — ne connaît pas les entailles d'Antiparos et Remmatonisi mais toutes les autres l'ont frappée profondément. Elle y voit des chantiers navals pour Santa Maria et des installations pour bateaux exportant le marbre car les routes anciennes menant des carrières jusqu'à la mer aboutissent à cette zone. Si l'auteur a le grand mérite d'y reconnaître quelque chose de maritime, l'existence de mêmes stries de l'autre côté de l'île interdit de penser qu'il s'agissait d'installations liées à l'exportation du marbre, hypothèse déjà affaiblie par leur présence sur la presqu'île d'Economou.

Le premier à faire un relevé très sérieux — du moins de celles de la partie nord-est de Paros — est C. Photion déjà cité. C'est le premier qui a émis l'hypothèse qu'il pourrait s'agir de cales à bateaux et il a l'avantage d'avoir trouvé, profitant de la construction de routes agricoles, des tessons tout autour qu'il déclare avoir été déposés au Musée de Paros et que nous n'avons pu retrouver. Mais nous ne pouvons le suivre lorsqu'il pense qu'Oikonomos est le site de la capitale de Paros et celui du lieu de débarquement de Miltiade après sa victoire de Marathon en 490, quand il vient conquérir — sans succès — l'île.

Cette hypothèse de cales à bateaux est pour notre part celle que nous avons retenue car elle correspond à ce qui semble le plus pertinent d'emblée. Nous l'avons dit, la recherche de la *longueur* dans le dessin de ces entailles et surtout leur association dans l'espace à des sites du IXème-Xème siècle font immédiatement penser aux superbes représentations de bateaux longs sur les vases proto-géométriques et géométriques (fig 13). Ces bateaux sont les véritables ancêtres de tous les bateaux de ce type de la Méditerranée antique: triacontores, pentecontores puis trirèmes etc... Cette civilisation des «Chevaliers de la rame» dont parle Victor Bérard dans ses commentaires sur l'Odyssée[10], on peut la voir s'installer sur nos promontoires : Filizi, Kargadousa, Oikonomos, voire Remmatonisi. Dans le cas d'Oikonomos, on a trouvé des vestiges d'un site fortifié de forme ovoïde d'environ 120m sur 83m, agglomération en terrasse avec un mur d'enceinte dont l'épaisseur varie de 0,75m à 1,50m. On y a également retrouvé des vestiges d'une construction à abside qui pourrait être un temple et une nécropole elle aussi en partie submergée[11]. Nous avons tenté une reconstitution figurée de ce site avec des cales à bateaux associées (fig 14). Les habitants de ces enceintes étaient essentiellement des marins et peut-être des pirates, dans leurs forteresses tout près de leurs bateaux, et on peut penser avec D. Berranger que «l'activité de la baie de Naoussa a été plus importante que celle de Paroikia tout à fait au début de la période géométrique»[12]. On peut en dire autant de la zone entre Antiparos et Remmatonisi qui correspond aux mêmes caractéristiques topographiques. Dans cette hypothèse de cales à bateaux, il pourrait être tentant de voir dans les trous associés parallèlement aux stries, des emplacements où planter des poteaux qui auraient pu soutenir des toits couvrant ces cales. Certes leurs dimensions sont un peu grandes pour cette utilisation mais leur disposition indique bien une fonction en liaison avec les grandes entailles et toute interprétation de celles-ci nécessite que l'on prenne en compte cet artefact particulier.

La seule difficulté soulevée par l'hypothèse des cales à bateaux est leur horizontalité. Toutes les autres cales à bateaux répertoriées sont plus ou moins inclinées mais on peut penser qu'elles s'inspirent toutes de l'aménagement d'une plage, premier reposoir naturel des bateaux primitifs. En l'absence de plages et sur une côte rocheuse, l'idée de tailler des formes pour recevoir des bateaux sur des à-plats rocheux, par définition horizontaux, n'est pas absurde. La station horizontale est même meilleure puisqu'elle ne nécessite pas de calage dans le sens vertical. La difficulté n'existe que dans la manoeuvre de mise au sec et mise à l'eau. Mais d'une part nous n'avons pas les véritables extrémités de ces cales qui peuvent avoir été inclinées; d'autre part des échelles de bois peuvent avoir été utilisées pour faire basculer le bateau sur son rail comme on peut le voir de nos jours dans l'île de Milos[12]. Les bateaux de pêche reposent dans des hangars creusés dans la roche formant le rez de chaussée des maisons d'habitation des pêcheurs et ils sont tirés horizontalement. Quand ils arrivent, même s'il est vrai qu'il existe une pente presque insignifiante, ce qui est frappant est que le quai tombe à pic dans la mer et que l'échelle d'échouage sert non pas seulement à aider à glisser le bateau mais réellement à le faire basculer sur le quai (fig 15). Il semble difficile d'affirmer que tout ce qui est incliné, quelles qu'en soient les dimensions, est une cale à bateau et tout ce qui ne l'est pas, ne peut pas l'être. Nous pensons en tout état de cause que de toutes les idées avancées sur la nature de ces entailles rocheuses, celle liée à l'installation et/ou la fabrication de bateaux est celle autour de laquelle il conviendrait de travailler.

Pour conclure signalons le seul autre site qui jusqu'ici, à notre connaissance, présente une similitude morphologique avec nos entailles : il s'agit de celui d'Ognina, près de Syracuse signalé par E.F. Castagnino (1996). Dans un schéma de présentation de diverses formes creusées dans la roche que l'on trouve dans cette région, on voit une quinzaine d'entailles apparemment de dimensions proches de celles des nôtres, certaines émergées, d'autres légèrement submergées perpendiculaires à la côte au sud du site. L'auteur ne se prononce pas sur l'usage qui pouvait en être fait. Il serait important de confronter l'ensemble de nos données ci-dessus décrites avec une analyse approfondie de ce site, car il faut bien admettre qu'une de nos interrogations les plus importantes provenaient jusqu'à présent du fait que nous ne pouvions comparer ce qui existe à Paros et ses alentours avec rien de semblable. Ce rapprochement, si la ressemblance s'avère exacte à y regarder de plus près, est donc très important.

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NOTES

1) Photion 1973, p:10
2) Renfrew/Evans 1968, Appendix 1 de Ian A. Morrison,? 92-98
3) Berranger 1992 p 53
4) Rubensohn 1901 p 185 à 170

5) Strabon 13-1-48
6) Pline XVII 159
7) Pline XIV
8) Frankel 1999 p 51 à 54
9) Berranger 1992
10) Bérard 1971
11) Berranger 1972 p 152
12) Auffray 1992 p 72

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Strabon *Géographie* Livre 13

TABLE DES ILLUSTRATIONS

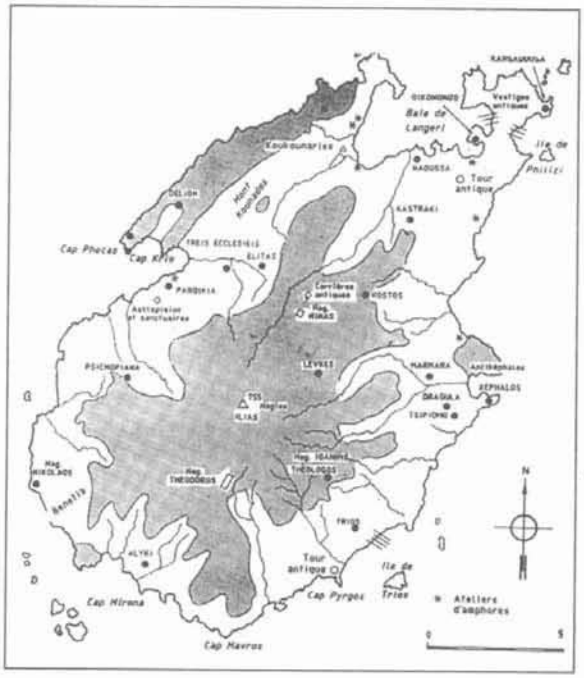


Fig. 1

Plan de la presqu'île de Naoussa avec les emplacements où des cales ont été relevées.

■ lieux où ont été retrouvés des vestiges de l'époque géométrique

— emplacement des cales

Fig. 4

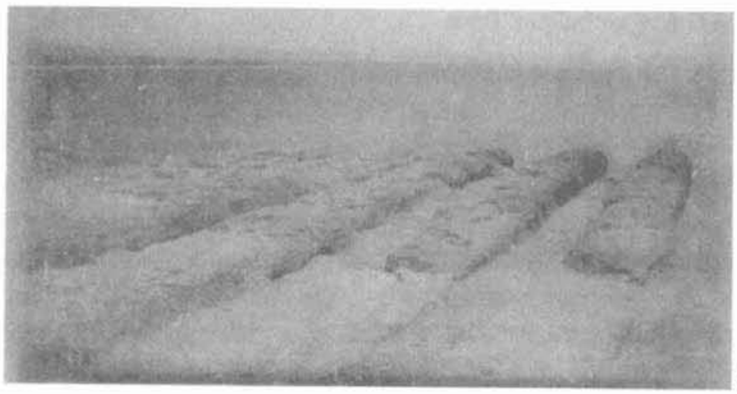


Fig. 2

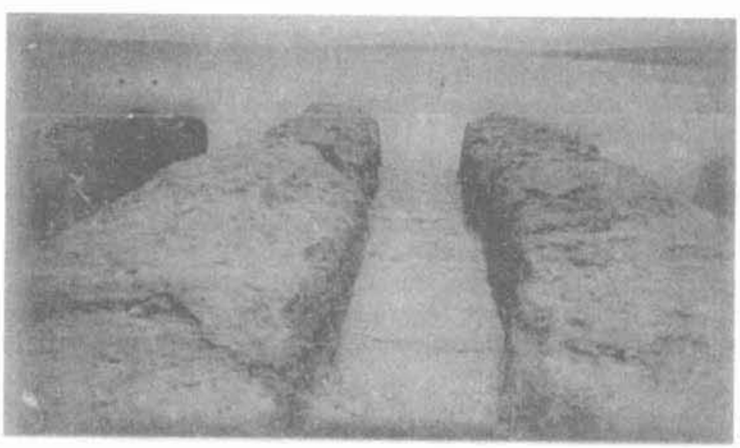


Fig. 3

Fig. 4 bis

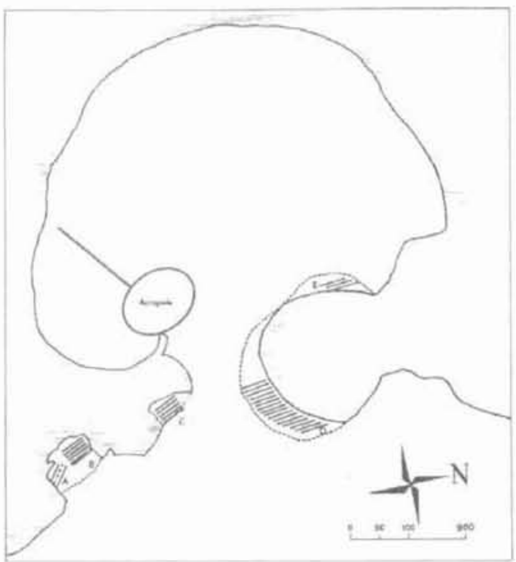


Fig. 5

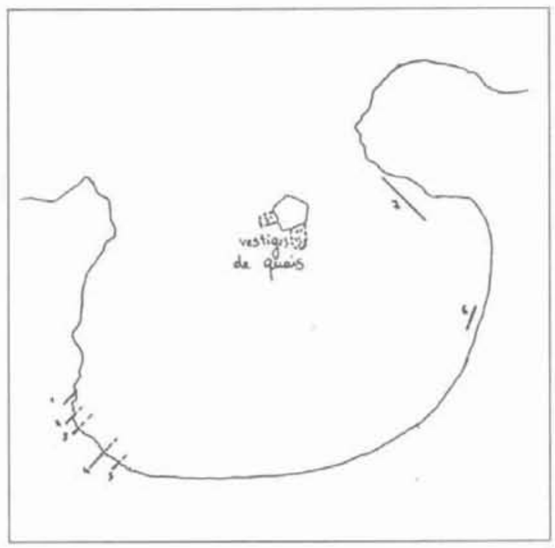
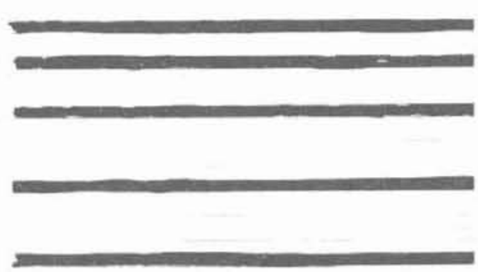


Fig. 8

Serie B ▬ = creux
1cm = 2m Fig. 6



Serie C Fig. 7

Fig. 9

Fig. 10

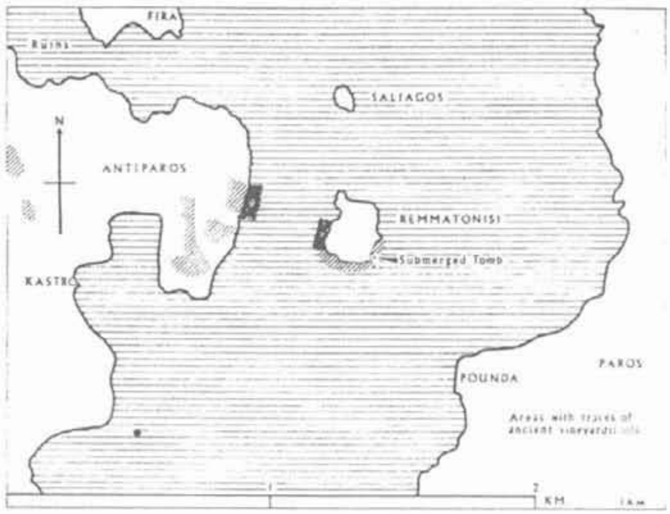


Fig. 11

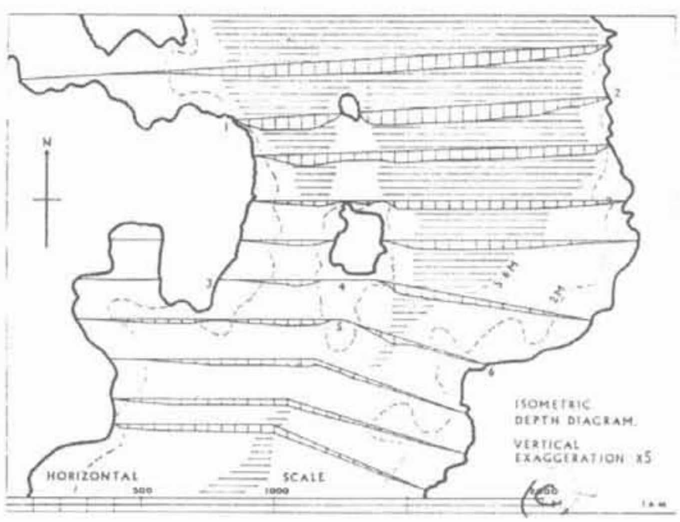


Fig. 12

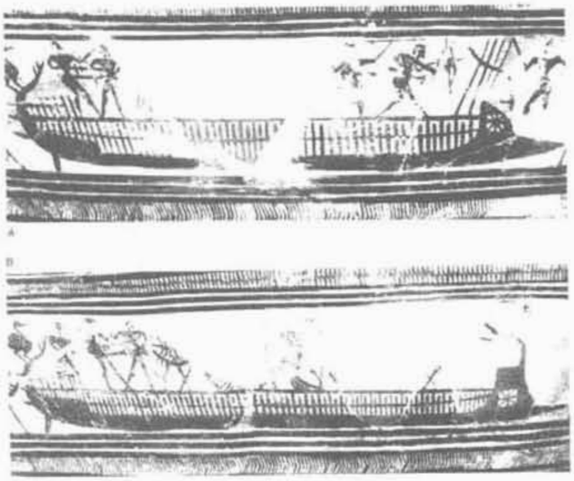


Fig. 13

Fig. 15

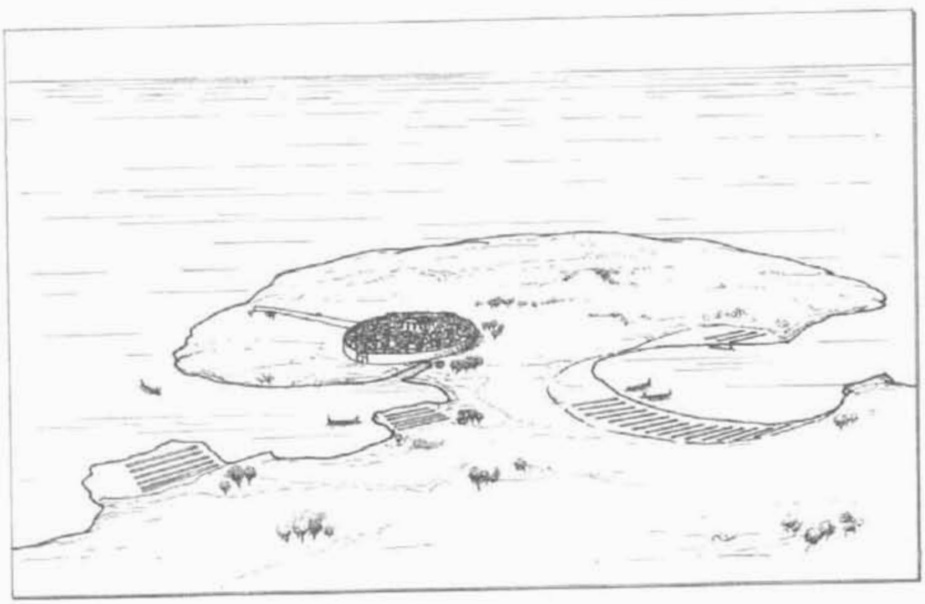


Fig. 14

DISPOSITIF DU HALAGE DES HANGARS NAVALS ANTIQUES: ETUDE ETHNO-ARCHEOLOGIQUE

De nouvelles données archéologiques relatives aux installations portuaires ont fait progresser les recherches portant sur les méthodes de halage et l'infrastructure en bois des neosoikoi anciens. Par ailleurs, différentes reconstructions contradictoires ou complémentaires ont déjà été proposées. Le problème crucial qui persiste encore concerne le risque du mouvement latéral de la coque du vaisseau lors des opérations de halage et de lancement. Certaines solutions ont été étudiées comme le halage à l'aide d'un système de cordages, de poutres transversales et l'utilisation des diverses structures de support de la quille. Lors de ce même symposium, M. Coates propose comme support latéral des trières halées dans les neosoikoi de Pirée, les colonnes qui divisent les loges et supportent la toiture.

Une étude ethno-archéologique pourrait donner des indices sur des pratiques maritimes antiques, en particulier au sujet de l'utilisation éventuelle d'une sorte de structure de soutien de la coque, c'est-à-dire d'un type de traîneau (berceau, cradle, vazia).

ETUDE COMPARÉE

Aujourd'hui sur les chantiers navals traditionnels (*carnagia*) des îles d'Egée, on utilise une infrastructure en bois relativement simple et pratique, qui sert au lancement et au halage des embarcations de pêche et de bateaux de grand tonnage sur des plages de faible déclinaison. Une étude ethno-archéologique peut révéler la persistance historique de méthodes techniques qui se sont imposées à travers les siècles du fait de leur simplicité et leur efficacité.

L'étude présente a été réalisée dans des chantiers traditionnels de la Grèce (Spetses, Héraklion de Crète, Perama, Paros, Patmos, Chios, Lesbos)[1]. Les mêmes systèmes opérationnels sont attestés sur plusieurs côtes de la Méditerranée occidentale (Sicile, Marseille, Espagne), et orientale, en Turquie, en Chypre, au Levant jusqu'en Egypte et en Inde[2].

A. L'INFRASTRUCTURE DES CARNAGIA

Dans les carnagia, le halage des bateaux se fait à l'aide d'une infrastructure presque entièrement en bois disposée sur une plage de faible déclinaison. Elle est composée (Fig. 1):

1. D'escarres en bois faites de troncs de cyprès longitudinaux reliés par des traverses (falaggia- φαλάγγια).
2. D'un chemin de glissement sur la plage fait de *falaggia* (chevrons-échelons) perpendiculairement posés sur le littoral à la continuation des escarres. Ils atteignent d'habitude une longueur de 30m.
3. Des *vazia,* structures de support en forme de traîneau.
4. D'un cabestan, manuel ou mécanique.

1. ESCARRE

L'échelle de lancement et de halage est constituée de poutres parallèles posées perpendiculairement au littoral, sur lesquelles s'ajustent des chevrons transversaux *(falaggia)*[3]. Quand l'échelle constitue une construction permanente du chantier, elle est ancrée dans le sol, formant plutôt un chemin de glissement bien défini allant de l'endroit de la construction jusqu'à une certaine profondeur dans la mer[4]. Des échelles libres se déplacent pour chaque halage (Fig. 3). Leur longueur normale atteint 12 ou 15m et leur largeur varie de 2,20 - 2,50 - 2,70m. Selon les dimensions du vaisseau à haler, on peut prolonger la partie submergée de la cale en attachant deux échelles.

2. FALAGGIA (palato, palancho, palo)[5]

Les *falaggia* sont des chevrons posés sur le littoral en déclinaison vers la mer, au prolongement de l'échelle du halage. Ils sont bien ancrés dans le sol et positionnés en intervalles réguliers formant, ainsi, un chemin de glissement (Fig. 2).

Federico Foerster Laures a remarqué qu'actuellement dans la Méditerranée sur les côtes espagnoles et françaises les barques sont tirées à sec sur des poutres en bois, qui s'appellent *pals* et qui sont normalement graissées avec du suif. Le halage se fait de telle façon que seule la quille ou les quilles secondaires se mettent en contact direct avec les *pals*. Lors d'un voyage, les bateaux portent avec eux au moins deux pals, pour qu'ils soient capables de se haler à sec n'importe où, si le mauvais temps l'impose. Un vieil adage dit que ceux qui n'ont pas des pals peuvent utiliser les avirons pour créer un chemin de glissement et tirer le bateau à sec[6].

3. VAZO (letto, cradle, släde, bercéaou, base, lit, ber, berceau, vaso)[7]

Vazo désigne une structure particulière en forme de berceau, une sorte de lit mobile qui porte le vaisseau. Il peut être utilisé comme un *traîneau ordinaire, qui soutient* la *coque* du bateau et qui, glissant sur les échelles puis le chemin de falaggia, l'amène jusqu'à sa position définitive sur la plage à l'aide d'un cabestan manuel ou d'un treuil mécanique[8].

La charpente se réduit à deux longerons reliés par des barres de fer ou par des traverses (Fig. 4-5). Ils se placent parallèlement à la *quille* et à une distance de 1/3 de la largeur du vaisseau. Généralement, leurs dimensions sont 0,50 de large, 0,60 m de hauteur et environ 5m de longueur. A la différence d'un traîneau traditionnel, les patins n'ont pas un écartement fixe, et ils peuvent ainsi servir à des embarcations diverses. En conséquence, les deux patins s'attachent avec des chaînes et des barres de fer, qu'on appèle κλειδιά (clés). Pour assurer l'immersion de la structure dans la mer, afin que celle-ci reçoive la coque du bateau lors de l'opération du halage, des pièces de métal sont clouées sur les parois extérieures des patins[9].

Le terme au pluriel *vaza* ou *vazia (βάζια= structures de soutien)* est aussi employé en italien. D'ailleurs, les mêmes structures sont également attestées dans les chantiers navals d'Italie, sur les plages siciliennes et ailleurs, et même dans le fameux Arsenal de Venise. En ce qui concerne la terminologie, dans les chantiers navals contemporains grecs, on constate que les deux poutres oblongues en bois qui forment les *vazia* sont appelées *olkoi* ou *chamoulkoi*. Sur les *olkous*, on fixe des supports (*υποστάτες* ou *υπογάστρια*) destinés à caler la carène. Ainsi, on construit le *likno* (lit - letto) du vaisseau, qu'on appelle justement *traîneau* (*έλκυθρο*) et qui glisse sur des escarres stables, celles-ci suivant la déclinaison du fond du littoral. On retrouve le même type de disposition sur une représentation d'un berceau du XVIe siècle. Dans sa structure fondamentale, il est constitué de *coittes* (DEKC: pièces oblongues parallèles), de *collombiers* (EF: étais) et de la *ventrière* (GH: pièce courbe qui épouse le ventre du bateau) (Fig. 7)[10].

Toute la partie inférieure des *vazia* ainsi que les *falaggia* sont réalisés en bois d'eucalyptus, qui résiste bien au halage. L'ensemble de l'infrastructure en bois est peint de poix qui protège contre l'érosion marine. Le cas échéant, on utilise du pétrole, de l'huile ou d'autres matières.

Le processus du halage

La largeur de deux vazia s'adapte aux dimensions du bateau à haler et s'ajuste à la déclinaison de la coque du bateau (*stella*) mesurée à l'avance. Une ou deux escarres attachées sont partiellement immergées dans la mer, pour faciliter les manœuvres (βιράρισμα). Les escarres, les *falaggia* et la partie inférieure des vazia sont enduits deux ou trois fois de graisse animale pour diminuer les frictions pendant le glissement et faciliter l'opération (Fig. 6)[11].

Après la lubrification, les *vazia* sont dirigés dans la mer jusqu'à 20m de distance de la plage pour recevoir la coque du vaisseau. Un nombre limité de 6 ou 7 personnes peuvent manœuvrer la structure à l'aide de cordages, qui s'appellent μουστάκια (moustaches) et qui embrassent l'ensemble de la coque afin de la stabiliser au centre du berceau. La structure portant la coque, tirée par un treuil mécanique, glisse successivement sur les escarres et puis sur les *falaggia*, jusqu'à atteindre la position finale souhaitable dans le chantier. Une fois halés sur la plage, les vazia sont démontés. Le vaisseau est stabilisé à l'aide de poutres oblongues (des étançons - *pountelia*) et de structures en bois (tins, *takoi* - *skaria*)[12].

B. DISPOSITIFS DU HALAGE ANTIQUE

Les escarres, les *falaggia*, les *pountelia* et les *skaria* sont les solutions pratiques et communes adoptées jusqu'à la fin de l'époque pré-industrielle dans les communautés maritimes. Les sources littéraires et iconographiques ainsi que les vestiges archéologiques attestent leur présence et utilisation dès l'antiquité.

1. ESCARRE

Les escarres de lancement, communes partout, sont attestées dès l'époque d'Athénée pour le lancement du vaisseau célèbre de Ptolémée Philopator (*Deipnosophistae* 5, 204c): καθειλκύσθη δὲ τὴν μὲν ἀρχὴν ἀπὸ ἐσχαρίου τινός), comme le note également Eustathe de Thessalonique[13], P, 1575, 44. 'Αθήναιος δὲ καὶ ἐσχάριον παραγώγως οἶδε δι' οὗ καθέλκονται νῆες εἰς θάλασσαν. Etymologiquement, le terme n'a pas changé de sens jusqu'à aujourd'hui: (ἐσχάριον, ἐσχάρα, σχάρα).

Des représentations de telles échelles, utilisées aussi dans les chantiers navals sous l'empire ottoman (Fig. 5)[14], sont fournies par des gravures du XIXe siècle sur les Monastères de Mont Athos (Fig. 8). Ils font partie du dispositif des *arsanades* (les *neosoikoi* du Moyen Age) et leur présence est attestée jusqu'à récemment (Fig. 9)[15]. Notons cependant la similarité du plan de l'installation de Thurii, du fin du Ve siècle av. J.-C., où le plafond des cales conserve clairement des traces d'un réseau de rainures destinées à recevoir une structure en bois en forme d'échelle d'échouage à trois montants, avec le plan d'aménagement de l'échelle du halage de l'*arsanas* byzantin (Fig. 11)[16].

2. PHALAGGAE

Le terme est utilisé dès l'antiquité pour désigner un type de *'machines navales'* de halage. En général, *phalanga* (φάλαγξ)[17] désigne la bille de bois ou le rondin (*fustes terretes*), c'est-à-dire le rouleau commun utilisé lors du transport de petits fardeaux. Le terme *falaggae* a également une signification technique par excellence maritime et désigne des poutres de bois couramment utilisées pour le halage encore de nos jours. L'utilisation des *falaggae* dans les pratiques maritimes est attestée d'ailleurs par un passage d'Apollonios Rhodios (*Argonautica* B.843)[18], quand Orphée invite son équipage à placer sur la tombe de Idas, un compagnon décédé, l'une des *falaggae* qui servaient au halage à sec d'*Argo*. La *falagga* en olivier sauvage (νήιος ἐκ κοτίνοιο φάλαγξ) aurait servi à identifier le défunt, comme la rame plantée sur le tombeau d'Elphénor.

Bien que dans la littérature le terme soit traduit d'habitude comme 'rouleau', il désigne probablement aussi de simples chevrons[19]. Ainsi, pendant le lancement célèbre du même vaisseau mythique décrit à nouveau par Apollonios Rhodios (*Argonautica*, A 367-391[20]), des *falaggae* sont disposées dans le chenal creusé qui amène à la mer. Le navire se porte en glissant sur eux (ὀλισθαίνουσα), ce qui démontre clairement qu'il s'agit de chevrons. Egalement, dans les hymnes orphiques (*Argonautica* 270-1), *Argo* se lance si rapidement qu'il disperse les *falaggae* disposées sous la quille: 'θαμινάς ... φάλαγγας'.

A Alexandrie, elles sont utilisées à la fin du IIIe siècle pour le lancement d'un autre navire célèbre, le *tessarakontiris* de Ptolémée Philopator. Athénée (*Deipnosophistai*, 5.204 c-d) cite d'après Callixène de Rhodes (*On Alexandria I)* comment un mécanicien phénicien a construit exceptionnellement pour ce vaisseau une cale à sec[21]. Dans un chenal de 5 cubiques de profondeur, il a disposé transversalement des chevrons de 1 cubique de hauteur (φάλαγγας ἐπικαρσίας κατά πλάτος τῆς τάφρου διώσας συνεχεῖς τετράπηχυν εἰς βάθος τόπον ἀπολειπούσας). Après avoir inondé le chenal et tiré le vaisseau à l'intérieur, il a pompé l'eau jusqu'à ce que le navire se soit posé sans risque sur les chevrons: ἡδράσθη τὸ πλοῖον ἀσφαλῶς ἐπὶ τῶν προειρημένων φαλάγγων.

Les *falaggae* servent, d'ailleurs, à une remarquable opération de transport terrestre des vaisseaux militaires. Polyaenius (5.2.6) raconte comment Denys I a transporté dans le port de Motya fermé par Imilicion ses 80 trières en une journée. Il précise que le passage où se faisait le transport, était régulier et boueux et avait 20 stades de longueur. Pour aménager le chemin, les soldats avaient pourvu tout le chemin avec des *falaggae*: τόπος ἦν ὁμαλὸς καὶ πηλώδης, εὖρος εἴκοσι στάδια· τοῦτον οἱ στρατιῶται ξύλοις φαλαγγώσαντες ὑπερήνεγκαν ὀγδοήκοντα τριήρεις ἡμέρᾳ μιᾷ.

Cette partie de l'infrastructure en bois est, en outre, mentionnée par des écrivains latins comme Nonius Marcellus en tant que dispositif du halage maritime (163, 23: *phalangae dicuntur fustes teretes, qui nauibus subiciuntur, quum attrahuntur ad pelagus, uel quum ad litora subducuntur*)[22]. César (BC II, 10, 7)[23] les caractérise comme des *'machines navales'* et les utilise pour le déplacement d'un tour lors d'une opération militaire. On pense alors à Horace (Od. IV, 2) qui mentionne que les *machinae* font glisser les quilles à sec *'trahuntque siccas machinae carinas'*.

Le terme apparaît dans les gloses des lexicographes tardifs, comme Photius et Suidas dans un sens moins restreint et se retrouve aussi sous la forme de diminutifs (φαλάγγια et φαλαγγώματα)[24]. Il désigne en général les poutres de bois, qui soutiennent la coque du vaisseau une fois halé à sec, c'est-à-dire soit les chevrons, soit les étançons. Ainsi, Photius les considère comme *ypereismata* du navire φάλαγγες καὶ νεὼς ὑπερείσματα, tandis que Eustathius Thessaloniceus les désigne comme *ermata*[25]. Dans le *'Megisti'*, le Code Byzantine de l'Athos, il y une référence au verbe *φαλαγγώνω*, qui signifie le positionnement des *falaggia* sur l'escarre pour le lancement du bateau[26]. On retrouve cette signification chez Polyaenus, comme déjà cité, dans le cadre de l'aménagement d'un chemin terrestre des trières.

Pour finir, Pollux précise que les *falagges* ne constituent qu'une partie des engins de halage (VII, 190 : νεωλκοὶ τὰ δὲ τῶν νεωλκῶν ξύλα, οἷς ὑποβληθεῖσιν ἐφέλκονται αἱ νῆες, φάλαγγεςκαὶ φαλάγγια). Les autres composants méritent une étude séparée, sur laquelle on reviendra par la suite.

Vestiges Archéologiques

L'étude des installations portuaires confirme les données littéraires. Les vestiges archéologiques des hangars de Cos, de Rhodes et de Thurrii attestent de l'encastrement des escarres en bois et des chemins d'échouage sur les rampes en pierre ou en mortier. D'autres, comme Carthage et Marseille conservent de façon exceptionnelle des vestiges des transverses en bois de charpente

A Carthage, trois cales (nos 16, 13 et F762) conservent à la surface des poutres transversales posées parallèlement et à intervalles réguliers (Fig. 13). Les traces d'un trou de mortaise préservées sur une des traverses marquent probablement la position d'un chemin de glissement posé verticalement qui aurait servi pour guider les quilles des vaisseaux hissés et portés probablement sur un berceau[27]. A Cos, à l'intérieur des môles, qui délimitaient les loges, il y avait des rangés parallèles d'assises de pierres, sur les parois intérieures desquelles se trouvaient des encoches carrées qui servaient à l'encastrement des poutres transversales du plan de glissement. A mi-distance entre les rangées de pierres, on a révélé quatre pierres isolées avec une cannelure à l'étendue supérieure qui assurait le soutien des transverses (Fig. 14)[28]. A Rhodes, pendant la deuxième phase de construction, on trouve également des encoches sur la paroi intérieure des rampes latérales, qui servaient plutôt pour l'encastrement des poutres transversales, que pour caler les étançons, bien que ces derniers aient été aussi certainement employés. On suppose que le système des poutres transversales reposait, selon toute probabilité, sur une rampe solide, qui supportait les tensions du poids du navire[29].

Pour finir, à titre également d'une comparaison ethno-archéologique, on constate qu'à Canton en Chine, dans un chantier de construction navale de la période de Chin (246-207 av. J.-C.), les trois cales sèches dégagées comprenaient chacune deux rangées parallèles de poutres glissières posées sur des traverses en bois. Sur les poutres, des billots de bois verticaux placés l'un en face de l'autre se correspondaient d'une poutre à l'autre[30].

3. SCUTALAE

Les rouleaux sont par excellence désignés par le terme grec *σκυτάλη* (*scutulae* en latin), et sont traditionnellement employés au lancement des vaisseaux jusqu'à aujourd'hui. Pendant l'antiquité, ils sont employés à une autre opération militaire de transport terrestre des vaisseaux. Ainsi, on apprend par César (*BC III*, 40. 2) que durant la Guerre Civile, Pompée le fils, après être entré dans le port de Oricum où Acilius défendait la flotte, a fait passer quatre de ses *birèmes* dans le port intérieur par dessus la digue naturelle qui protégeait le port à l'aide des *scutulae* manoeuvrées par des leviers (*uectibus*) [31]. On a ici une mention directe de l'emploi de rouleaux pour le déplacement des vaisseaux militaires de grand tonnage à travers une sorte de péninsule. L'opération est très similaire à celle entreprise par Denys I, bien qu'à cette occasion on a une référence unique sur une opération complète de transport terrestre des vaisseaux effectuée à l'aide de rouleaux et de simples machines, à savoir des leviers. En ce qui concerne l'utilisation de leviers, notons qu'ils apparaissent déjà dans un contexte maritime chez Homère à l'occasion du lancement du bateau d'Ulysse construit sur l'île de Calypso (*E 261*: μοχλοῖσιν δ'ἄρα τήν γε κατείρυσεν εἰς ἅλα δῖαν)[32].

Cependant, on peut facilement reconstruire un système de halage en rouleaux grâce aux fouilles du port antique de Marseille. En effet, les fouilles récentes ont dégagé la partie du port militaire qui comprend les zones du littoral aménagées en 'cales ouvertes' et en *neosoikoi*. Le dispositif fouillé atteste de façon incontestable l'utilisation d'un système de halage à l'aide de chevrons et de rouleaux mobiles attachés aux cordages (Fig. 10, 12)[33]. Pourtant, l'utilisation de rouleaux semble plus probable sur des plages ouvertes ou des chemins de halage de faible déclinaison, à l'exemple du dispositif fouillé à Marseille. Dans les *neosoikoi*, leur utilisation est considérée comme redoutable, surtout à cause de l'inclination de la rampe.

4. ETANCONS

Dans la littérature, on retrouve les termes ἕρματα, ὑπερείσματα, διερείσματα[34], qui désignent en général les supports qui calaient le vaisseau latéralement et maintenaient la coque en position verticale. Il pourrait s'agir d'étançons (ou 'épontilles'), de tins ou de simples cales.

Dans l'Iliade, les navires noirs après avoir été tirés à sec sur la plage sont soutenus par de longs étais (Homère, Iliade I, 485-486: νῆα μέν οἵ γε μέλαιναν ἐπ'ἠπείροιο ἔρυσσαν ὑψοῦ ἐπὶ ψαμάθοις, ὑπὸ δ'ἕρματα μακρὰ τάνυσσαν). Par ailleurs, lorsqu'il s'agit de lancer de nouveau un navire tiré à sec, l'équipage nettoie le chenal de glissement et retire les étais (Homère, Iliade II 153 : οὐρούς τ'ἐξεκάθαιρον ...ὑπὸ δ'ᾕρεον ἕρματα νηῶν). Morrison traduit les *hermata* comme des piles des pierres[35], qu'on construit

d'un côté et de l'autre du fossé creusé, où le vaisseau repose. Il se fonde davantage sur le texte de Hésiode, *Les Travaux et les Jours,* 624-625: νῆα δ'ἐπ' ἠπείρου ἐρύσαι πυκάσαι τε λίθοισι πάντοθεν, ὄφρ' ἴσχωσ' ἀνέμων μένος ὑγρὸν ἀέντων.
Le terme désigne sans doute les supports de la carène halée, qu'il s'agisse de poutres oblongues ou de pierres. Cependant, les *hermata makra* sont probablement de longs étançons, qui soutenaient le navire des deux côtés, tandis que des pierres ou des billots des bois (tins, skaria) servaient également à caler la quille sur la plage.

De plus, les termes ὑπερείσματα, διερείσματα, qui apparaissent déjà chez les lexicographes pour la glose de *falaggae* désignent soit des épontilles qui maintiennent le vaisseau en position, soit des échelons sur lesquelles repose la quille. Un inventaire de Délos (ID, 1403, Bb, col. I, l. 39-40), sur le *Neorion*, un édifice en forme de cale sèche destinée à abriter un navire de guerre dédié au temenos d'Apollon après une victoire navale[36], mentionne [καὶ διερείσματ]α τὰ ὑπὸ τ[ῆι τ.][37], se référant probablement aux chevrons transversaux qui portaient la quille du vaisseau sacré.

En outre, dans l'Inventaire Naval d'Athènes, on a des références diverses aux *parastates* (IG II^2 1611, 38-41: 454 *parastates* pour 227 vaisseaux), qui sont catalogués comme des composants importants de l'agréement d'une trière, deux pour chacune. Il est déjà suggéré qu'ils désignent probablement des étançons qui supportent la quille[38], bien qu'ils soient également interprétés comme supports du mât[39]. Le fait qu'on n'en énumère que deux pour chaque trière favorise la deuxième interprétation, tandis qu'étymologiquement *parastatis* peut avoir plusieurs significations.

Dans l'iconographie, les étais apparaissent sur la fresque connue de Pompéi, dite 'shipsheds frescoe', qui représente des navires tirés dans leurs loges[40]. De plus, les *δρύοχοι* (dryochoi) et les *τροπίδια* (tropidia)[41], c'est-à-dire les supports de la carène lors de sa construction dans le chantier, attestés dans les sources antiques sont gravés sur la stèle de P. Longedienus de l'époque impériale, représentant une scène de chantier naval (Fig. 15)[42]. Les *tropidia* et les *dryochoi* assurent la stabilisation de la coque, comme auparavant les piles de pierres (Hésiode, *Les Travaux et les Jours*, 624-625).

La présence des étais est, en outre, démontrée par les vestiges archéologiques des hangars de Rhodes[43] et les fouilles récentes au port antique de Marseille. Un dispositif fortement original a été découvert grâce à la conservation exceptionnelle des matières organiques sur le site. On a ainsi pu dégager une cale ouverte creusée dans le sable avec des tins centraux pour supporter la quille, des épontilles éparses sur le bord de la fosse, mais dont les cales sont encore en place (Fig. 16)[44].

5. VAZIA

L'utilisation des structures en traîneaux (carcasses) pour le halage antique n'a pas été considérée probable. Pourtant, il s'agit d'un système de halage qui minimalise le grand risque du mouvement latéral pendant le lancement et le halage dans une cale, sur une plage ou sur un plan incliné. D'ailleurs, comme on peut facilement constater, il est attesté dès une époque très précoce comme moyen de transport sur terre instable des fardeaux et même des vaisseaux. Avant d'étudier son emploie plausible dans les *neosoikoi* classiques, revisont sa structure fondamental et la manière de son utilisation comme ils ont attesté dans les civilisations antiques et surtout en Egypte.

Le Traîneau, moyen de transport des fardeaux

Attesté dès 7000 av. J.-C. en Europe du Nord, le traîneau est répandu presque dans toutes les civilisations comme le moyen le plus courant pour le transport des charges lourdes sur des sols instables. Il constitue donc le moyen de transport par excellence des Egyptiens et des Assyriens utilisé dès la troisième millénaire av. J.-C. et demeure en Egypte un instrument de travail même après l'introduction de la roue à l'époque d'Hyksos, surtout pour le transport des fardeaux de plus de 20 tonnes qui ne peuvent pas être voiturés[45]. D'ailleurs, il est massivement utilisé par les Grecs du VIe et du Ve siècle dans les carrières et les chantiers de construction[46].

Des parallèles ethnographiques montrent que la pratique de tirer de statues monolithiques ou des troncs de bois se poursuit jusqu'aujourd'hui dans les îles de Pâques, en Malaisie et ailleurs (Fig. 17)[47]. En outre, le traîneau de forme Y est d'un dessin si élémentaire, que son utilisation n'implique pas nécessairement de contact historique ou culturel.

1. Indices iconographiques

Plusieurs parallèles iconographiques de l'époque assyrienne et égyptienne, de valeur incontestable pour la technologie ancienne, représentent le transport par traîneau de matériel de construction et d'équipement funéraire, tirés par la force humaine ou animalière sur le sol ou sur un chemin de glissement lubrifié.

La célèbre peinture murale égyptienne dans le tombeau de Djehutihotep à Gebel El Bersheh (XIIe dynastie) (ca. 1880 av. J.-C.) est un document fondamental qui représente le déplacement d'un colosse égyptien de 60 / 70 tonnes fixé sur un traîneau par l'intermédiaire de câbles et tiré par 172 ouvriers tracteurs en quatre doubles files (Fig. 18)[48]. Les blocs des pierres extraites de la Carrière à El Maasara (XVIIIe dynastie) sont halés sur traîneau tiré cette fois-ci par force animalière, par trois paires des bœufs (Fig. 19)[49]. Les deux obélisques de la reine Hatshepsout lors les carrières sont embarqués de Assouan à Karnak fixés sur des traîneaux, comme illustrent les peintures murales du temple de Deir el-Bahari à Thèbes[50]. Les traîneaux devaient être plus de 30m de long et construits de troncs de bois entiers. Les bas-reliefs assyriens de Kouyunjik à Ninève montrent une technique pareille utilisée environ 700 ans plus tard par le roi Sennacherib (VIIe siècle av. J.-C.) pour le transport des statuaires des dimensions immenses de la carrière de Mosule au long de Monts Kouyunjik au palais et dans la bibliothèque (Fig. 21-22)[51]. Notons la disposition des chevrons (et pas des rouleaux[52]) devant le traîneau aux intervalles réguliers, afin de préparer un chemin de halage ferme pour le traîneau. D'ailleurs, il est déjà suggéré que le chemin de glissement soit lubrifié pour réduire la friction[53]. Cela est plus manifeste sur les représentations de transport des statues en patins sur plusieurs registres du tombeau de Ti. Un homme verse de liquide devant les patins, ce qui semble plus un acte de lubrification qu'une scène de purification (Fig. 23)[54]. Cependant, la lubrification du chemin (avec de l'eau, du lait ou d'huile[55]) semble plus manifeste sur des représentations des tombeaux de pyramides de Abusir- Sakkara[56], à la tombe de Tetaky à Thèbes[57] et sur la peinture murale de El Bersheh[58], cité auparavant, et demeure sans doute une étape importante de l'opération jusqu'à aujourd'hui[59].

En ce qui nous intéresse le plus, des bateaux également tirés sur des traîneaux apparaissent souvent dans l'iconographie égyptienne. D'ailleurs, le transport rituel de la statue de culte ou de la barque funéraire sur traîneau est fréquemment représenté sur les parois des cercueils de la Deuxième Période Intermédiaire. Le traîneau est indiqué par l'engin que représente le signe hiéroglyphique *tm.t* [60].

A Mirgissa dans la nécropole M X, sur le cercueil de la tombe 130

–12, un panneau latéral aux couleurs vives représente le transport de la barque funéraire sur traîneau tiré par des taureaux (Fig. 24)[61]. Egalement, dans le '*Livre des Morts*' des anciens Egyptiens, à la vignette générale dans la première grande division du Livre des Morts, qui présente en brefs épisodes juxtaposés la marche du cortège funèbre vers la nécropole, le sarcophage se trouve dans une barge placée sur traîneau halé originellement par des taureaux[62].

2. Vestiges archéologiques

Des vestiges archéologiques confirment les données littéraires et iconographiques. Des traîneaux cérémoniels de chêne ou de hêtre de dimensions réelles, ainsi que des modèles, ayant servi vraisemblablement au transport du matériel funéraire ont été révélés dans les débris des pyramides du roi Se'n-Wosret I à el Lisht, de Hawara et dans le tombeau de Tutanchamun[63]. De plus, un somme de 36 modèles des traîneaux constituait une partie du dépôt du temple de la reine Hatshepsout à El-Deir el-Bahari[64].

Le plus grand traîneau en bois de 4,21m de longueur sur 0,78-0,80m de largeur, qui date de la XIIe dynastie, a été découvert à côté de la pyramide Se'n-Wosret III à Dahchour, enterré dans des décombres à côté des barques en bois. Constitué par deux fortes pièces de bois formant patins, assemblés par des traverses encastrées à tenon et mortaise, il avait probablement servi au transport du bateau royal de 10m de longueur (Fig. 20)[65].

Chemins de glissement

Le déplacement par traîneau impose la régularisation et la lubrification du sol. Aujourd'hui, on a repéré des traces de certains chemins de glissement dans les carrières d'extraction des matériaux et à proximité des chantiers des pyramides. Ils présentent généralement la même disposition qu'on observe dans l'architecture des hangars de l'époque classique et hellénistique, ainsi que dans les chantiers navals modernes: disposition des traverses de bois encastrées, afin de constituer un chemin de glissement.

a. Rampes de construction

En Egypte, en particulier, on a repéré un certain nombre des rampes de construction en briques crues ou en pierre, qui servaient postérieurement de rampes d'accès au temple funéraire, sur lesquelles était tiré le traîneau qui portait le coffre ou le bateau funéraire lui-même[66]. Certains de ces rampes repérées sont armées de poutres de bois d'acacia ou des troncs de dattiers posés transversalement pour constituer un chemin de glissement et distribuer le poids des fardeaux sur une surface plus ample. Ainsi, au temple de Mentuhotep à Deir el Bahari, la rampe de construction se constituée d'une série de 18 poutres d'acacia, tandis qu'à la pyramide de Amenemhat à Lisht des poutres de bois de construction navale réutilisé ont été insérées dans la terre et le mortier (largeur de 6,5m)[67]. Autour de la pyramide de Senwosret I à Lisht un grand nombre des rampes de même type de construction ont été également fouillées. Quand la largeur de rampe l'imposait, deux poutres de bois ont été posées de façon que leurs extrémités se recouvrent au centre[68].

b. Glissières de carrières

Au Moyen Empire, une disposition similaire se trouve dans les carrières de Lahoun. Le chemin de glissement a été aménagé à flanc de colline pour la descente des blocs de pierre et a été repéré à proximité de la pyramide de Senusert II (Fig. 25-26). Les poutres qui arment la piste (3,6m de largeur), insérées dans le rocher ou encaissées dans le gravier provenaient des bateaux. Placées en travers du chemin, il semble qu'elles servaient de support à de longues poutres transversales. Il est possible que les patins des traîneaux glissent sur trois poutres transversales à la fois, bien qu'il n'y ait pas des traces d'usure au-dessus des poutres[69].

Les carrières antiques grecs fournissent des exemples de chemins de glissement presque identiques[70]. Les vestiges des chaussées empierrées des carrières nous indiquent les différentes méthodes d'évacuation des produits des carrières. Pour ceux dont la descente était totalement effectuée par glissières, comme à Pendèli[71] et aux carrières romaines d'Eubée[72], des ornières peu profondes qui jalonnent plusieurs tronçons de la route empierrée permettent la reconstruction des patins des traîneaux. En ce qui concerne la mécanique de l'opération, notons qu'aux glissières de Pendèli, on retrouve au long du chemin des cavités pour des potelets de bois destinés à amarrer les cordes de traction pour retenir le traîneau sur la voie (Fig. 28)[73]. En Egypte, une disposition pareille a été révélée à la Khor Sud de la pyramide de Senwosret I à Lisht[74].

c. Glissière de bateaux

Notons enfin la découverte exceptionnelle d'une glissière découverte à Mirgissa en Nubie qui servait par excellence au transport terrestre des bateaux hissés sur des traîneaux. Datée du Moyen Empire ou de la Deuxième Période Intermédiaire, elle doublait la zone de la Deuxième cataracte où la navigation n'est à la rigueur possible qu'en période de crue. La piste était une bande étroite de limon du Nil, posée sur le sable et armée, de place en place, de poutres de bois enrobées transversalement dans le limon (Fig. 27)[75]. Des empreintes longitudinales, dont le fond est plat et lisse, sont visibles sur la totalité de la longueur de la piste et constituent des traces de patins de bois soigneusement rabotés et assemblés par paires pour former un sort de traîneau. Le glissement était facilité probablement par l'arrosage du sol, surtout puisque le limon du Nil a une certaine viscosité, qui le rend particulièrement glissant lorsqu'il est mouillé[76].

La disposition de la glissière de Mirgissa est assez relevante et peut offrir une parallèle valable pour le transport terrestre des vaisseaux, conforme d'ailleurs avec les sources littéraires. La description de Polyaenus, cité ci-dessus, sur la préparation d'un chemin boueux avec des chevrons pour le transport des trières semble être la plus proche, bien qu'on n'ait pas des détails sur le dispositif utilisé. On peut, pourtant, présumer que les 'cales ouvertes' classiques, c'est-à-dire les chemins en bois pour le halage des flottes militaires sur des plages auraient fonctionné de la même façon.

Ainsi, on constate en général, qu'en Egypte antique, le déplacement des bateaux, comme d'autres fardeaux, se faisait sur traîneaux qui glissaient sur des chemins proprement aménagés et équipés et qui étaient tirés par la force humaine ou animalière. Puisque de telles glissières sont attestées dans les hangars classiques par les vestiges archéologiques et les vaisseaux sont des fardeaux assez considérables à déplacer, peut-on supposer que des structures en forme de traîneau faisaient également partie du dispositif du halage?

LE TRAINEAU DANS LES HANGARS CLASSIQUES

Jusqu'à aujourd'hui, on a considéré comme douteux l'utilisation du traîneau dans le cas du halage antique, en particulier pour la trière, vaisseau long et fin[77]. Des questions techniques, l'absence d'une dénomination explicite dans les sources littéraires et le manque de vestiges archéologiques ont contribué à renforcer cette opinion. Cependant, certains points doivent être réétudiés et reconsidérés.

Comme on a déjà constaté, l'étude du profil longitudinal du plan incliné des cales fouillées révèle des traces de bois ou des encastrements pour recevoir des traverses. Il reste, pourtant, à éclaircir si la quille glisse directement sur les *falaggia* ou si la trière est halée à l'aide d'une structure de soutien. Le glissement de la quille sur les chevrons est attesté par les traces d'usure qui portaient les poutres fixes des cales ouvertes du port hellénistique de Marseille et se déduit implicitement par la constatation de Théophraste (V.7.2) qui spécifie que la quille des trières est faite de bois de chêne pour endurer le halage[78]. Cette remarque est davantage conforme avec les vestiges de l'archéologie sous-marine et la découverte des fausses quilles (*χέλυσμα*) sur les épaves antiques[79]. Par conséquent, il est évident, que sur certaines cales et sur des plages ouvertes, les navires glissent sur leurs quilles.

Cependant, pour ce qui concerne les grandes bases navales de l'antiquité, on peut supposer une 'mécanisation' de l'opération de halage et même l'installation d'une infrastructure plus permanente et performante. L'architecture des grands complexes de *neosoikoi* suggèrent que le halage des navires de guerre constituait une opération très précise, effectuée sans risques pour les installations et surtout pour les vaisseaux, qui étaient d'un coût très élevé. Par conséquent, on peut supposer que les anciens ont dû essayer de limiter les risques quant au mouvement latéral du vaisseau. L'opération apparaît à priori comme courante et banale vu qu'on ne retrouve aucune allusion à d'hypothétiques accidents ou difficultés lors de sa réalisation. Cette constatation nous conduit à penser que le dispositif utilisé était assez sûr et pratique à manœuvrer.

Avant de procéder à l'étude des données littéraires et archéologiques certains points doivent être éclaircis au niveau technique:

A. La pratique moderne montre qu'un vaisseau de coque en forme de V, qui pèse 100 tonnes et mesure 25m de longueur et 7m de largeur est halé sur une plage de faible déclinaison à l'aide de deux *vazia* de 15m de longueur. Une trière qui pèse 35 tonnes environ peut s'accommoder sur un traîneau d'au moins 15m de longueur et de 2,5 à 3m de largeur.
B. Les vestiges des cales de *Carthage* impliquent l'existence d'un chemin de glissement de la quille perpendiculaire aux chevrons encastrés dans la rampe. Le même dispositif est a été probablement utilisé dans les

hangars d'*Apollonia* et de *Rethymno* qui disposent une rainure centrale probablement pour l'encastrement d'un chemin de glissement en bois. Il est déjà suggéré que ces cales auraient nécessité l'utilisation de berceaux afin d'éviter la tension accumulée au point central de contact de la quille avec les chevrons longitudinaux[80].

C. Dans les hangars fouillés, la construction et le profil des rampes, ainsi que certains détails architecturaux suggèrent, comme on l'a déjà évoqué, que différentes techniques de halage soient employées. En ce qui concerne les loges qui possèdent des encastrements pour recevoir des chevrons, comme Cos, Carthage, Rhodes et Thurii le chemin de glissement du traîneau est bien défini. En ce qui concerne les hangars possédant des rampes en pierre de 3m environ de largeur (Pirée, Kition), ils peuvent également accommoder des structures de soutien en forme de traîneau, même si les rampes ont un profil concave comme dans les hangars de Rhodes ou de Carthage. Le traîneau qui soutiendra la partie horizontale de la quille ne doit pas être de plus de 15 à 20m de longueur. Par exemple, à Carthage, où les rampes se divisent en deux parties de déclinaisons différentes, la partie destinée à recevoir la quille a une longueur de 24m, tandis que la partie concave pour la poupe n'est que de 10m de long[81].

D. Le halage en berceau demande, en effet, une longueur supplémentaire de la partie immergée de la cale[82]. Cependant, des traîneaux peuvent être utilisés même dans des cales, dont la partie immergée n'est pas considérable, pourvu qu'une infrastructure en bois en forme d'escarre prolonge le plan incliné. Pourtant, la déclivité des rampes ne doit pas dépasser le 12%. Cette restriction convient à la plupart des hangars fouillés, à l'exception des cales de *Sounion* ou de *Seteia* par exemple, qui de toute façon ne servaient pas au halage des trières, mais des vaisseaux de patrouille plus petits.

E. En ce qui concerne la modification de la hauteur du *neosoikos*, les patins longitudinaux étant seulement environ 60-70m de hauteur, ne soulèvent pas la trière de façon considérable. La modification de la hauteur peut être insignifiante, surtout si des cordages relient les deux patins et non des traverses, qui soutiennent la quille perpendiculairement. Il faut, pourtant, préciser qu'il existe de différents types de berceaux, dont certains possèdent des patins avec des montants verticaux et des cales qui s'ajustent à la forme de la coque du vaisseau. La présence de tels berceaux, qui atteignent une hauteur considérable, est souvent attestée en Italie.

Ainsi, les *berceaux* en forme des simples poutres obliques pourraient jouer le double rôle de soutien et de guidage de la quille, au même titre que les chemins de glissement trouvés à Carthage et indiqués ailleurs. Placés parallèlement à l'axe de la quille, ils constituent un support latéral et vertical de la partie inférieure de la coque, support mobile qui glisse sur les traverses.

1. LES SOURCES LITTÉRAIRES

Le traîneau reste un moyen de transport très courant dans le monde classique et est souvent mentionné dans les textes.

La structure et l'utilisation du traîneau (χελώνη = tortue) en tant que moyen de tirer des fardeaux sur le sol, est explicitement décrit par Héron d'Alexandrie (Ier siècle ap. J. -C.) (*Mechanica III, 1*): χελώνη. τὰ μὲν οὖν ἀγόμενα ἐπὶ χελώνας ἄγεται. Ἡ δὲ χελώνη πῆγμα ἐστίν, ἐκ τετραγώνων ξύλων συμπεπηγός, ὧν τὰ ἄκρα ἀνα σεσίμωται. Ταύταις οὖν ἐπιτίθεται τὰ βάρη καὶ ἐκ τῶν ἄκρων αὐτῶν ἤτοι πολύσπαστα ἐκδέννυται ἤ ὅπλων ἀρχαί. 'Les fardeaux qui sont traînés à terre le sont sur la tortue. C'est un corps solide formé d'une pièce de bois équarrie et arrondie aux deux bouts. Sur cette pièce sont placés les poids; à ses extrémités on attache des câbles *ou quelque autre chose que l'on tend et par quoi on tire la tortue*'[83].

D'ailleurs, il étudie trois possibilités pour que le traîneau avance, représentées par Pappus dans le Manuscrit de Vatican (Fig. 30). Si le fardeau est léger, le traîneau est tiré sur des pieux de bois arrondis (σκυτάλαις χρῆσθαι δεῖ); si le poids est considérable, on emploie des chevrons (ταῖς σνίσιν), parce que le mouvement est alors moins rapide; parfois, on place aux deux extrémités des roues robustes (τροχοὺς ναστοὺς) sur lesquelles le fardeau se meut.

Il précise d'ailleurs, que l'on tire le câble à la main ou à l'aide de différents instruments et que la *tortue* est traînée sur des rouleaux ou des chevrons disposés sur la terre: τα[ῦα δὲ ἤτοι ἀπὸ χειρὸς ἕλκεται ἤν εἰς ἐργάτας ἀποδίδοται, ὧν περιαγομένων ἡ χελώνη ἐπὶ τοῦ ἐδάφους σύρεται ὑποβαλλομένων σκυταλίων ἤ σανίδων.

On peut sans risque supposer que dans les hangars où les traîneaux étaient utilisés, ceux-ci glissaient plutôt sur des chemins en chevrons lubrifiés et pas sur des rouleaux, dont l'utilisation dans les cales pourrait même se révéler très dangereux, surtout à cause de l'inclination des rampes[84]. Héron (Mech. III, 1) précise le danger: αἱ γὰρ σκυτάλαι κυλιόμεναι κίνδυνον ἔχουσι τοῦ φορτίου ὁρμὴν λαβόντος.

Cependant, est-ce que l'utilisation du traîneau est attestée dans les sources littéraires pour le halage des vaisseaux?

La structure n'apparaît pas dans les Inventaires de la Marine d'Athènes ni dans les inscriptions parmi l'agrément des vaisseaux, bien que, comme Coates le remarque, il serait un engin assez considérable. Cependant, notons qu'aucun élément de l'infrastructure de halage n'est inventorié. On croit en général que cela est dû au fait qu'une fois les vaisseaux calés, les engins de halage restent au-dessous des carènes et donc ils ne font pas partie du dépôt des skeuothèques[85].

De plus, les sources littéraires qui se réfèrent à l'opération du halage sont rares et éparses et, dans la plupart des cas, il s'agit des textes poétiques ou de gloses de lexicographes tardifs. Des quelques phrases des œuvres littéraires, on déduit des termes comme: *olkos*, *chamulcos, machinae,* dont la signification est étroitement associée à l'opération de halage, mais dont l'interprétation reste obscure[86]. Ainsi, surtout pour le terme de *holkos* on trouve des traductions et des interprétations aussi diverses que hangar, cale, port, lieu d'embarquement ou encore machine à tirer. La confusion persiste chez les lexicographes, entre le sens premier du terme et son extension sémantique qui désigne l'endroit où se trouvent les engins de halage[87].

L'absence d'une référence explicite à une sorte de berceau lors de l'opération de halage peut aussi s'expliquer par le fait que, d'habitude, ce type d'infrastructure est désigné par le terme général μηχανή ou *machinae* sans autre précision. A titre d'exemple, Pollux (X, 147-148) parmi les outils du maçon, il ajoute la μηχανὴν λιθαγωγόν, qui correspond selon toute probabilité à la ἐσχάρα λιθηγός mentionnée dans un inventaire de Délos (IG XI, 2, 203 B, l. 97), et qui désigne la 'tortue' (traîneau) utilisée pour le transport des blocs de construction (Fig. 28). De même, Hérodote mentionne que les Egyptiens ont utilisé des *machinae* pour la construction de pyramides et, comme déjà suggéré, il se refère probablement aux traîneaux[88].

La même ambiguïté apparaît dans les récits des historiens. A titre d'exemple, pendant une opération de voiturage des navires militaires lors de l'épisode célèbre de 212 av. J.-C. à Tarente, Hannibal a transporté sa flotte bloquée dans le port interne par les Romains à travers la ville jusqu'à la mer. Par divers propos[89], on apprend que les bateaux qui mouillaient dans le port intérieur ont été halés à sec à l'aide des *machinae*; un chemin a été préparé à travers la ville jusqu'à la mer extérieure; les navires ont été montés sur des *plaustra* et tirés à l'aide d'hommes et de bœufs. Parmi les machines employées, Silius Italicus (*Pun.*, XII, 444-446)[90] mentionne les termes *substramina lubrica,* dont l'interprétation reste controversée.

Il a déjà été démontré que le terme *substramina* ne désigne pas des rouleaux, qui seraient difficilement conciliables avec les *plaustra* de Tite Live[91]. Conformément à l'étymologie du terme, il peut aussi s'agir du matériel déposé par terre pour aplanir la surface pour le passage des véhicules[92]. D'ailleurs, l'aménagement du chemin pour faciliter l'opération du voiturage est mentionné par Tite-Live (*minitumque iter, quo faciliora plaustra).* De l'autre côté, Raepsaet et Spaltenstein ont présumé avec raison que les termes *substramina lubrica* et *plaustra* se réfèrent à des opérations différentes et à des moyens de halage et de transport alternatifs bien que complémentaires. L'opération devient parfaitement compréhensible en supposant que les bateaux étaient premièrement halés à sec à l'aide de planches suiffées, puis montés sur des chariots et finalement transportés à travers l'isthme[93]. D'ailleurs, une décomposition identique presque se propose pour l'opération de voiturage dans le cadre du fonctionnement de *Diolkos* en Corinthe, où les vestiges 'suggèrent des moyens de transport différents, avec transfert d'un type de support vers un autre. Peut-être les trières passaient-elles d'un traîneau vers un chariot...'[94].

D'ailleurs, un autre terme latin qui correspond probablement au 'berceau' dans le contexte maritime est le *pulvinus-i,* d'étymologie indéterminée, qui désigne en général tout objet ayant la forme d'un coussin, de lit, ainsi que l'oreiller ou le traversin. Le terme est utilisé par Plaute (*Casina* 557)[95] quand dans une plaisanterie il associe le lieu où les vaisseaux reposent sur leurs coussins à la chambre à coucher (*pulvinarium*). Il se réfère, donc, à une cale sèche, une sorte d'abri où on retire le vaisseau, peut-être aux traversins même où un vaisseau halé se repose. Pourtant, Jal critique l'identification du terme comme *falaggia* et il est convaincu que cette machine était une construction analogue des *Vasi* du Moyen Age. Il précise que 'dans son acceptation la plus étendue, *Letto* a un sens analogue à celui de *Pulvinus*, défini par Forcellini: *Lectulus brevis*, etc., au *Ber* des constructeurs modernes, et non pas de simples rouleaux'[96]. Il cite davantage Isidore: '*Pulvini sunt machinae, quibus naves deducuntur et subducuntur in portum'.*

Revenons à la terminologie grecque et au terme de *holkos.* Dans l'*Onomasticon,* Pollux (X, 148-149) nous donne la description des 'outils' d'un *neolkos*, à savoir ceux utilisés par le personnel qui assurait le halage des vaisseaux à sec. Il précise que le dispositif comprend les *falagges-falaggia*, les *holkoi* et les *ouroi* :νεωλκοῦ σκεύη φάλαγγες φαλάγγια, ὁλκοί, οὐροί.

Parmi les termes cités, on a bien identifié les *falaggia* (chevrons), qui constituent en principe l'infrastructure en bois des engins de halage (νεωλκῶν ξύλα)[97]. Il reste à'éclaircir la notion des deux autres composants du dispositif, les ὁλκοί et les οὐροί. Notons que la signification des *ouros* est le fossé creusé sur la plage pour le lancement et le halage des vaisseaux, comme mentionné également par Homère (*Iliade II*, 153): οὐρούς τ'ἐξεκάθαιρον ...ὑπὸ δ' ἥρεον[98]. D'ailleurs, si l'on prend la citation de Pollux à la lettre et si l'on considère la disposition de la cale sèche trouvée à Marseille, où on a mis en évidence le fossé (*ouros*) et les chevrons (*falaggia*), à quoi peut correspondre les *holkoi* ?

On ne va pas reprendre la terminologie du *holkos* déjà suffisamment traitée. Notons seulement qu'il correspond manifestement au terme latin *sulcus,* qui inclue les mêmes notions propres et métaphoriques. Le sillon, le tracement d'un sillon, le fossé, la tranchée, la trace d'un vaisseau en mouvement[99]. A part son utilisation au *Diolkos* de Corinthe[100], il est mentionné trois fois dans les Inscriptions de Délos et contrairement à Th. Homolle qui pense qu'il s'agit d'un cabestan ou d'une machine de halage, J. Tréheux a supposé pour le *holkos de l'Ile* que 'un simple plan incliné de planches suiffées faisait l'affaire et que les coques y étaient tirées à bras'. Cependant, selon Th. Homolle, un *holkos* aurait pu fonctionner dans un port, sur une plage ou dans une baie et cette hypothèse reste fort probable[101].

Cependant, ce qui semble encore plus intéressant pour notre étude est la référence de Pollux (VII, 191) aux soit-dites '*chamoulkoi mixanai*' qui servent par excellence au halage des navires: αἱ δὲ καλούμενοι χαμουλκοὶ μηχαναὶ δι'ὧν εἵλκοντο <ὁλκοί>.
Le χαμούλκιον, en général, ou χαμουλκός μηχανή (ἕλκω) désignent une infrastructure de halage, mais l'interprétation de ces termes reste aussi controversée que celle de ὁλκός, puisqu'il s'agit évidemment de mots dérivés. Notons cependant que le terme inclut la notion de glissement *sur* la terre (χαμ ὁλκός), et si l'on considère comme un composant de l'infrastructure du terme général ὁλκοί, il peut correspondre à une structure en forme de berceau ou de traîneau. A la terminologie moderne, comme on a vu, les *chamulcoi* désignent précisément les poutres oblongues qui forment le 'lit' du vaisseau (likno, έλκυθρο = traîneau).

D'ailleurs, sa transcription en latin *chamulcus* est cité par Ammien

Marcellin (XVII, 14, 4) et désigne probablement l'engin en forme de traîneau sur lequel un obélisque a été transporté. Plus précisément, pour le transport de l'obélisque connu aujourd'hui comme 'obélisque de Laterane' par Constantin le Grand jusqu'à Rome, Ammien mentionne que l'obélisque une fois à Alexandrie *unde chamulcis inpositus, tractusque lenius*. Selon Gorringe, le terme *chamulcus* est traduit comme traîneau (cradle or sledge) et correspond selon toute probabilité au *trahae,* qui désigne également le traîneau[102].

2. LES VESTIGES

Les vestiges archéologiques du dispositif du halage sont assez rares, ce qui n'est pas étonnant, puisque toute l'infrastructure en bois des hangars et des chantiers navals a disparu sans laisser de traces[103]. Le seul vestige en forme d'un berceau ou d'une petite escarre a été fouillé dans le Lac de Kinneret, à la Mer de Galilée. Dans un cimetière de bateaux, sous la 'barque de Kinneret', on a dégagé une partie d'une structure faite de bois de construction navale. Selon les fouilleurs, la structure avait vraisemblablement la forme d'un berceau ('cradle') pour supporter la coque du vaisseau (Fig. 29)[104].

Pour conclure, sans exclure l'utilisation simultanée dans l'espace ou le temps d'autres pratiques déjà attestées, une structure intermédiaire en forme de traîneau ou berceau, comme décrit par Héron d'Alexandrie, s'avère fondamentale lors de l'opération de halage. Moyen de transport efficace sur la terre sablonneuse, il représente une méthode simple et économique, qui s'adapte aux différentes embarcations, d'autant plus qu'elle minimalise le risque de mouvement latéral. Bien que l'existence de cet engin navale ne soit qu'implicitement suggérée comme tel dans les sources littéraires et qu'il n'ait laissé que des traces archéologiques très rares, il pourrait éclaircir la signification des *chamoulkoi michanai* et constituer un des éléments du dispositif de halage de certaines cales et des *neosoikoi* anciens.

Or, le terme de *holkos* implique selon toute probabilité une combinaison des machines de halage comprenant des traîneaux (*chamoulkoi michanai*), des escarres (*ἐσχάριον*), des rouleaux (*σκυτάλαι*-scutalae), des cordages et des poulies, dont l'utilisation séparément ou en combinaison assurait le halage des navires de guerre.

Avant de mettre une terme à notre étude ethno-archéologique, ajoutons qu'en ce qui concerne la mécanique de l'opération, le tirage du traîneau se fait soit à la force seule des bras, soit à l'aide de machines, de treuils et de cabestans, comme Héron le précise: (Mech. III, 1): ταῦτα δὲ ἤτοι ἀπὸ χειρὸς ἕλκεται ἢ εἰς ἐργάτας ἀποδίδοται. Le manuscrit du Vatican fournit la représentation d'un traîneau sur des *skytalai* tiré par un cabestan (Fig. 31)[105]. D'ailleurs, dans le cadre de l'étude de la technologie ancienne égyptienne et assyrienne, on a déjà étudié le déplacement d'un traîneau sur une surface plate lubrifiée ou un plan incliné[106].

En ce qui concerne le halage des navires de guerre de l'époque classique, l'équipage d'une trière était certainement suffisant et capable de faire face à l'opération pour échouer un navire à tout moment sur une plage. Sur les plages ouvertes, on a pu même utiliser des animaux, comme il est attesté dans les civilisations anciennes et même jusqu'à récemment sur les côtes méditerranéennes[107]. Pourtant, dans les *neosoikoi* organisés, on pourrait s'attendre à une mécanisation de l'opération et même l'installation des engins plus permanents, comme déjà explicité ci-dessus. L'utilisation dans les *neosoikoi* des engins de halage, comme des treuils et des cabestans, est donc plausible, mais les indices archéologiques ne sont pas encore suffisants pour tirer des conclusions.

Or, un des vestiges archéologiques qu'on possède appartient probablement à un cabestan manuel découvert à North Ferriby. La datation n'est pas certaine, mais l'engin fait probablement partie du débris qui entourent les vestiges de barques en bois, datées d'environ 1500 av. J.-C. Selon le fouilleur, il appartient donc vraisemblablement à l'Age du Bronze. D'après sa reconstruction hypothétique, il s'agit d'un simple cabestan assemblé en tenons et mortaises, tout pareil aux cabestans traditionnels (*ergates*) installés et utilisés dans les berges de la Grèce et de la Méditerranée pour l'échouage des barques de pêche[108]. Ancrés à proximité du littoral, ces cabestans manuels pourraient même s'utiliser en combinaison pour le halage d'un vaisseau de grand tonnage[109].

CONCLUSION

L'infrastructure de carnagia modernes ne peut certes donner que des indices sur les pratiques nautiques anciennes. Cependant, on peut conclure de cette première étude que le halage traditionnel semble se révéler assez proche des méthodes anciennes attestant ainsi de la continuité des traditions maritimes.

La réalisation du projet de la reconstruction d'un *neosoikos* classique à Phalère pour loger l'Olympias, nous aidera sans doute à mener une étude plus approfondie sur les manœuvres nautiques à travers les expérimentations techniques. Il serait souhaitable désormais de tester expérimentalement différentes méthodes et matériaux, afin d'infirmer ou confirmer les diverses hypothèses émises sur le fonctionnement de dispositif du halage antique.

REMERCIEMENTS

Je suis reconnaissante à mon professeur, spécialiste des installations portuaires, D. Blackman, de m'avoir beaucoup encouragée et aidée à la réalisation de ce projet. Je tiens aussi à remercier M. Alain Schnapp, professeur d'archéologie classique de l'Université de Paris I et aussi Mmes Honor Frost et Arenson de m'avoir gracieusement signalé des parallèles ethnographiques existant en Mediterrannée orientale, en particulier dans le Levant, et M. Wachsmann de m'avoir signalé les trouvailles du Lac Kinneret. Enfin, je voudrais remercier Mlle Athena Adamopoulou, archéologue, pour sa collaboration à l'étude ethnologique menée au *carnagio* de l'Héraklion en Crète, Mlle M.Sabatier, ethnologue, et les maîtres constructeurs navals de *carnagia* de Spetses, Vasilis Delimitros, et de Camatero, Basilis Chalkitis et Katsoulakis, de m'avoir accueillie dans les installations et de m'avoir fourni toutes les informations nécessaires. Sans leur aide cette étude n'aurait pas pu être menée à bien.

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NOTES

1 Pour une répartition géographique et une étude historique des chantiers navals traditionnels grecs, voir: DAMIANIDIS (1996), pp. 21-38; pour l'infrastructure, surtout pp. 35-38.

2 Je suis reconnaissante à Mme Honor Frost et Mme Arenson de m'avoir indiqué d'autres parallèles ethnographiques surtout en Chypre, au Levant et en Inde.

3 BEKIAROGLOU (1994), p. 60, note 53, fig. 7

4 FAMILONIDIS (1995), figs. 9.1-9.2; GOURGOURIS (1983), p. 451

5 JAL (1847-1850), s.v. *palato*

6 F. FOERSTER LAURES, 'Comment on 'A trireme displacement estimate' (IJNA 11: 305-318)', ***IJNA 12.2 (1983)***, p. 176

7 cf. JAL (1847-1850), s.v. *ber, vaso,* pour la description et l'utilisation des *Vasi* du XIIIe siècle.

8 Introduit en Grèce contemporaine par un constructeur naval de Chios au XVIII e siècle d'après K. Nikodimos, cf. DAMIANIDIS-ZIVAS (1986), pp. 31; PROIKIOU (1991), pp. 73-75; GOURGOURIS (1983), pp. 482-483; DAMIANIDIS (1996), pp. 36-38. Cf. TZAMTZIS (1972), p. 105 et fig.; ZOUROUDIS (1974), pp. 170-173

9 POULIANOS (1977), p. 590 et fig.

10 PROIKIOU (1991), pp. 53, 73-75; cf. JAL (1847-1850), s.v. *ber;* Reproduction d'un berceau du XVIe siècle, p. 285.

11 TZAMTZIS (1972), p. 105: 'ξύγκι ή άλειμμα'; PROIKIOU (1991), p. 73: 'σαπούνι ή παραφίνη'; GOURGOURIS (1983), p. 483: 'ξύγκι'.

12 Cf. JAL (1847-1850), s.v. *tirar:* Le halage 'se fait au moyen d'un fort *Palan* (*Paranco*), d'un cabestan et de *Palate*. Le navire est présenté au rivage par l'arrière, les *Palate* garnissent le chemin qu'elle va suivre, on accroche la paloma, on garnit la *Gomena* (garant) du palan, on vire, et l'on maintien droit le navire avec des béquilles (étais, cales, supports) quand il glisse sur les *Palate*'.

13 KOUKOULES (1950), p. 307

14 BEKIAROGLOU (1994), pl. I : Partie du chantier naval de Constantinople sous le règne de Selim III.

15 ***Ports et bateaux dans le Musée Byzantin***, Catalogue d'exposition, Ministère de la Culture, Athènes 1997, pp. 76-77, no. 31; pp. 78-79, no. 32; pp. 80-81, no. 33; pp. 88-89, no. 37; ΟΡΛΑΝΔΟΣ Α.Κ., ***Μοναστηριακή Αρχιτεκτονική***, 1927, pp. 85-87, fig. 133

16 P. ZANCANI MONTUORO, 'Uno scalo navale di Thurii', dans Sibari e Thurii, ***Atti e Memorie delle Società Magna Grecia NS 13/14 (1972/73)*** **(1974)**, pp. 75-79; G.P. GUZZO, 'Casa Bianca', ***Notizie di Scavi (1974)***, **Suppl.**, pp. 419ff, fig. 385. Cf. BLACKMAN D.J., 'Review of ***Sibari e Thurii,*** P. ZANCANI MONTUORO et G. Pugliese Carratelli (eds), Atti e Memorie delle Società Magna Grecia NS 13/14 (1972/73) (1974)', ***IJNA 6 (1977),*** pp. 357-359, fig.1

17 Le terme *phalanga* (φάλαγξ) est la forme aspirée grecque, emprunté par le latin *palanga*, employé surtout au pluriel. *palagga, palanga, phalanga* = rouleau de bois, 'palanche' de portefaix. Cf. **Pline, HN, XII, 17**; cf. **Hesychius**: φαλάγγια στρογγυλὰ ξύλα καὶ σύμμετρα 'Αττικοὶ δὲ κόρακας; **Vitruve, X, 3, 7**: perche qui repose sur les épaules des porteurs (*phalangarii).*; **Pline, HN VII, 200**: 'Proelium Afri contra Aegyptios primi ferece fustibus, quos uocant phalangas'; **IG XI, 287 B 145 :** φάλαγγες πύξιναι ΔΔ; **IG II 2² (1), 1673, I.41:** ἧλοι δύο εἰς τὰς φάλαγγας; **Ηροδ. 3.97:** φάλαγγες ἐθένου ; ***Dictionnaire des Antiquités IV, 1***, p. 424 s.v. *phalanga* (G. Lafaye). Cf. JAL (1847-1850), s.v. *palato:* 'Rouleau ou pièce de bois ayant la forme d'un demi-rouleau servant à faire le chemin sur lequel glisse le navire qu'on veut tirer à sec sur le rivage'. ; F. WOTKE, Pauly-Wissova, ***Realencyclopedie***, XIX², pp. 1646-1647, s.v. *phalanx*

18 **Apollonios Rhodios, Argonautica 2.843**:
Καὶ δή τοι κέχυται τοῦδ' ἀνέρος ἐν χθονὶ κείνῃ τύμβος· σῆμα δ' ἔπεστι καὶ ὀψιγόνοισιν ἰδέσθαι, νήιος ἐκ κοτίνοιο φάλαγξ θαλέθει δέ τε φύλλοις-, ἄκρης τυτθὸν ἔνερθ' 'Αχερουσίδος.
Traduction: F. Vian, BL, Paris 1974, p. 216 et pp. 278-279, note 844.

19 BLACKMAN (1995), pp. 74-75 et no. 6: 'The translation 'rollers' conveys a slightly misleading impression'.

20 **Apollonios Rhodios, Argonautica, A**:
375 (...) 'Εν δ ὁλκῷ ξεστὰς στορέσαντο φάλαγγας·
τὴν δὲ κατάντη κλῖναν ἐπὶ πρώτῃσι φάλαγξιν,
ὥς κεν ὀλισθαίνουσα δι'αὐτάων φορέοιτο.
388 Αἱ δ'ἄρ ὑπὸ τρόπιδι στιβαρῇ στενάχοντο φάλαγγες
τριβόμεναι, περί δέ σφιν ἀιδνὴ κήκιε λιγνὺς βριθοσύνη.(...)

21 HUMPHREY J.W.-OLESON J.P., SHERWOOD A.N., ***Greek and Roman Technology: A Sourcebook***, London and N.Y. 1998, p. 481. cf. CASSON (1971), pp. 108-109, note 48.

22 Nonii Marcelli, ***De Compendiosa Doctrina***, Libros XX, (Wallace M.Lindsay), Lipsiae MCMIII, p. 240.
Non. 163, 23 : *phalangae dicuntur fustes teretes, qui nauibus subiciuntur, quum attrahuntur ad pelagus, uel quum ad litora subducuntur ; unde etiam nunc phalangarios dicimus, qui aliquid oneris fustibus. Varro de uita populi Romani : Quum Poenus in fretum obuiam uenisset nostris et quosdam coepisset, crudelissime pro palangis carinis subiecerat, quo metu debilitaret nostros.*

23 **César, B.C., II, 10, 7** : *hoc opus, ..., machinatione nauali phalangis subiectis, ad turrim hostium admouent.*

24 ***Suidae Lexicon***, Ada Adler (ed.), Teubner Stuttgart 1997, *s.v.* p. 693
31 Φάλαγγες : (...)καὶ νεὼς ὑπερείσματα· (...) ἔνιοι καὶ τὸ στρογγύλον ξύλον καὶ σύμμετρον φαλάγγια· **32 Φάλαγγες** : (...). φάλαγγες τῶν νεῶν, παρὰ τὸ σπᾶν εἰς ἅλα.
Phrynichus, *Praeparatio Sophistica* 124 B: φάλαγξ:το ξύλον <ἐστὶν> ἡ φάλαγξ, ἃ ν[ῦν φαλαγγώματα καλοῦσι).

25 **Θεσσαλονίκης Ευσταθίου**, *Τα λαογραφικά Α'*, Π, 140, 7: Φαλλάγγια· οὕτω παρ'ἐκείνοις ἐκαλοῦντο τὰ ξύλα ... ἴσως δὲ καὶ τὰ τοῖς πλοίοις ὑποτιθέμενα ἕρματα ἐντεῦθεν οἱ πολλοὶ καλοῦσι φαλάγγια.
Π, 194, 27: Νηῶνδὲ καὶ νῦν ἕρματα τὰ ὑποκείμενα ταῖς ναυσὶ λέγει ξύλα ἔξω παρὰ τὴν ἄμμον, ἐφ'ὧν ὀχούμεναι αἱ νῆες ἐδράζονται καὶ ἐρείδονται.

26 ΚΟΥΚΟΥΛΕΣ (1950), p. 290, note 6; cf. JAL (1847-1850), s.v. *lancer:* Palancar = mettre des rouleaux dessous.

27 HURST (1994), p. 17-18, fig. 2 ; HURST H. R., 'Excavations at Carthage 1977-78: Fourth Interim Report', ***The Antiquaries Journal 59 (1979)***, p. 30, pl. VIIIa; GIBSON in HURST (1994), p. 33, figs. 2.1, 3.2, 12.2-3, Pl. 2a.

28 KANTZIA Ch., 'Anaskafes Ko', ***Deltion 42 (1987), B' Chronica 2,*** pp. 632-635, pl. 355-357; PARIENTE A., ***B.C.H. (1994),*** p. 795, fig.120.

29 BLACKMAN et al.(1996), pp. 400-401 ; BLACKMAN (1990), pp. 42-43, 52, figs. 3a-3b

30 LEI C., 'Découverte des cales sèches d'un chantier naval de 2200 ans', ***Archeologia 118 (1978),*** pp. 70-71.

31 **César** (BC III, 40. 2): *Eodemque tempore ex altera parte molem tenuit naturalem obiectam quae paene insulam oppidum effecerat; IIII biremes subiectis scutulis inpulsas uectibus in interiorem portum traduxit.*

32 Dans la traduction des éditions Belles Lettres, ('enfin, sur des rouleaux, il mit le bâtiment à la vague divine') les *mochloi* sont traduits comme *rouleaux.* Notons que presque tous les termes associés à l'opération du halage (*machinae, mochloi, falaggae*) sont

d'habitude traduits comme 'rouleaux'.

33 HESNARD et al. (1999), pp. 21-41 et figs, Pl.II, p. 156; HERMARY et al. (1999), pp. 125-130 et figs.; HESNARD A., 'Une nouvelle fouille du port de Marseille, Place Jules-Verne', **RAI** janvier- mars **1994**, p. 206

34 LIDDELL-SCOTT, s.v. ἔρμα (prop used to keep ships upright), ὑπέρεισμα (under-prop, support) , διέρεισμα (supporting beam).

35 MORRISON-WILLIAMS (1968), p. 65, cf. p. 293, 'parastatai' = étançons.

36 Selon les dernières hypothèses par Démétrios Poliorcète : TRÉHEUX J., 'Sur le Néôrion à Délos', ***CRAI 1987***, pp. 180-181, et bibliographie sur le sujet.

37 TRÉHEUX J., 'Sur le Néôrion à Délos', ***CRAI 1987***, p. 174, et note 45; Cf. R.Vallois, ***Architecture Hellénique et Hellénistique à Délos I***, Paris 1944, p. 40, restitution I.46: (ἐρείσματα)

38 BLACKMAN (1990), p. 43; MORRISON-WILLIAMS (1968), p. 293, 183 et note.

39 TORR Cecil, ***Ancient Ships***, Cambridge 1894 (repr. Argonaut Library of Antiquities, Chicago 1964), p. 83; LIDDELL-SCOTT, *s.v.*; MORRISON-COATES (1986), p. 160, note 1: changement d'avis, surtout parce que le terme convient bien aux supports du mât, qui seraient necessaires à une trière.

40 Aujourd'hui au Musée National de Naples, no. 8606, 8604; MORRISON (1996), pp. 245-246, fig.43a-b, reconstruction des vaisseaux logés comme des pentères et indication de la position des étançons par J.F. Coates, pp. 312ff, fig. 71; Traits obliques sous la 'caisse de rames' interprétés autrefois comme des rames. Cf. ASSMAN E., 'Zur Kenntnis der antiken Schiffe', ***Jarhbuch 4 (1889)***, p. 100 ; BASCH L., 'Caisse de rame' hellénistique et relief no 13533', ***Cahiers d'Histoire 33 3-4 (1988)***, p. 295, fig. 8 ; BASCH L., 'Roman triremes and the outriggerless Phoenician trireme', ***MM 65.4 (1979)***, pp. 292-294

41 LIDDELL-SCOTT, s.v.; CHANTRAINE P., **Dictionnaire étymologique de la langue grecque**, Paris Editions Klincksieck, 1984, *sv.* τρέπω, pp. 1132-1133; LEHMANN-HARTLEBEN K. (1923), ***Die Antiken Hafenanlangen des Mittelmeeres,*** (Klio Beiheft 14), (Scientia Verlag Aalen 1963), pp. 119, note 4;
BREUSING A., ***Die Nautik der Antiken***, p. 28 ; CARTRAULT, ***La Trière Athénienne***, Paris 1881, p. 37

42 H. GRUMMERUS, 'Darstellungen aus den Handwerk auf römischen Grab- und Votivsteinen', ***Arch. Jarhbuch (1913)***, pp. 92-93, fig. 15

43 A Rhodes, des entailles irrégulières à des distances diverses sur les parties inférieures des rampes en pierre étaient destinées, en partie, à recevoir des étais qui supportaient la poupe. Cf. BLACKMAN et al. (1996), pp. 400-401; BLACKMAN (1990), pp. 42-43, 52, figs. 3a-3b

44 HESNARD A., 'Une nouvelle fouille du port de Marseille, Place Jules-Verne', ***CRAI janvier- mars 1994***, p. 206; HERMARY et al. (1999), p. 126, fig. p. 127

45 BERG (1935), pp. 74-84 et passim ; COTTERELL-KAMMINGA (1990), pp. 216-217; PIGGOTT (1992), pp. 16-17; PIGGOT(1983), pp. 36-39, fig. 8: Pictographs du IVe millenaire av. J.-C. de Uruk, Iraq; HEIZER (1969), pp. 826-827 ; COULTON (1988), pp. 45-46; COLE S.M.(1954), 'Land transport without wheels', In SINGER C.-HOLMYARD E.J.-HALL A.R., (eds), ***A history of technology. Vol. I***, Charenton Press, Oxford 1954, pp. 706-712

46 KORRES M., ***From Pentelicon to the Parthenon: the ancient quarries and the story of a half-worked, column capital of the first marble Parthenon*** (trad. du grec par D. Turner et Dr. W. Phelps), Athens, Melissa Publishing House 1995

47 Malaisie: SMYTHIES B.E. (1951), 'Timber extraction in the third division, Sarawak', ***Empire Forestry Journal 30, no 1,*** pp. 47-51, pl. VI ; SMYTHIES B.E. (1952), 'Extraction by kuda kuda in Sarawak', ***Empire Forestry Journal 31, no 1,*** p. 42, pl. I-IV : En Malaisie des traîneaux en bois lubrifiés tirés sur une série de poteaux de bois posés

perpendiculairement sont appelés **panglong** ou **kuda-kuda** et ils étaient utilisés jusqu'à très récemment pour le transport des troncs de bois. COTTERELL-KAMMINGA (1990), pp. 218-222; cf. archéologie experimentale: MOHEN J.- P. (1980), 'Aux prises avec de plusieurs dizaines de tonnes', ***Dossiers de l'Archéologie 46***: pp. 58-67

48 NEWBERRY P.E. (1897), ***El Bersheh- Part I, The tomb of Tehuti-hetep***. Archaeological Survey of Egypt Exploration Fund, pp. 19-22, pls. XII, XV; HABACHI (1978), fig. 9, Pl.4; CHEVIER (1970), pp. 21-23, Pl. 1 et 1A : Reconstruction en maquette par R. Engelbach réalisée en 1933 à l'occasion d'un congrès international des transports; ARNOLD (1991), p. 277

49 DARESSY M.G. (1911), 'Inscriptions des carrières de Tourah et Mâsarah', ***Annales du Service des Antiquités de l'Egypte XI,*** Le Caire, pp. 257-268, esp. 263: Bas-relief de la stèle VI du roi Amosis I, gravé à l'entrée de galeries contigües des carrières; CLARKE-ENGELBACH (1930), p. 88, fig. 84; WILKINSON (1878), p. 302, fig. 428

50 NAVILLE E. (1908), ***The Temple of Deir el-Bahari, VI*** (Egypt Explor. Fund), pl. CLIII et CLIV; ENGELBACH R. (1922), ***The Aswân Obelisk***, Le Caire, p.32, fig. 7

51 LAYARD A.H. (1853), ***Discoveries in the ruins of Ninevah and Babylon***. John Murray, London, p. 104-115, pl. 10-17(aujourd'hui au British Museum nos 124820, 124822, 124823); DAVISON (1961), p. 16, fig. 2; HEIZER (1966), p. 826: documents sur le transport; cf.CHOISY (1904), p.78, fig.61; COTTERELL-KAMMINGA (1990), pp. 219-220, fig. 8.15 (représentation et restitution), analyse des forces exercées.

52 Théorie critiquée par DAVISON (1961), pp. 12-14; cf. Davis N. de GARIS (1943), ***The Tomb of Rekh-mi-Ré' at Thebes***, NY, p. 55, pl. 58: interprétation des chevrons comme rouleaux. ARNOLD (1991), pp. 273-275: même si des traîneaux sont occasionnellement transportés sur rouleaux, cela ne constitue pas la norme.

53 COTTERELL-KAMMINGA (1990), p. 224 ; ARNOLD (1991), p. 280; DAVISON (1961), p. 14-15: Utilisation de pièces des bois (non représentées) lubrifiées avec de l'huile, disposées sous le traîneau pour que celui-ci ne s'enfonce pas dans le sable. Son calcul de la force de friction et de la force de traction humaine nécessaire à l'opération est très proche des 171 hommes représentés. De plus, il considère que les hommes devant les porteurs des pièces de bois, portent 6 pots de lubrifiant.

54 EPRON L., DAUMAS F., GOYON G. (1939), ***Le tombeau de Ti, Fasc. I,*** Le Caire, pl. LII-LV; CHEVIER (1970), pp. 23-24, fig. 3; LAYARD (1853), p. 115 : '...probably grease, on the ground to facilitate the progress of the sledge; Au contraire selon COTTERELL-KAMMINGA (1990), p. 222: sur la représentation, l'homme qui jette de l'eau fait partie d'un rite de purification.

55 CHEVIER (1970), p. 20; HAYES W.C. (1968), ***The Scepter of Egypt I***, Cambridge, Mass. (1953, 1959, rep.1990), p.193

56 LEPSIUS C.R., ***Denkmäler aus Aegypten und Aethiopien***, zweite Abteilung vol. III et IV, Abth II, Bl 64a-b, Genève 1972

57 N. de Garis DAVIS, 'The Tomb of Tetaky at Thebes (no. 15)', ***JEA XI (1925)***, pp. 10ff, Pl. V: p. 17 et note 2: L'inscription: 'casting water under the [sled?] and milk (?) for the *amakhy*; the royal son, Tetaky'. Or possibly 'The assistant casts water and milk for....'

58 FAKHRY A. (1969), ***The Pyramids***, Chicago, (1re édition en 1961), p. 12: après avoir examiné les couleurs originales des copies du début du siècle, il suggère que le liquide versé devant le traîneau est du lait. Lally propose que le liquide jeté est du limon humide, dont la mixture avec de l'eau peut donner l'impression du lait. Cf. LALLY M. T., 'Engineering a Pyramid', ***JARCE 26 (1989)***, pp. 207-218, p.213, note 21; GOYON (1977), ***Le Secret des Bâtisseurs des Grandes Pyramides***, Paris, p. 123, p. 302, note 157; Goyon cite un cas où les Egyptiens n'ont pas hésité à verser du lait de vache sur le sol argileux, peut-être pour en augmenter la viscosité; cf. CHOISY (1904), p.78

59 COTERRELL-KAMMINGA (1990), p. 222: étude de lubrifiants différents, calcul sur la

réduction du coefficient de la friction : 'on peut facilement présumer que les ingénieurs du monde ancien pourraient réduire le coefficient de la friction entre des surfaces glissantes jusqu'à 0,15-0,20 sans problème'; DOWSON (1969), pp. 4-5, fig. 2; BOWDEN F.P. et TABOR D., ***The Friction and Lubrification of Solids***, Oxford 1950

60 VERCOUTTER (1970), p. 211, note 25; PETRIE W.M.F. (1900), ***Royal Tombs of the First Dynasty I***, pl. XXVII, 68; W. BARTA, 'Das Götterkultbild als Mittelpunkt bei Prozessionsfesten, ***MDAIK 23 (1968)***, pp. 75-78; DÜMICHEN J., ***Der Grabpalast des Patuamenap I***, Leipzig 1894, p.41 et Tafel XIII: la statue de culte sur un *tm*-traîneau.

61 VERCOUTTER J. (1970), p. 211 et figure 18

62 BARGUET P., ***Le Livre des Morts des anciens Egyptiens***, Paris 1967, pp. 40-41, p. 35, note 3

63 Cf. ARNOLD (1991), pp.276-277, fig. 6.36; HAYES W.C. (1968), ***The Scepter of Egypt I***, Cambridge, Mass. (1953, 1959, rep.1990), p.193, fig. 118; Plusieurs sarcophages ont été faits de façon à être montés sur des traîneaux, comme le coffre en boi de Yuya ou le sarcophage en granite de Papa'messu du Musée du Caire.

64 Aujourd'hui au Musée de Caire; NAVILLE E., ***The Temple of Deir el Bahari VI***, London 1908, pl.154: exemplaire d'un petit modèle; CLARKE-ENGELBACH (1930), p. 92, fig. 89; HAYES W.C. (1968), *The Scepter of Egypt, I*, Cambridge, Mass. (1953, 1959, rep.1990), p.193, pp. 85-86, fig. 47

Certains de ces modèles ont été interprétés comme des ascenseurs oscillants, engins en forme de berceau considérés comme ayant été employés à la construction des pyramides et plus précisément au transport des blocs de pierres à des niveaux supérieurs. FITCHEN J., 'Building Cheops' Pyramid', ***Journal of Architectural Historians 37 (1978)***, pp. 3-9; CHOISY A. (1904), ***L'Art de bâtir***, Paris, pp. 80ff, fig. 63; CLARKE-ENGELBACH (1930), p. 94-95, fig.89; Interprétation des modèles comme des traîneaux ordinaires: Voir ARNOLD (1991), pp. 271-273. Utilisation combinée: PETRIE W.M.F., ***Tools and Weapons***, London 1917, p. 41: 'for shifting large building stones the Egyptians seem to have placed them on a cradle of wood, so that they could be readily twisted round, drawn along, or rocked up an inclined plane', Pl. XLI: B37: modèle du dépot de Deir el Bahri.

65 J. de MORGAN, ***Fouilles à Dahchour***, (Mars- juin 1894), Vienne, p. 81-83, fig. 204; CLARKE-ENGELBACH (1930), p. 89, fig. 85; pp. 34-35, fig. 34-35: the royal barque; REISNER G.A., ***Models of Ships and Boats***, Catalogue général des Antiquités Egyptiennes du Musée du Caire, Le Caire, p. 89, fig. 326 (no.4928), (Catalogue du Musée no. 4798). Cf. GOYON G., 'Les navires de transport de la chaussée monumentale d'Ounas', ***BIFAO 69 (1971)***, pp. 11-41, PL.3-5, Pl. VI; FISCHER H.G. (1975), 'Two tantalizing Biographical Fragments of Historical Interest', ***JEA 61***, pp. 33-37, p. 34, fig. 2; cf. CHOISY (1904), pp. 117-120, fig. 90: reconstruction du traîneau du tombeau de Djehutihotep.

66 ARNOLD (1991), pp. 79-98: Présentation chronologique des chemins de construction et des diverses rampes; ARNOLD (1994), s.v. *Baurampe*, pp. 37-38; ARNOLD D. (1981), 'Überlegungen zum Problem des Pyramidenbaues', ***MDAIK 37 (1981)***, 15-28: sledges rampes; CERNY J., 'A Note on the recently discovered Boat of Cheops', ***JEA 41 (1955)***, pp. 75-79; JONES D., ***IX Model Boats from the Tomb of Tut'Ankhamûn***, Oxford 1990; STROUHAL E. (1992), ***Life in Ancient Egypt***, Cambridge 1992, p. 179-182

67 ARNOLD (1991), pp. 85-88, pl. 3.38-3.40; GOYON (1977), p. 68-69

68 ARNOLD D., ***The South Cemetries of Lisht, III, The Pyramid Complex of Senwosret I***, NY 1992, pp. 92-95, pl. 101-109

69 PETRIE Fl., BRUNTON G., MURRAY M.A., ***Lahun II*** , BSAE, XXXIII, Londres 1923, p. 9, 12, pl. XV, (photos 1-3), pl. XIII ('Timber Causeway'). Le chemin se trouve à l'ouest d'une fosse, qui est localisée à l'exterieur du grand mur, environ 230 pieds à l'ouest. Pendant la

fouille, les archéologues ont détruit le chemin utilisant les poutres pour transporter le cercueil en granite de Paramessu à Ghurob.

70 Jusqu'à aujourd'hui les méthodes de transport n'ont pas changé profondément. Elles ont été conservées intactes au moins jusqu'au XIXe siècle. cf. WARD-PERKINS J. (1971), ***Quarrying in Antiquity.*** *Technology, Tradition et Social Change*, Proccedings of the British Academy of Rome 57, p. 8, pl. XVIa: Dessin du Salvioni, (d'environ 1800) sur les carrières de Carrara, qui représente le traînage d'un monilithe par des animaux sur un traîneau qui glisse sur un chemin de rouleaux qui s'appèle *lizza*.

71 ORLANDOS (1968); Internazionale Marmi e macchine Carrara, ***Il marmo nella Civiltà Romana***, La produzione e il commercio, (a cura di E.Dolci), Carrara 1989, Tav. 1, fig. 1,4

72 VANHOVE Doris (1996), ***Roman Quarries in Southern Euboea and the associated Road Systems***, E.J.Brill, Leiden, NY, Köln

73 ORLANDOS A. (1968), p. 24, fig. 8

74 ARNOLD (1991), pp. 89-90: photo, fig. 3.42, 3.43: plan isométrique de la rampe en brique à la Khor Sud de la pyramide de Senwosret I à Lisht; ARNOLD D., ***The South Cemetries of Lisht, III, The Pyramid Complex of Senwosret I***, NY 1992, pp. 94-95, pl. 109

75 VERCOUTTER J. (1970), pp. 13-15, 171ff, 204-214, fig. 13-20. La piste qui est parallèle au Nil et qui est à une distance d'environ 350m de la berge, devait avoir un parcours total de 2km (fig. 1). De la structure, il subsiste deux tronçons dans le même alignement (76m et 59m). En coupe transversale, d'est en ouest, la glissière est légèrement concave. Une bordure de briques crues est disposéee parallèlement à l'axe de la structure. Les rodins encastrés dans le limon, disposés à des intervalles variants de 20 à 70 cm sont de 5 à 8 cm de diamètre et longs de 180cm. L'écartement des patins devait être de 1,20 à 1,70m.

76 COTTERELL-KAMMINGA (1990), p. 222: Ils présument que les Egyptiens auraient trouvé que la terre cuite mouillée a un grand potentiel comme lubrifiant; CHOISY (1904), p.78

77 COATES (1999), pp. 104-105, 109; ERICSSON C.H. (1984), ***Navis Oneraria***, Abo, pp. 99-102

78 **Theophrastus V.7.2** : τὴν δὲ τρόπιν τριήρει μὲν δρυίνην ἵνα ἀντέχῃ πρὸς τὰς νεωλκίας, ταῖς δὲ ὁλκάσι πευκίνην ὑποτιθέασι δ'ἔτι καὶ δρυΐνην ἐπὰν νεωλκῶσι ταῖς δ'ἐλάττοσιν ὀξυΐνην καὶ ὅλως ἐκ τούτου τὸ χέλυσμα; MEIGGS R., ***Trees and Timber in the ancient Mediterranean World***, Oxford 1982, p. 118

79 **Pollux I. 86**: τὸ δ' ὑπὸ τὴν τρόπιν τελευταῖον προσηλούμενον, τοῦ μὴ τρίβεσθαι τὴν τρόπιν χέλυσμα καλεῖται; S. AMIGUES, 'Termes techniques de construction navale dans Théophraste, HP, V, 7, 1-3', ***Revue Archéologique, 1990 (1)***, pp. 85-96; CASSON (1971), p. 221; cf. BLACKMAN (1990), p.45 Le bateau de Kyrénia a reçu au moins trois fausses quilles en chêne. Voir : J.R. STEFFY, 'The Kyrenia Ship: An Interim Report on its Hull Construction', ***AJA 89 (1985)***, p. 89, 97

80 COATES-SHAW (1993), p. 89

81 HURST (1994), p. 35; Hurst (1993), p. 45; BLACKMAN et al. (1996), p. 402 et no. 77

82 COATES (1999), p. 109

83 ***Héron d'Alexandrie***, 'Les mécaniques ou l'élévateur des corps lourds', Traduit et établi du texte arabe par B. Carra de Vaux, Commentaires A.G. Drachman, Les Belles Lettres, 1988. Reproduction de certains dessins du manuscrit de Vatican. Dans le Manuscrit de Hiéron il n'y a pas de figures à ce chapitre.

84 COATES (1999), pp. 109, 114; COTTERELL-KAMMINGA (1990), pp. 223-224

85 Federico FOERSTER LAURES, 'Appendix to 'The use of tallow on the hulls of ships (IJNA 15 (1986): 161)', ***IJNA 16.2 (1986)***, p. 171

86 RAEPSAET (1993), p. 248-9: pour les différentes propositions.

87 **Hésuchlus**, s.v. *ákj1r*; **Photius**, s.v. également **Suldas**, s.v.; **Pollux X 134, 148-9** et **VII 191**

88 GOYON (1977), pp. 122-123 : Ces machines ont été interprétées comme de simples traîneaux ou d'ascenseurs oscillants.

89 **Tite Live XXV 11, 17-19**:
Via quae e portu per mediam urbem ad mare transmissa est, plaustris transueham naues haud magna mole. Contracta extemplo undique plaustra iunctaque inter se, et machinae ad subducendas naues admotae, minitumque iter, quo faciliora plaustra minorque moles in transitu esset. Iumenta inde et homines contracti, et opus inprigre coeptum; paucosque post dies classis instructa ac parata circumuehitur arcem et ante os ipsum portus ancoras iacit.; **Polybe VIII 34, 9-12**: πορείων ὑποτρόχων κατασκευασθέντων; **Strabon VI, 3, 1** : τὰ πλοῖα ὑπερνεωλκεῖσθαι ραδίως ἑκατέρωθεν ταπεινοῦ ὄντος τοῦ αὐχένος; **Appien**, *Hannibal* 34

90 **Silius Italicus** (*Pun.*, XII, 444-446):
Lubrica roboreis aderant substramina plaustris,
atque, recens caesi tergo prolapsa iuuenci,
aequoream rota ducebat per gramina puppim.

91 Traduction du terme largement acceptée par des commentateurs. Cf. E. De SAINT-DENIS, 'A Tarente, en 212 av. J.-C.', ***Latomus 13 (1954)***, p.30, note 1; Cf. **Verg.** *Aen. II*, 235: pedibusque rotarum subiciunt lapsus = sous le pieds du cheval on met le glissement de roues (des roues qui glissent, qui tournent); cf. **Verg.** *Aen. I*, 147 et *II*, 225

92 GLARE P.G.W., ***Oxford Latin Dictionnary***, Oxford 1976: s.v. *substramen- inis* (substerno + men)

93 RAEPSAET (1993), p. 250; F. SPALTENSTEIN, ***Commentaire des Punica de Silius Italicus***, Genève 1990, p. 184; cf. J. TRÉHEUX, 'Retour sur l'Artemision de l'île', ***Récueil Plassart***, Paris 1976, p. 199, note 1

94 RAEPSAET (1993), passim et pp. 257-261(Annexe: Considérations techniques et mécaniques, par M. Tolley).

95 *Ibo intro, ut subducam nauium rusum in puluinaria.* (= je vais) a la maison, remettre mon vaisseau à l'abri en cale sèche). Traduit par E.ERNOUT, ***BL*** (1970), p. 193, et note 1.

96 JAL (1847-50), s.v. *pulvini*

97 cf. **Pollux VII, 190**, cité dessus

98 cf. LIDDELL-SCOTT, s.v. οὐρός; cf. **Photius** : οὐρούς ὀξυτόνως· τὰ νεώρια καὶ περιορίσματα τῶν νηῶν. Par extension, Photius les considère comme des cales à sec, des *neoria*.

99 cf. LIDDELL-SCOTT, s.v. ; Glare P.G.W., ***Oxford-Latin Dictionnary***, Oxford 1976, s.v. **sulcus**

100 RAEPSAET (1993); WERNER (1993)

101 ID 442, A, l.154 : ὁ ὁλκὸς ὁ ἐν Νήσωι; ID 369, A, l.39 : ὁ ὁλκὸς ὁ ἐν τῆι ἰσθμῶι ἐν Μυκόνωι; ID 442, A, l. 153 : ὁ ὁλκὸς ὁ ἐν 'Απολλωνίωι; voir aussi HELLMAN M.Ch.(1992), ***Recherches sur le vocabulaire de l'architecture grecque, d'après les Inscriptions de Délos***, EFA de Boccard, Paris, p. 305;
RAEPSAET (1993), p. 249; Th. HOMOLLE, 'Comptes des Hiéropes du temple d'Apollon Délien', ***BCH 6 (1882)*, p. 67, n.3 : 'ákj1r** est proprement un instrument pour tirer, élever ; en particulier celui dont on sert pour mettre à sec; par dérivation il peut être employé pour le lieu où l'on tire et remise les navires'; J. TRÉHEUX, 'Retour sur l'Artemision de l'île', ***Récueil Plassart***, Paris 1976, p. 197ff

102 GORRINGE H.H., ***Egyptian Obelisks***, N.Y. (1882), p. 156; cf. SABBAH G., ***BL*** 1970, p. 48: 'Puis il est placé sur des rouleaux, tiré doucement...'; p. 169, note 34 : 'La transcription du grec **χαμούλχος** désigne, d'après les glossaires, les **trahae** ou **phalangae**, c'est-à-dire les rouleaux de bois servant à faire glisser les vaisseaux vers la mer'. La traduction du terme (comme des autres) comme 'rouleaux' n'est pas surprenante. Notons, cependant, que le

terme *trahae* désigne également le traîneau.

103 Cf. HERMARY et al. (1999), p. 126: 'Si ce dispositif traditionnel n'était pas connu pour L'Antiquité, c'est parce qu'il était constitué uniquement de bois et de cordages qui disparaissent habituellement'.

104 S. WACHSMANN et al., The Excavations of an Ancient Boat in the Sea of Galilee (Lake Kinneret), Chapter 5. The Boat. A Preliminary study of its construction (by J. Steffy), ***Atiquot XIX***, Jerusalem 1990, English Series, pp. 45-46, fig. 5.16. Je remercie beaucoup M. Wachsmann de m'avoir signalé la trouvaille.

105 L.NIX-W.SCHMIDT (éds.), ***Herons von Alexandria***, *Mechanik und Katoptrik*, Teubneur, Leipzig 1900, p. 295 (Mechanicorum Fragmenta), fig. 75

106 GOYON (1977), pp. 122-125; COTTERELL-KAMMINGA (1990), pp. 27-29, fig. 2.2 (étude de friction), pp. 86-89 (plan incliné), fig. 4.10 (plan incliné), pp. 221-222 (transport terrestre); cf. Raepsaet (1993)

107 M. Honor Frost a eu la gentillesse de me faire remarquer que par exemple à Famagusta, elle avait observé que la traction des traîneaux, qui portaient des vaisseaux, se faisait par des moutons.

108 WRIGHT E.V. (1986), 'A Bronze Age Beach-Capstan', ***Oxford Journal of Archeology 5 (3)***, pp. 309-321; DAMIANIDIS (1996), pp. 35-36, p. 38, fig. 19; POULIANOS (1977), pp. 590-593 et figs.; ***Ελληνική εμπορική ναυτιλία (1453-1858)***, Αθήνα, Εθνική Τράπεζα της Ελλάδος, fig. 32: traînage de bateau de pêche sur vazia par un cabestan manuel.

109 DAMIANIDIS K.A.- HÜSEYIN COBAN (1999), 'Pereme Kutugu' from Inebolu: The last 'shell first' construction survived in the Black Sea', ***Tropis V***, p. 135, fig. 1 (Shipyard at 'Inepoli' (1906). Carte Postale, collection A.S.Mailis. Je remercie M. Damianidis d'avoir attiré mon attention sur son article.

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Abbreviations

AA	Archäologischer Anzeiger
AJA	American Journal of Archaeology (Baltimore)
BCH	Bulletin de Correspondance Hellénique
BIFAO	Bulletin de l'Institut Français d'Archéologie Orientale (Cairo)
BL	Maison d'édition 'Les Belles Lettres' (Paris)
CRAI	Comptes rendus de l'Académie des Inscriptions et des Belles Lettres (Paris)
Deltion	Archaiologikon Deltion (Athens)
IJNA	International Journal of Nautical Archaeology
JARCE	Journal of the American Research Center in Egypt (New York)
JEA	Journal of Egyptian Archaeology (London)
MDAIK	Mitteillungen des deutschen Archäologischen Instituts, Abteilung Kairo(Cairo)
MIO	Mitteillungen des Instituts für Orientforschung (Berlin)
MM	Mariner's Mirror
ZÄS	Zeitschrift fur Ägyptische Sprache und Altertumkunde (Berlin)

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ILLUSTRATIONS

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1) Vue de l'ensemble du *carnagio* de Paros. Paire de *vazia*, chemins parallèles de *falaggia*, une échelle à moitié submergée dans la mer.(Photo de l'auteur).
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20) Reconstruction du traîneau du tombeau de Djehutihotep d'après CHOISY (1904), p. 118, fig. 90 et représentation du traîneau de Dahschur. Reproduits par ARNOLD (1994), s.v. *schlitten*
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PLANCHE 6

28) Glissière des carrières de Pendèli avec reconstitution du système du halage. D'après ORLANDOS (1968), p. 24, fig. 8
29) Traces d'une structure en forme de berceau découvert sous une épave à mer de Galilée. D'après le dessin de E. Amos in: S. WACHSMANN et al., ***The Excavations of an Ancient Boat in the Sea of Galilee (Lake Kinneret)***, Chapter 5. The Boat. A Preliminary study of its construction (by J. Steffy), ***Atiquot XIX***, Jerusalem 1990, English Series, p. 46, fig. 5.16
30) Représentation de l'utilisation de la '*tortue*'. Reproduit par B. Carra de Vaux, ***Héron d'Alexandrie***, 'Les Mécaniques ou l'élévateur des corps lourds', Traduit et établi du texte arabe par B. Carra de Vaux, Commentaires A.G. Drachman, Les Belles Lettres, 1988, fig. 34
31) Représentation d'un traîneau sur rouleaux tiré par un cabestan. D'après L. Nix-W. Schmidt (éds.), ***Herons von Alexandria***, *Mechanik und Katoptrik*, Teubneur, Leipzig 100, p. 295 (Mechanicorum Fragmenta), fig. 75

PLANCHE 1

Fig. 1

Fig. 2

Fig. 3

Fig. 4

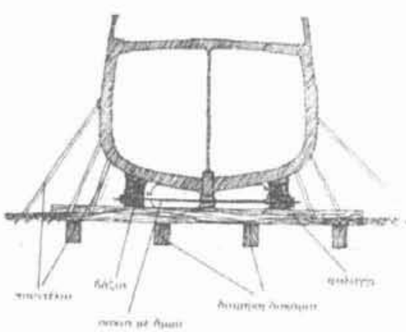

Fig. 5

Fig. 6

PLANCHE 2

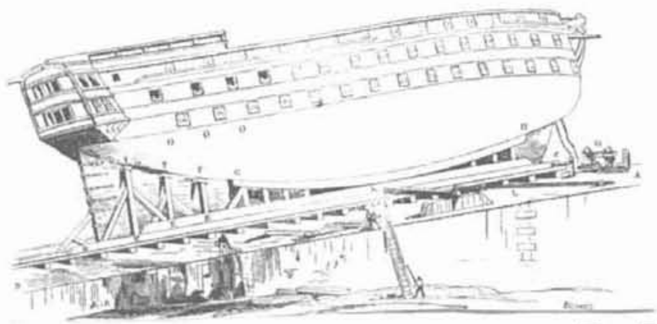

Fig. 7

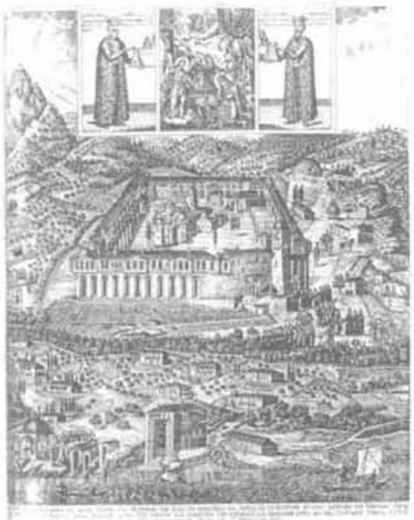

Fig. 8

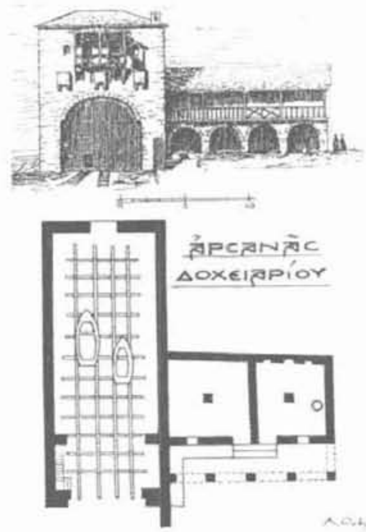

Fig. 9

Fig. 10

Fig. 11

PLANCHE 3

Fig. 12

Fig. 13

Fig. 14

Fig. 15

Fig. 16

PLANCHE 4

Fig. 17

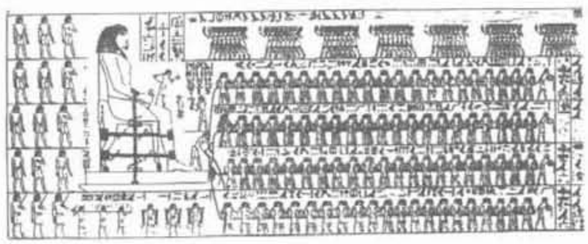

Fig. 18

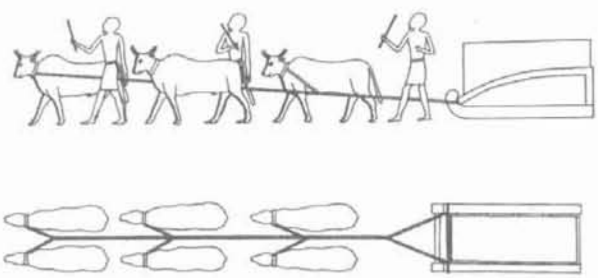

Fig. 19

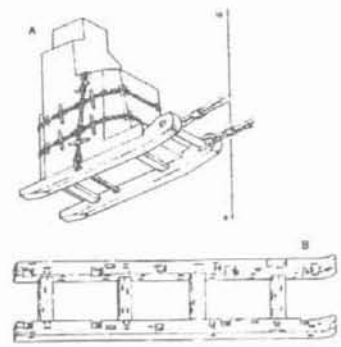

Fig. 20

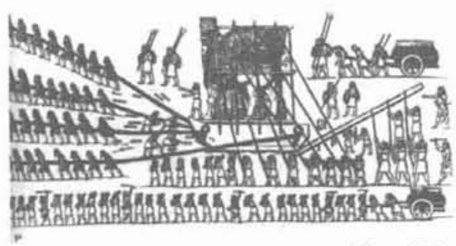

Fig. 21

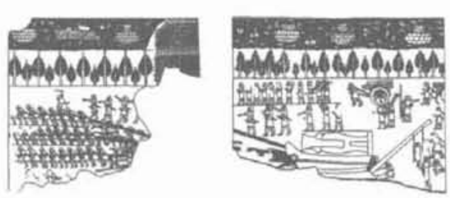

Fig. 22

Fig. 23

PLANCHE 5

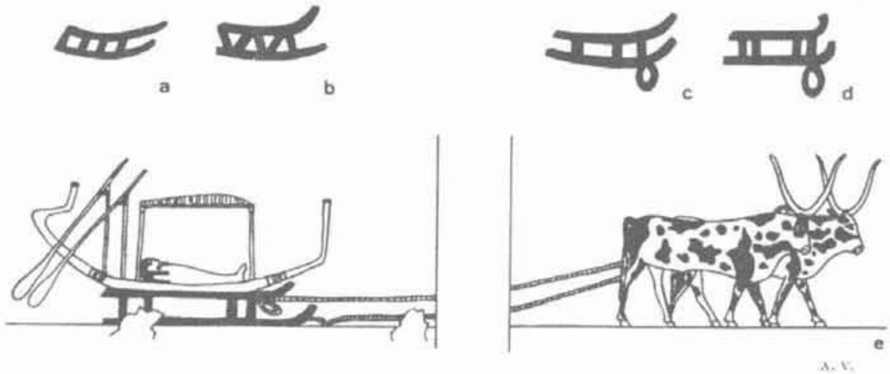

Fig. 24

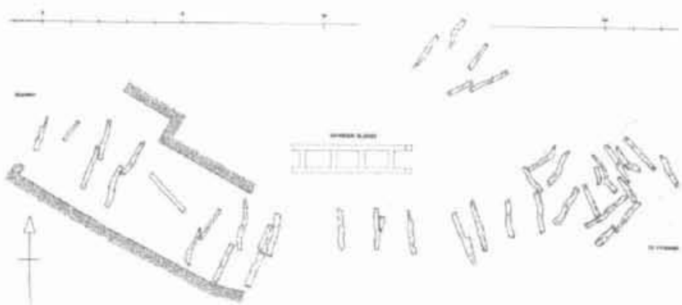

Fig. 25

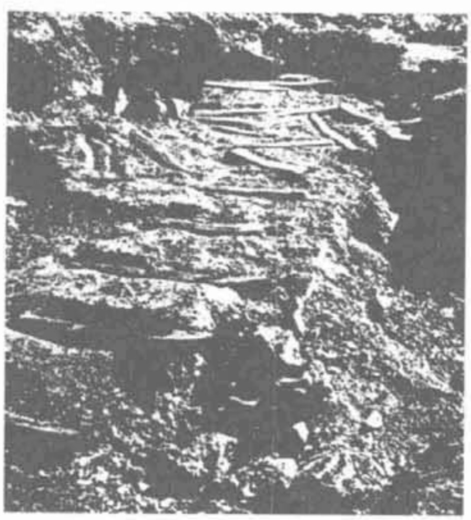

Fig. 26

Fig. 27

PLANCHE 6

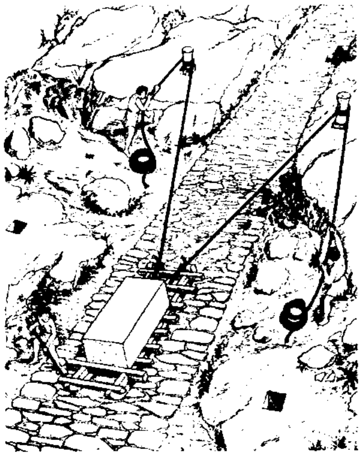

Fig. 28

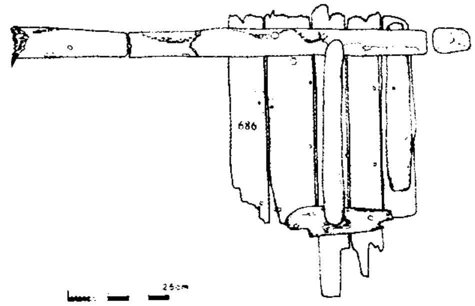

Fig. 29

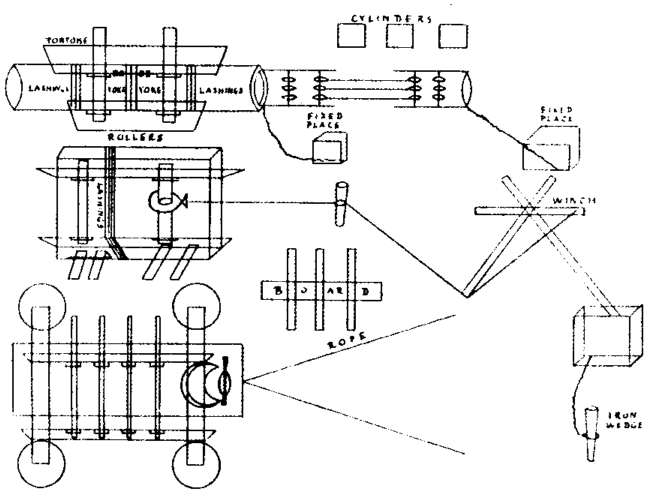

Fig. 30

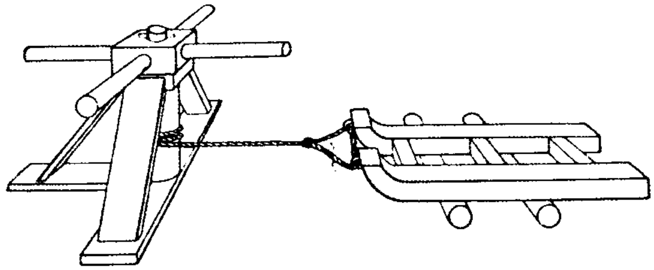

Fig. 31

ANATOMIE D'UN STATERE D'ARADOS

Avant la conquête de la Phénicie par Alexandre le Grand, trois cités-états de la côte levantine ont émis des monnaies au type du navire de guerre : Sidon, Byblos et Arados. Ce navire, qui symbolisait évidemment la puissance de l'état, était, en fait, une trière — sauf sur les monnaies émises à Sidon sous le règne du roi Tennès (355-351), qui représentent très probablement une quinquérème (*MIMA*, p. 339, fig. 722).

Si les monnaies de Sidon et de Byblos montrent *toujours* le navire de *manière stéréotypée*, la proue vers la gauche, celles d'Arados montrent *toujours* un navire dont la proue est dirigée vers la droite. En outre, à Arados, le navire n'est jamais montré de manière identique : pratiquement, bien qu'il s'agisse toujours du même navire, une trière, les graveurs paraissent, dans cette cité, avoir rivalisé d'imagination pour représenter de manière personnelle le même sujet. Cette originalité s'accompagne curieusement d'une indifférence très générale quant à l'intégralité totale de l'image du navire : alors qu'à Sidon et à Byblos, le bâtiment est toujours figuré scrupuleusement en entier, à Arados, tantôt la proue (ou l'éperon seulement), tantôt la poupe sont amputés. On en trouvera ici quatre exemplaires inédits du Cabinet des Médailles de Bruxelles (fig. 1 à 4)[1] ; ces navires sont tous figurés de manière sommaire, mais même cette manière est chaque fois différente.

J'ai eu à deux reprises l'occasion de commenter trois statères d'Arados très particuliers, tous au British Museum, qui permettent, par leur originalité, de saisir certains éléments distinguant les trières phéniciennes des trières grecques (Basch, 1969 ; Basch, 1977 ; *MIMA*, p. 325, fig. 692 à 694).

Un quatrième statère d'une originalité au moins aussi grande a fait son apparition en 1982 (Bourgey, 1982, p. 34). Il a été mis en vente publique à Paris le 10 juin 1982 (catalogue de la vente, Nouveau Drouot, n° 152). Ce statère (d'argent), daté de la période 350-332, d'un poids de 10 g. 48, représente à l'avers la tête barbue et laurée de Melkart (fig. 5). Sa plus grande largeur est de 19 mm. On voit bien (fig. 11 à 14) que le graveur s'est ingénié à représenter le navire d'une manière infiniment plus complexe que ceux des fig. 1 à 4, ce qui nécessite plus qu'une analyse : un déchiffrement.

Dans les trois éudes que j'ai consacrées aux trières phéniciennes (voir ci-dessus), j'ai cru pouvoir établir, parmi les éléments qui les distinguent des trières grecques :
- l'absence de toute *parexeiresia* (apostis ou, en anglais « outrigger »), cadre extérieur à la coque proprement dite, portant un rang de rames, absolument essentielle sur une trière grecque ;
- la présence d'une rangée de boucliers ronds au niveau du pont supérieur, sur lequel étaient postés les soldats de marine ; ces boucliers n'existent sur aucune représentation d'une trière grecque.

Ces deux caractéristiques se retrouvent sur un modèle de trière en terre cuite trouvée à Erment (Égypte), conservée au Musée National de Copenhague (fig. 6 ; aussi *MIMA,* p. 329, fig. 703 à 712). La fig. 7 indique, sur ce modèle, les différents niveaux des rames et du pont supérieur :

A : rangée de rames inférieures, qui passent par des sabords de nage, percés dans la coque ;

B : lisse de plat-bord, qui constitue le point d'appui de la rangée intermédiaire de rames ;

C : lisse supportée par des épontilles, qui sert de point d'appui à la rangée supérieure de rames.

D : pont supérieur, quasi-dissimulé, lorsqu'il est vu de profil, par la rangée de boucliers.

Tous ces éléments se retrouvent sur le statère d'Arados du British Museum, fig. 8, à l'exception, toutefois, de la rangée de sabords de nage, indiquée fig. 9 par une rangée de cercles tracés en pointillé ; certes, il s'agit là d'une hypothèse, mais je la crois tout à fait légitime : la surface de la coque laissée libre est à peine supérieure au diamètre des boucliers, ce qui est irréaliste et elle ne permettait pas, en raison de son étroitesse, au graveur de « percer » une rangée de sabords de nage. On notera que le pont supérieur, au lieu d'être dissimulé par les boucliers, est rendu visible par une convention qui consiste à le faire figurer au-dessus des boucliers. Cette convention a également été utilisée à Arados sur d'autres monnaies : *MIMA,* p. 325, fig. 689, 692 et 694 – ici fig. 10[2].

Le statère apparu en 1982 est différent de toutes les autres monnaies d'Arados citées jusqu'ici. Pour comprendre ce qu'a voulu représenter le graveur, il convient de soumettre son œuvre à différents éclairages : fig. 11 à 14. On distingue dans tous les cas une figure humaine, particulièrement sur les fig. 11 et 14 : on y voit un personnage debout, le bras gauche levé ; il pourrait s'agir d'une représentation du dieu Reshef, posée sur un socle reposant lui-même sur l'éperon. On observera sur d'autres monnaies d'Arados un personnage debout au bras levé : Elayi, J. et Elayi, A. G., 1986, p. 2, fig. 2 et *MIMA,* p. 325, fig. 691, mais aussi un personnage assis : *MIMA,* p. 325, fig. 687. Ces personnages rappellent un passage d'Hérodote (III, 37) parlant de *patèques* (πάταικοι). L'historien rapporte que la statue de Ptah (assimilé à Héphaistos), à Memphis, « ressemble aux *patèques,* ces images que les Phéniciens promènent sur les mers à la proue de leurs vaisseaux ; pour en donner une idée à ceux qui n'en ont jamais vu, je dirai qu'elles représentent un pygmée »[3].

Il est certain que les personnages figurant à la proue des monnaies d'Arados ne ressemblent pas à des pygmées (à l'exception, peut-être, de celle figurant dans *MIMA,* p. 325, fig. 691), mais Hérodote a visité la côte phénicienne vers le milieu du Ve s., alors que les monnaies examinées ici datent du IVe s. ; en tout cas, il n'existait pas, à Arados, un type unique de *patèque.*

Les fig. 11 à 14 présentent deux caractéristiques communes : dans tous les cas, on remarque clairement, au sommet du navire, le trait qui représente le pont supérieur ; dans tous les cas aussi, il est évident que des sabords de nage sont représentés.

Fig. 11 et 12. Ces deux éclairages sont très proches. Au-dessus d'une espèce de feston qui surmonte les sabords de nage, on remarque des cônes qui supportent des objets de forme circulaire ; si l'on considère les trois premiers de ces « objets » à partir de la droite, on serait tenté de penser à des têtes d'êtres humains dirigées vers la proue et dont les cônes seraient les torses. Cependant, cette tentative d'identification n'est pas valable pour les autres « objets » circulaires ». En fait, il s'agirait plutôt de la trace d'une frappe passant par la partie *inférieure* de ces « objets ».

Fig. 13. Cet éclairage souligne le festonnage. Les « objets circulaires » portent un creux en leur centre. Une monnaie d'Arados (*MIMA,* p. 324, fig. 685 – ici fig. 15) montre des boucliers avec un creux identique, ce qui permet d'identifier également comme des boucliers les « objets circulaires ».

Fig. 14. Ici, on distingue non seulement les creux des cinq boucliers à partir de la gauche, mais surtout la trace d'une frappe d'une « barre », cette fois à la partie *supérieure* des boucliers (particulièrement visible sur les boucliers 2 et 3 à partir de la droite).

Cette fois, *tous* les éléments de la trière phénicienne sont réunis : fig. 16 :

A : rangée de sabords de nage (qui n'étaient qu'hypothétiques sur la fig. 9) ;
B : lisse de plat-bord ;
C : lisse supportant la rangée de rames supérieure ;
D : pont supérieur.

Les épontilles en forme de cônes peuvent surprendre, mais on les retrouve, identiques, sur le statère de la fig. 8.

Enfin, le statère apparu en 1982 permet de mieux comprendre un statère d'Arados du British Museum, fig. 17. Sur cette monnaie, très usée, a figuré (en A) une rangée de sabords de nage : il n'en subsiste que trois, à droite.

En conclusion, le « statère de 1982 » constitue l'exemple le plus achevé de l'ambition d'un graveur phénicien soucieux de représenter *tous* les éléments d'une trière sur une surface minuscule, au risque de produire une œuvre à première vue déconcertante.

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NOTES

1 J'exprime ma profonde gratitude à la mémoire de feue Madame Jacqueline Lallemand, conservatrice du Cabinet des Médailles de Bruxelles pour m'avoir, avec sa gentillesse habituelle, autorisé, en 1982, à prendre les photos des fig. 1 à 4, et à les publier.

2 Cette convention n'est jamais utilisée à Sidon. Sur les monnaies au type du navire de cette cité, le pont est habituellement masqué par la rangée des boucliers ; toutefois, de manière exceptionnelle, le pont apparaît clairement, entre les boucliers légèrement espacés (*MIMA,* p. 323, fig. 682), comme sur une monnaie, elle aussi exceptionnelle, d'Arados (*MIMA,* p. 325, fig. 687). Une autre convention fut très généralement en usage à Sidon : les rames sont régulièrement représentées *sous* la quille, dans le but manifeste de pouvoir montrer la coque toute entière, sans aucune interférence : *MIMA,* p. 322-323. A Byblos et à Arados,

les rames ne sont jamais représentées.

3 Sur les *patèques* : voir Morenz, S., 1954 et Elayi, J. et Elayi, A. G., 1986 (nombreuses références).

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LEGENDE DES ILLUSTRATIONS

Fig. 1 à 4. Monnaies d'Arados, 350-322. Cabinet des Médailles, Bruxelles. La monnaie de la fig. 1 est exceptionnelle, à Arados, en ce qu'elle représente le navire en entier, de *l'éperon à la poupe.*

Fig. 5. Statère d'Arados (350-332), en vente en 1982. Avers : tête de Melkart. Collection particulière.

Fig. 6. Modèle de trière de type phénicien, trouvé à Erment (Égypte). Musée National, Copenhague.

Fig. 7. Schéma de la trière d'Erment.
A. Rangée des rames inférieures.
B. Lisse de plat bord.
C. Lisse supportant la rangée de rames supérieures.
D. Pont supérieur.

Fig. 8. Statère d'Arados (350-332). British Museum (Catalogue [*BMC Phoenicia*], pl. II, 14). D'après un moulage.

Fig. 9. Statère de la fig. 8, schéma ; pour le lettrage : voir fig. 7.

Fig. 10. Statère d'Arados (350-332). *BMC Phoenicia,* pl. II, 13. D'après un moulage.

Fig. 11 à 14. Statère d'Arados (350-332), en vente en 1982. Photos de l'original sous différents éclairages. Collection particulière.

Fig. 15. Monnaie d'Arados, IV^e s., *BMC Phoenicia,* pl. I, 2.

Fig. 16. Interprétation du statère des fig. 11 à 14. Pour le lettrage : voir fig. 7.

Fig. 17. Statère d'Arados (350-332). *BMC Phoenicia,* pl. II, 9. Photo d'après un moulage ; lettrage de la fig. 17 B : voir fig. 7.

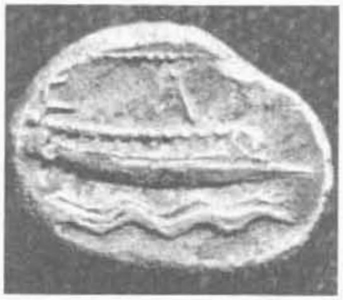


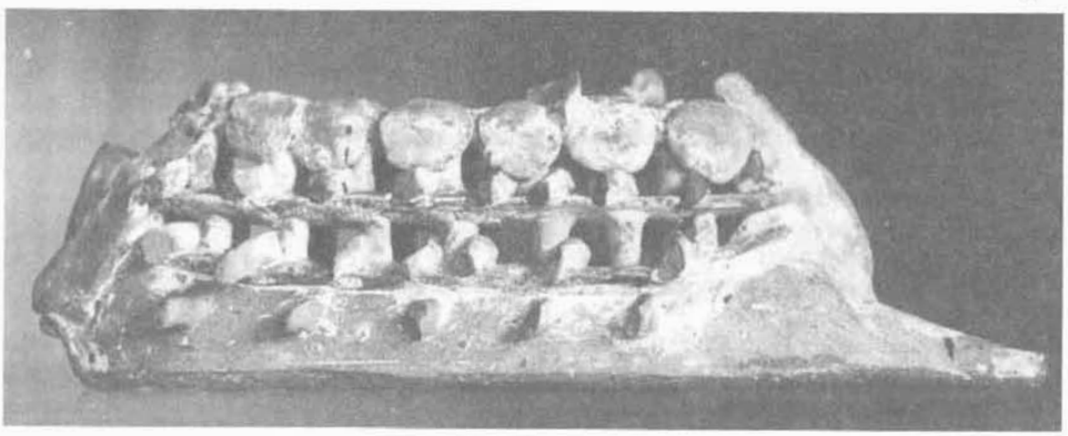
Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5



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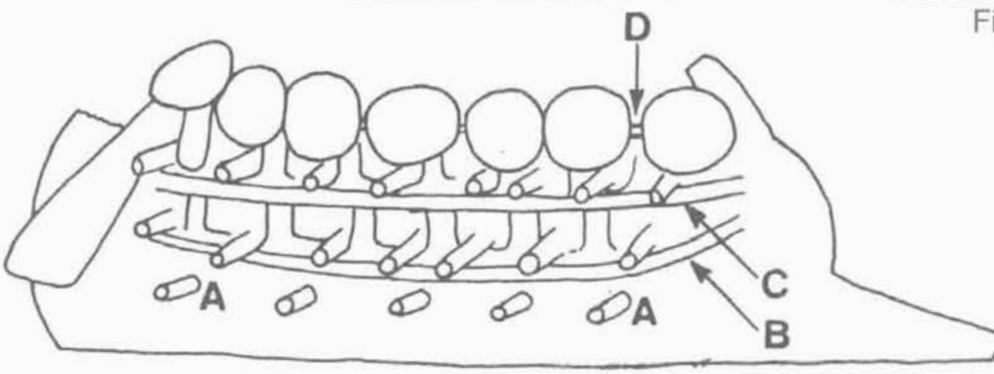

Fig. 7

Fig. 8

Fig. 10

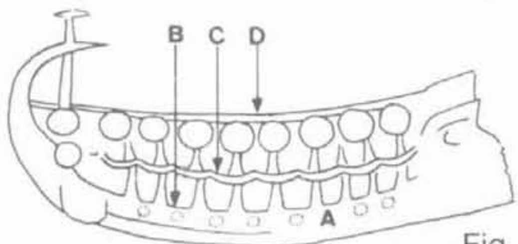

Fig. 9

Fig. 11a

Fig. 12a

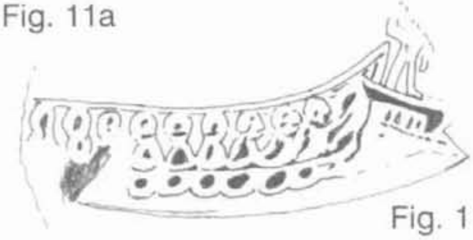

Fig. 11b

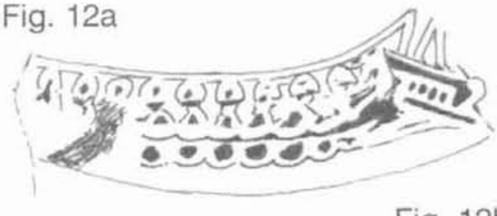

Fig. 12b

Fig. 13a

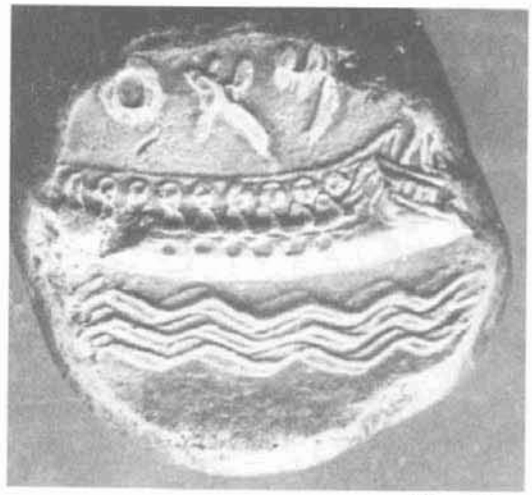

Fig. 14a

Fig. 13b

Fig. 14b

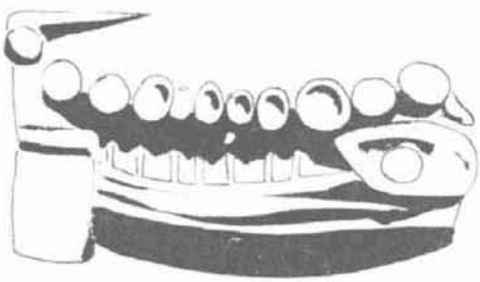

Fig. 15

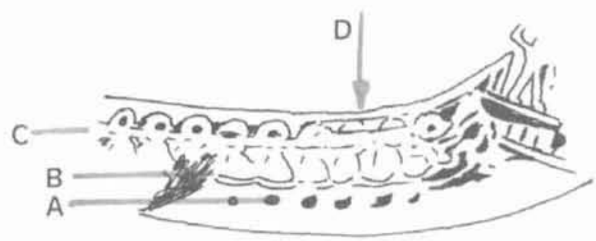

Fig. 16

Fig. 17a

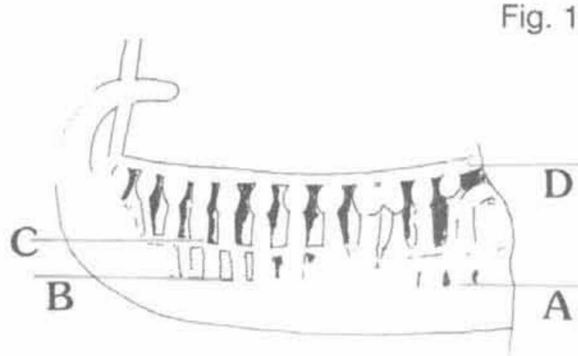

Fig. 17b

THE EXCAVATION OF A FIFTH-CENTURY B.C. SHIPWRECK: 1999 CAMPAIGN*

In 1999 the Institute of Nautical Archaeology (INA) at Texas A&M University, with support from the National Endowment for the Humanities, the National Geographic Society, and Turkish Airlines (THY), began the excavation of a ship wrecked at Tektaş Burnu, Turkey, in the fifth century B.C. Most of the staff of up to forty people, representing ten countries, were students serving apprenticeships under experienced INA veterans who have worked together as a team for a quarter century or more. George Bass served as excavation director, with Deborah Carlson as assistant director.

The wreck was discovered on 3 September 1996, during an INA survey directed by Tufan Turanli and sponsored by Shell of Turkey. Diving from INA's 20-meter, steel-hulled vessel *Virazon*, two of his team spotted the remains of a cargo between 38 and 45 meters deep near Tektaş Ada ("Lone Rock Island"), west of Siğacik (ancient Teos), which lies south of better-known Çeçme. About 60 amphoras of two major types lay visible on a sandy bottom just off the point, Tektaş Burnu, that takes its name from the tiny island. The upslope concentration of amphoras extended between two large rock outcrops, while a larger concentration, lower on the slope, covered an area of approximately four by nine meters at a depth of about 42 meters. A little hand-fanning at the time revealed additional amphoras under the sand. Still farther down the slope, the sea bed drops almost vertically. One of three amphoras raised for identification was filled with pitch.

Drawings of the amphoras were, on the advice of INA Adjunct Professor Carolyn Koehler, sent to Mark L. Lawall of the University of Manitoba, who had written his doctoral dissertation on one of the types. After preliminary correspondence, Dr. Lawall visited the Bodrum Museum of Underwater Archaeology in July 1997 for firsthand examination of the amphoras. He concluded that one of them came from the northern Greek city of Mende, and is best dated to the third quarter of the fifth century B.C. The origin of the other is uncertain, but some clues point to the west coast of Asia Minor for its manufacture, also in the third quarter of the fifth century B.C.; Lawall's suggestion of Klazomenai as a possible manufacturer of the jar is especially intriguing because of the short distance between that ancient city and the place where the ship sank.

The third quarter of the fifth century was, of course, the Golden Age of Classical Greece, the time when the Parthenon was being built, the time of Pericles, Socrates, Sophocles, Herodotus, Thucydides, Pheidias, Polykleitos, and so many others whose names remain well known to this day. Although archaeologists, historians, and art historians are intimately familiar with the architecture, pottery, sculpture, coinage, and clothing of this period, little is known of the ships that allowed Greece to prosper at that time. This fact led to our decision to excavate the wreck.

We devoted June to the preparation of the equipment needed for the task. Tektaş Burnu presents the most hostile environment any of us had faced in four decades of underwater excavations. The site lies open to the prevailing northwest wind of summer, without a completely sheltered cove in which to moor support vessels. Further, millennia of waves have eroded the cape into sharp teeth of rock, so that walking on shore was impossible on our visits to the site prior to 1999. Thus, with a few workmen from the nearest village, Zeytineli, about 40 minutes away by boat, an advance team from INA began to flatten some of the rocks and pour concrete platforms for heavy equipment. During that month, we used *Saros*, chartered from the Rahmi Koç Industrial Museum in Istanbul through TINA (Turkish Institute of Nautical Archaeology), a group formed by INA Director Ayhan Sicimoğlu to support INA. *Saros* was able to place on shore the two one-ton generators that supplied electricity to compressors, fresh-water makers, lights, computers, and even air-conditioning for the cabin devoted to computers on *Virazon*, which was moored in the lee of the cape that offered only partial protection from the wind and waves.

On 3 July, the entire staff moved onto *Artemis*, a former U.S. Navy wooden minesweeper, built in 1942, that had been converted into a cruise ship in Greece, but flew the flag of Belize (Fig. 1). Because of her much greater length, *Artemis* was not as well protected by the cape as *Virazon*, and on one occasion even the heavy bow lines running to shore parted under gale-force winds, leaving the ship at the mercy of her anchor and chain, which luckily held.

Meanwhile, we prepared the site for excavation by putting our airlifts and underwater telephone booth in place, laying a rope grid over the site to aid excavators (Fig. 2), and cleaning and mapping the site. While Robin Piercy supervised construction of a camp and dive platform on the cape, diving proceeded from *Virazon*, although this necessitated a surface swim of several minutes to the cape, and an underwater return of up to eight minutes from the wreck to the decompression stop beneath *Virazon*.

Mapping was accomplished largely by Tufan Turanli and Berta Lledó using a new computerized system based on photogrammetry. In this, the excavation area was photographed with calibrated 35 mm and digital cameras and later, on the surface, the resultant images were processed by programs that convert the data into three-dimensional models

When these preliminary stages were completed, full-scale excavation commenced. The first artifact brought to the surface was the first of eight intact oil lamps found in 1999 (Fig. 3); the round, handleless bodies of these lamps seemed reminiscent of sixth-century lamps, but other finds, mentioned below, soon reinforced the date of between 450 and 425 B.C. suggested by Mark Lawall. The first lamp was found near the shallower, upslope end of the wreck, and the nearby discoveries of a black-glazed *kantharos*, a jug (Fig. 4)[1], and a coarse-ware *hydria* initially led us to believe that we were excavating the stern of the ship, since galleys were normally at ships' sterns. We were soon persuaded otherwise, however, by the nearby discovery of a marble disk, flat on one side and convex on the other, approximately 14 cm in diameter and 2 cm thick (Fig. 5). Dark stains, the remnants of pigment, show that the convex side of the disk was painted with a central circle about 3 cm in diameter, encircled by a dark band 8 mm wide about equidistant from the center and the rim of the disk; the band is bounded by faint, incised lines. A metal fastener ran through a central hole in the disk, extending from its plain, flat side. Troy Nowak, who has prepared an article on the disk for submission to *IJNA*, was the first to recognize that it was one of the ship's eyes (*ophthalmoi*), an identification confirmed by a visit by William Murray, Carlson and Bass to the Piraeus Museum in Greece where we examined half a dozen marble eyes that had been excavated from a storage area of the famed ship sheds that housed Athenian triremes in the fifth century B.C.[2] Although those eyes are more natural, representations of ship's eyes in Greek art show that some of them were round[3], like that at Tektaş Burnu, as if they represented only the pupils and irises.

This is the first ship's eye ever found in association with an actual ship. The concretion on the metal rivet suggests that the disk was pinned to a plank about 3 cm thick, which further suggests the thickness of the ship's strakes (lines of hull planking). We hope that the future discovery of the other *ophthalmos* will give proof to some of these suggestions.

Meanwhile, at the deeper end of the site, household ceramics began to appear, including nine one-handled drinking cups, mostly 16-17 cm in diameter, but three only 6-9 cm in diameter (Fig. 6);[4] five more lamps; a terracotta mortar (Fig. 7);[5] and cooking pots (Fig. 8), including a spouted *chytra*.[6] Among them lay an intact *alabastron*, a stone vessel associated with perfumed oil in fifth-century Greece (Fig. 9).[7] Here, too, lay the two lead cores, each approximately 50 cm long, of a wooden anchor stock into which the lead had been poured to provide weight (Fig. 10). These, the earliest evidence of the first, embryonic steps toward metal anchors, are the subject of an article being submitted to *IJNA* by Ken Trethewey, who excavated them. They exemplify Haldane's Type IIA anchor[8], and are similar in size to the anchor stock fillings from the Capistello wreck of the late fourth or early third century B.C.[9], and the earlier Ma'agan Michael vessel of c. 400 B.C.[10]

Such discoveries did not mean that the upper end of the wreck ceased yielding artifacts. Indeed, along with two more lamps, an extremely fine black-glazed *kantharos* with stamped decoration appeared there,[11] as well as all the pieces of another undecorated *kantharos*. Lastly, Gökhan Bozkurtlar located a pocket of artifacts farther downslope than we originally thought the cargo extended, suggesting a larger ship than we had anticipated excavating. Finds there included a third type of *kantharos* (Fig. 11)[12] carried on board; its handles must be nearby under the sand.

The majority of nearly 200 amphoras uncovered during the course of the 1999 excavation campaign were of the pseudo-Samian type, one containing over a hundred cattle bones, mostly ribs cut to approximately the same length, suggesting cured beef of some kind.[13] Shipments of beef ribs are known from literary sources in antiquity, but if these bones represent part of the ship's victuals, they may indicate that the ship's last voyage began somewhere near where the ship sank, if the amphoras of this type were, as suspected, fired in that vicinity. Additional Mendean amphoras also appeared, as did two amphoras with the swollen neck typical of amphoras from Chios. Tektaş Burnu lies almost equidistant between Samos and Chios.

With the near completion of our camp coinciding with the end of the two-month charter of *Artemis*, the staff moved ashore at the end of August.

There, diving from a platform almost directly above the site greatly improved efficiency. Further, we extended our campaign from the end of August, when we had planned to stop diving, until September 21, when cold weather brought the 1999 expedition to its end.

Conservation of artifacts continues in the Bodrum Museum of Underwater Archaeology, where once cleaned they are drawn and catalogued in final form. For the latter we use the Tektaş Database Solution, a computer program designed by Berta Lledó, a Spanish graduate student who has worked with us for the past six years. This should be used by excavations around the world. On a single CD-ROM, each of the principal staff members now has a color illustrated catalogue of all artifacts, with descriptions, published parallels, and any other data that will aid in the publication of the site; a complete register of everything brought up from the sea bed, including the smallest fragments; the conservators' records for each artifact; an illustrated daily journal of the excavation, kept by staff and students on a rotating basis; the complete log of all dives made in 1999; financial records; hundreds of images of the camp, the site, and the artifacts; complete files of all staff and visitors; and more. When I recall the boxes of catalogue cards, pages of photographs, stacks of field notebooks, shelves of dive logs, and myriad legal pads filled with handwritten notes from our past excavations, I realize how much more quickly and easily it will be to publish this site than any we have previously excavated.

In conclusion, because much of the 1999 campaign was devoted to developing the infrastructure for full-scale excavation and experimenting with a new mapping system, we feel that we have not yet reached the heart of the wreck, for we are not deep enough in the sand to come across coins, tools, weapons, or whatever the ship may have carried to the bottom. Nevertheless, finds made to date suggest an extremely rich site that not only will probably yield the largest well-dated closed deposit of fifth-century B.C. ceramics ever found, but will continue to reveal unique knowledge of the ships and sailors that allowed Classical Greece to prosper. We anticipate two more summers of excavation.

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NOTES

* Photographs are by Donald A. Frey. Abbreviations are those used in *American Journal of Archaeology*. During the initial phase of the project, Harun Özdaş served as commissioner from the Turkish General Directorate of Antiquities and Museums, followed in August by Gökhan Bozkurtlar.

1. Similar, but with a slightly higher ring foot and seemingly rounder, rolled handle, and from a slightly later date, 425-400 B.C., is Sparkes/Talcott 1970: 350 no. 1617, with pl. 73.
2. Saatsoglu-Paliadeli 1976: 119-35; Bass 1972: 45 with fig. 11.
3. Casson 1971: fig. 91, of a late sixth-century merchantman.
4. Cf. Sparkes/Talcott 1970: 127 and pl. 30.
5. Cf. Eiseman/Ridgway 1987: 31-32 G10, with fig. 3-10, for a slightly later shipwrecked mortar. Lawall 1998: 16-23 for revised date of wreck.
6. Sparkes/Talcott 1970: 373 no. 1953, with pl. 94 and fig. 18.
7. Amyx 1958: 215.
8. Haldane 1990: 21.
9. Frey/Hentschel/Keith 1978: 292, 295-96.
10. Rosloff 1991: 223-226.
11. Cf. Sparkes/Talcott 1970: 115-16 no. 633 with pl. 27; Pease 1937: 276-79 no. 49.
12. Cf. Sparkes/Talcott 1970: 114 no. 629 with pl. 27.
13. The bones were identified by David Reese of the Field Museum during his visit to the Bodrum Museum of Underwater Archaeology to study the bones from the Bronze Age shipwreck excavated earlier by INA at Uluburun.

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FIGURES

Fig. 1. Camp, *Virazon*, and *Artemis* at Tektaş Burnu.
Fig. 2. The site at the commencement of excavation.
Fig. 3. Five of eight oil lamps, approximately 7 cm in diameter.
Fig. 4. Jug, 35 cm high.
Fig. 5. Marble *ophthalmos,* 14 cm in diameter.
Fig. 6. Smaller one-handled cups, 6-9 cm in diameter.
Fig. 7. Terra-cotta mortar; estimated diameter 37 cm.
Fig. 8 Cooking pot.
Fig. 9. *Alabastron*, approximately 14 cm high.
Fig. 10. Lead stock cores, approximately 50 cm long.
Fig. 11. *Kantharos*, missing handles, approximately 10 cm high.

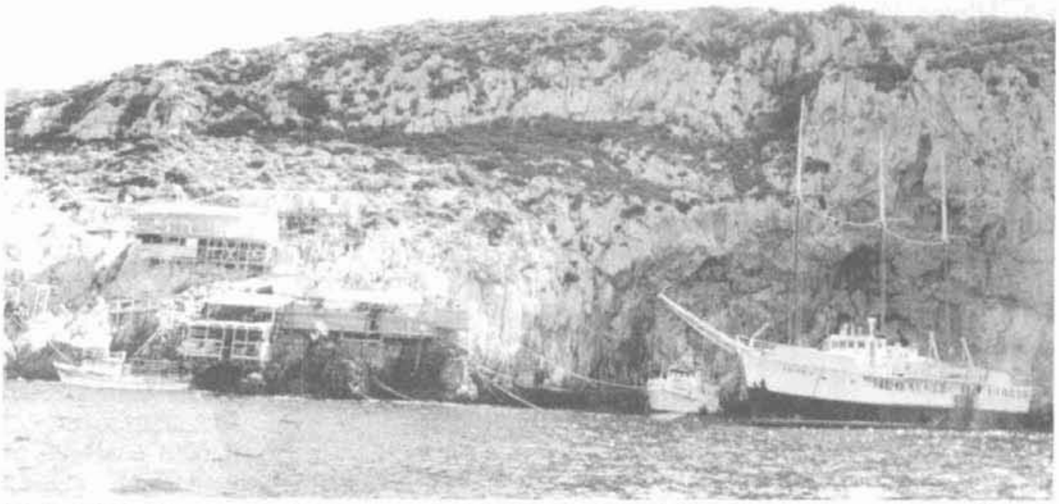

Fig. 1

Fig. 2

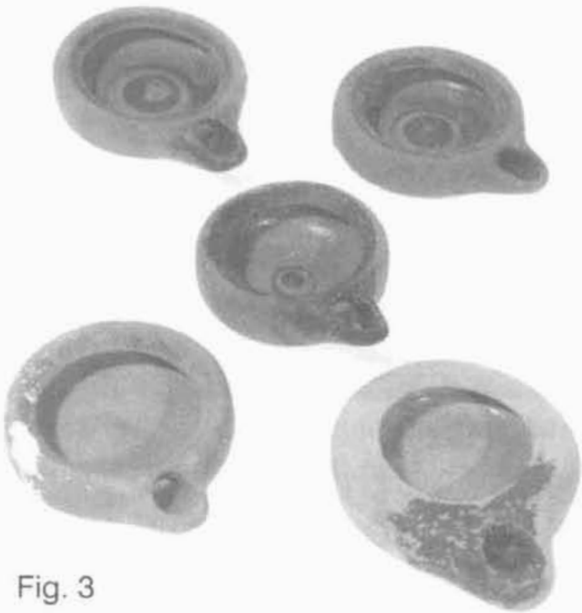

Fig. 3

Fig. 4

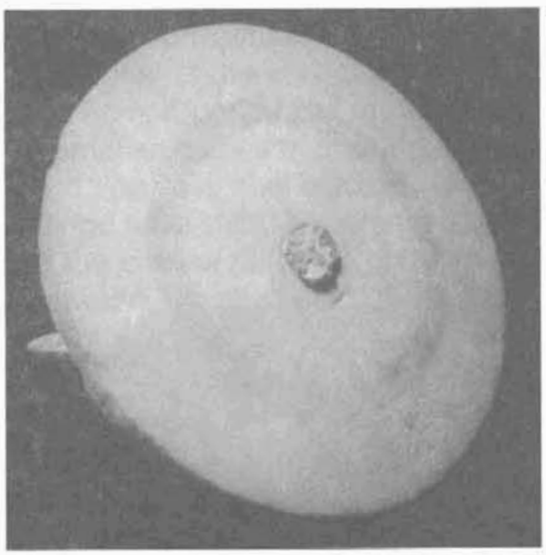

Fig. 5

Fig. 6

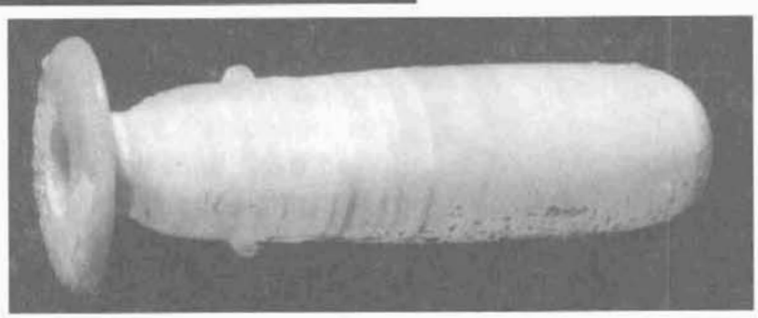

Fig. 9

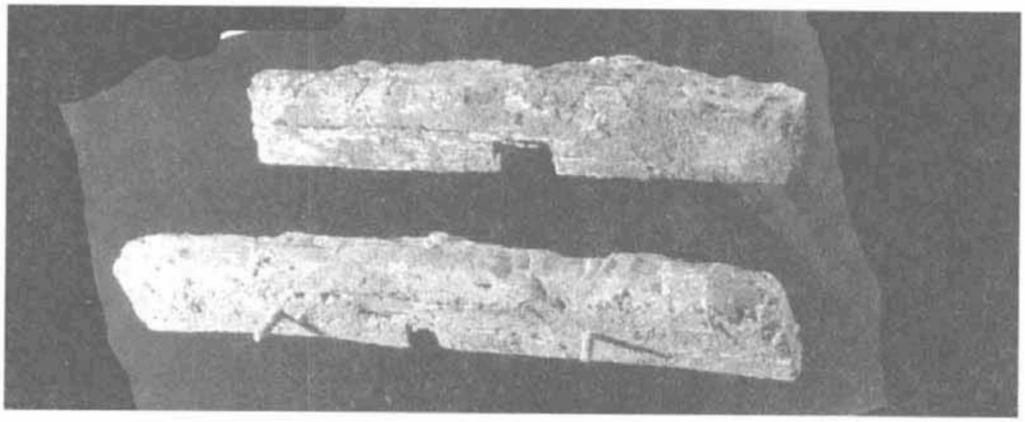

Fig. 10

Fig. 8

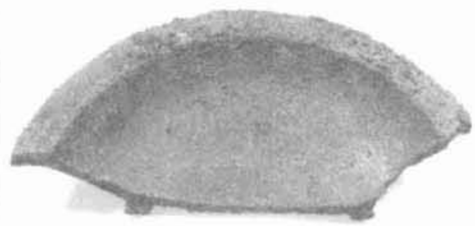

Fig. 7

Fig. 11

SEWN PLANK BOATS OF THE ROMAN ERA IN THE UPPER ADRIATIC SEA. NEW EVIDENCE

In the last few years, our knowledge of the sewn plank technique for the construction of ships in the ancient Mediterranean has increased significantly thanks to new evidence and to the study of previous discoveries.

Both Pomey's study of the Bon-Porté wreck (Pomey, 1981) and of the other sewn ships of the Archaic era (Pomey, 1985; 1997) and the French scholar's analysis of the two boats recently discovered in Place Jules-Verne in Marseille (Pomey, 1998) have allowed us to learn many aspects of this technique for ship construction, which, until a few years ago, was known only by a few references in ancient authors.

Discoveries in the area of the delta of the Po river in Italy allowed Pomey (1985) and Bonino (1985) to demonstrate that this system of construction, which began in Egypt in the third millenium BC, did not disappear at the end of the Archaic era. Rather, it continued to exist during the Roman period but in a limited geographical area, along the Italian and Dalmatian coasts of the Adriatic Sea.

In fact, the discoveries of evidence of sewn boats of the Roman period have steadily increased of late, and they have given us a clearer idea of the area of diffusion of these crafts and of the technological differences between these vessels and those constructed by Greek shipbuiliders. Unfortunately, we must warn the reader from the start that this type of analysis is complicated by the poor quality of the finds (which often consist in small sections of wood only) and by the lack of attention that the institutions charged with the protection of the archaeological evidence pay to the remains of ancient hulls.

Here, we propose a summary of the most recent discoveries of Roman sewn wrecks.[1]

From 1993 to 1997, along the shore of the **Venetian Lido**, numerous fragments of a sewn ship were recovered (Beltrame, 1996). The vessel from which they come may have been wrecked during maneuvres to enter the harbour of Malamocco, which, during the Roman period, was at the mouth of a river. The finds consist of various sections of planking (fig. 1) and one of the floor timbers. The planking is made entirely of elm and has diagonal holes, closed by lime treenails, along the edge of the planks. There is a trapezoidal cavity corresponding to each of the holes which provides a better housing for the joining rope (figs. 2 and 3).

The fragment of an oak (*Quercus sez. robur*) floor timber is rectangular in section and has holes for fastening to the planking.

The available remains do, however, allow us to recognize a boat with very similar characteristics to the Comacchio vessel. The most evident technical similarity is in the sewing system used on the planking with the juxtaposition of trapezoidal cavities through which the ropes were then run out. One further point of particular interest is the preference of the builders of the two ships for identical types of wood: in particular, they both used elm for planking, oak for frames, and lime for the majority of the treenails used to fix the ropes.

C 14 testing has given a date somewhere between 1 to 144 AD.

In 1988, in the ancient Anfora channel of **Aquileia,** two 10 meter-long strakes, a section of a third one and an unconnected piece of framing were discovered (fig. 4) (Bertacchi, 1990: 242-243).

The strakes still had the remains of a roll of caulking material and of rope along the seams. The central timber has, at one end, an S-scarf and, at the other, a sewn repair.

Unfortunately, it is still impossible for anyone to gain access to the find and the kind of excavation carried out to recover it does not allow us to deduce anything about the date, which lies sometime in the Roman era.

The remains of the ship of **Cervia,** recorded by Marco Bonino (1968; 1971) and recently analyzed by us, consist of seven fragments of planking in elm and five rib sections in oak (*Quercus sez. robur*).

Along the edges of the planks are diagonal holes where he noted several treenails which are now absent. On the edge of some strakes, there are nearly trapezoidal cavities corresponding to each hole. Remains of metal nails are still visible where the ends of the planks are cut obliquely for joining with other planks. The ribs have holes for the insertion of treenails.

The anchors, associated with the wreck, suggest to us a date in the seventh century (see also Maioli, 1986).

At **Corte Cavanella of Loreo**, near Rovigo, the remains of a Roman settlement are conserved. The archaeological site, which dates from the end of the Ist century BC or early in the following century, consists of a system of navigable channels connected by structures.

The water system was principally a channel cut artificially after the first phase of the settlement (sometime after the reign of Caligula) and then partially covered to form a dock for sheltering boats. The roofing-over of this building consisted in a double sloping roof of tegulae and embrices which probably collapsed in a flood.

The settlement could be the *mansio Fossis*, a stop along the littoral way documented by the *Tabula Peutingeriana* (Sanesi, Bonomi & Toniolo, 1986).

In 1983, a wooden hull was found inside the dock under the layer of collapsed eaves (Sanesi, 1985).

As the wreck was left *in situ* and covered, we have meager resources for an analysis. The vessel is preserved for a length of m 7,45. The hull is flat, without a keel, and has side strakes that form an obtuse angle with the bottom.

Pottery deposited over the hull dates the collapse of the dock, and so the boat, to a period between the end of the first and the beginning of the second century (pers. inf. by A. Toniolo).

Two years later, in the same settlement, a water gathering and percolation system was discovered consisting of small wooden channels and a waterfront. Between the small channel and the bank, a boat (**Corte Cavanella di Loreo II**) was discovered which had evidently been reused as a platform after partial dismantling (fig. 5) (Sanesi, Bonomi & Toniolo, 1986). The boat is 4,13m long and consists of three strakes of red fir or larch, which have slanted holes along the edges to insert the ropes blocked with cypress treenails. The planks have been cut with a precision unusual for shell-first construction: in fact, they are very straight and quite symmetrical. The central strake, near the end, has a V joint for connection to the stem, which has not been conserved.

The boat has a flat bottom, without a keel, and is missing side strakes and an extremity which appears to have been sawn off in antiquity. It is still conserved, positioned upside down on the wooden board used to recover it. For this reason, only the bottom is visible while, for the upper part, data are provided by some photos of the excavation. In these photographs, three floor timbers are recognizable, and chestnut treenails, visible on the planking, indicate the position of two more floor timbers.

The presence of a Nerva *dupondium*, under the bottom of the boat, and the dating of the waterfront give a *terminus post quem* for the deposition of the craft at the end of the first century.

There are no other clear elements for fixing a period of use of the boat, though this is unlikely to go beyond the first twenty years of the second century.

In the **north lagoon of Venice**, one wooden element, which perhaps could be regarded as a fragment of sewn planking, was recovered in 1971 (Dorigo, 1983: 247 and fig. 153). The piece was cm 130 in length and had slanted holes along one edge with five treenails still inside. C 14 testing has dated the find to 530 BC +/-60.

An excavation conduced in **Padua,** in 1991, led to the discovery of a large wall from the Augustan period, lying near the ancient bed of the Brenta river. This was interpreted as a harbor quay. At its base, many interventions of drainage designed to stop the processes of erosion have been identified. To build the last one, the end of a boat, 4,40m long, was utilized. It was composed by four planks in elm still sewn and two others not connected. The frames, no longer preserved, were eight in number.

The stratigraphy suggests that the planks were reused around the beginning of the second century (Balista, Ruta Serafini, eds., 1993).

In the Stella river, at **Palazzolo**, near Udine, in 1998, a wreck of a cargo of tegulae, dating from the first half of the first century, was located in 1998[2] On a part of the hull, at a high level, mortise and tenons have been recorded, but, on the bottom, a number of segments of rolls of caulking material held in place by ropes, tied in an X pattern, have been noted; it is possible that these ligatures were not repairs but fastenings between the planks. As in the case of the Comacchio ship, it could be that the bottom of the hull was assembled by sewing while the upper works were assembled with mortise and tenons.

Finally, at **Oderzo** (Treviso), during the digging of a channel designed to drive a hydraulic wheel that dates to the end of the second century, it was noted that some planks of the construction were connected by ropes, which passed through small holes closed by wooden pegs (Trøvo, 1996). Even if we could not see it directly, the photos that we have analyzed indicate that, given the notable thickness of the boards and of the absence of any trace of framing on them, we can say that this is not a piece of boat reused but a part of the system. Nonetheless, it is very probable that the use of this technique in hydraulic engineering was influenced by local nautical carpenters.

The evidence of Roman sewn boats, here presented, allow us to make some summary observations.

We know that, in the Mediterranean, the sewn plank technique was used simultaneously with the mortise-and-tenons system till the beginning of the Classical age. The last evidence for the sewn technique in the

Mediterranean, in fact, is on the extremities and along some breaks of the hull of Ma'agan Mikhael, in Israel, which is dated at 400 BC (Kahanov, in press). Subsequently period, in the Mediterranean area, it seems that this technique was completely superseded by mortise-and-tenon construction, which allowed the construction of bigger, stronger, and more «developed» hull forms (Pomey, 1995: 199). However, it is important to note that the mortise-and-tenon technique required less frequent maintenance: in fact, the ethnographic evidence of sewn boats in the modern age shows the necessity of fully overhauling the ligatures annually due to their slacking with use (Mc Grail, 1987: 135). The sewn system next appears only at the beginning of the second century BC and in a peripheral zone of the Mediterranean Sea, precisely in a river, near Ljubljana (Gaspari, 1998 a, 1998 b; Karinja, 1998).

For successive centuries, we have both archaeological and written evidence of its existence. While written sources seem to refer to the existence of sewn boats between the second century BC (see Pacuvius, *Niptra,* fragm. 250) and the fifth century (see St. Jérôme, *Epistolae,* CXXVIII, 3), the finds which have been made in recent years confirm this dating. After the sewn boat of Ljubljana, the most ancient wreck is that one of Comacchio, dated to the last quarter of the first century BC, while the *Cervia* ship is the most recent and probably dates to the seventh century. At that juncture in history, the silence of sources and the absence of archaeological evidence seem to indicate the disappearance of the technique. Only the *Pomposa* wreck (Bonino, 1968; 1978: 53-54; 1985) appears as an exception, but we ought to consider the question of its dating more cautiously than has been done in the past.

It is very important to note that the known Roman sewn boats and those recently discovered are all located exclusively in the upper Adriatic area along the Italian coast, from Aquileia to Cervia, and along the Dalmatian one.

The discoveries of Nin (Brusic, 1995) and Ljubljana seem to confirm Varro's testimony (in Aulu Gelle, XVII, 3, 4) regarding a tradition among Liburnians shipbuilders to use ligatures, and Verrius Flaccus' account (in Festus, 460 L) regarding a variety of sewn boats called *serilia* in use among the Liburnians and the Histrians. With this in mind, Illyric and north Adriatic boatbuilders appear to be the only naval carpenters of the Roman period who kept alive this technique, inherited from the Hellenic tradition, in order to construct the entire hull.

Sewn plank boats from the Greek age and those of later periods exhibit several differences within a single technical approach.

The most obvious difference is the presence, in the Greek age, of tetrahedral cavities along the inner joints of the planking, used as guides to thread the ligatures into the holes (fig. 6) (Pomey, 1998). Subsequently, in their place, we find simple holes (fig. 3). Moreover, on the *Comacchio, Lido* and *Cervia* wrecks, on the edges of the planks there are no longer simple semi-circular carvings to house the ropes so that they do not protrude, as found on Greek ships, but trapezoidal cavities (figs. 2 & 3). On the *Cavanella II* boat, on the contrary, the grooves are simply rectangular. It seems that the former solution was adopted on planks not much more than cm 3,5 thick. As proof of this, on the *Comacchio* hull, both this technique and the latter one may be found together: one applied to planking – of considerable thickness – the other on the planks of the «hatch» – which are of reduced thickness.

During the Roman age, horizontal treenails between planks seem to disappear almost completely. These were typical elements of Greek ships (fig. 6) and served a dual purpose of making sewing operations easier during the construction stage and, subsequently, of hindering longitudinal movement between the planks (Pomey, 1981: 236). Floor timbers of later vessels were spaced closer together (passing in fact from a gap of cm 95 to about cm 50): this solution, creating greater longitudinal cohesion between the planks, perhaps, made treenails unnecessary[3].

Only the Roman (*Comacchio*) and later (*Cervia*) periods see the use of nails in the joinery of the planks. This technique is used only in fastening strakes to posts (only *Comacchio*) and in fixing some angle joints (Berti, 1990: 29).

The shape of the frames during the two ages is another distinctive element. A profile with sloping walls (fig. 3) replaces the heavily flared sides and the round back of the Greek period (fig. 6). This simplification is the result of the fact that frames are now no longer fastened to the hull by ropes which of course stretch more along the second kind of section (Pomey, 1998: 152). Now, in fact, the fitting of the planking to the frames is made *via* wooden treenails alone: the *Comacchio* vessel is an exception to this style as it has ligatures as well as treenails (see Berti, 1990: 29-32).

Except for the *Nin I* wreck, which has a real keel and should be considered separately as a seagoing vessel, the construction of sewn boats in the Roman age seems to have followed a preference for flat-bottomed crafts, used, prevalently – but not only – on inland waterways.

A clue to explaining the preservation of the sewn technique in the Roman age in the north Adriatic alone and, on the contrary, the paucity of evidence for use of the mortise-and-tenon system, may be found in the environment. The western littoral today consists of many channels, marshes and lagoons and, despite changes, this situation doubtless existed during ancient times (see Cacciaguerra, 1991). Inland navigation was thus of primary importance, either along natural waterways or along artificial channels. On the Adriatic littoral, then, an inland passage that connected Ravenna and *Altinum* through *fossae per transversum* and the *Septem Maria* is well documented by written sources (Plinius, *Nat. Hist.* III, 119-21; *Itinerarium Antonini*, XXXIII, 6, 7). This waterway, perhaps, continued all the way to Aquileia and the Anfora channel (Uggeri, 1990).

Some of the boats which we have documented have been found in ancient river-beds of inland water-ways and others were found along the shorelines. Since the latter were near river mouths, they were probably exiting or entering the mainland. This type of geography would certainly have required small and, especially, flat-bottomed craft. Livy, on the other hand, recounts that the citizens of *Patavium* (Padova) attacked Cleonimo's fleet on boats *planis alveis fabricatas,* that is with flat-bottoms, and *ad superanda vada stagnorum apte*, that is well suited for local hydrography (Livius, X, 2, 4-15). Then, we have to consider that either Cassiodorus' words and the numerous planked and paved banks which border some ancient channels document the diffusion of towing along the upper Adriatic littoral: of course this mode of navigation required flat-bottomed boats.

Concluding, we have said that the mortise-and-tenon technique, in comparison with the sewn one, allowed the construction of more «developed» and bigger hulls. Now, because of the upper Adriatic boatbuilder's unpretentious need for the assembly of boats with limited dimensions and flat bottoms, we do not have to be surprised by the small number of discoveries of vessels constructed by mortise-and-tenon technique in comparison to those assembled by ligature. This need, in fact, could be fully satisfied by continuing to use the ancient and simple system by ligature instead of moving to the other which, because of its complexity, would have required longer and perhaps not justifiable times for the construction.

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NOTES

1 For more details see also Beltrame, 1996-97; in press.
2 F. Bressan and S. Vitri's communication at Conegliano in 1999.
3 In any case, it should be noted that, on two fragments of planking from the Venetian Lido, there is a horizontal treenail which is not fitted in the planking but presents a completely free side. Comparing it with those on a Greek wreck of Marseille (pers. inf. by P. Pomey), we could suppose this is a repair joint made in a way similar to that in the mortise-and-tenon hull of Kyrenia (Steffy, 1999: 397-398).

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ILLUSTRATIONS

1) Sewn planks from Alberoni beach (Venice) (after Beltrame, 1996).
2) Detail of the trapezoidal cavities along the edge of the sewn planks from Alberoni beach (Venice).
3) Technique for the assembly of planks by sewing in Roman crafts.
4) Sewn planks from the «Anfora» channel in Aquileia (photo: Museo Archeologico di Aquileia - Ministero dei Beni e delle Attività Culturali).
5) Sewn plank boat from Corte Cavanella di Loreo (Rovigo).
6) Technique for the assembly of planks by sewing in Greek crafts (after Pomey, 1997).

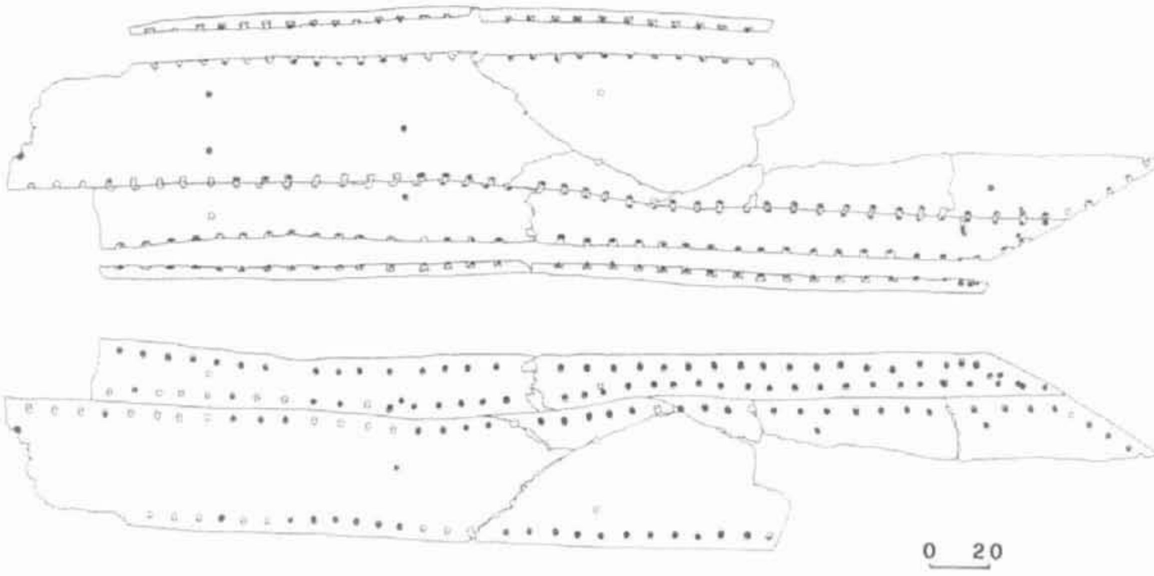

Fig. 1

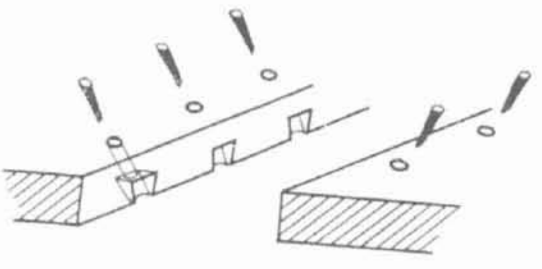

Fig. 3

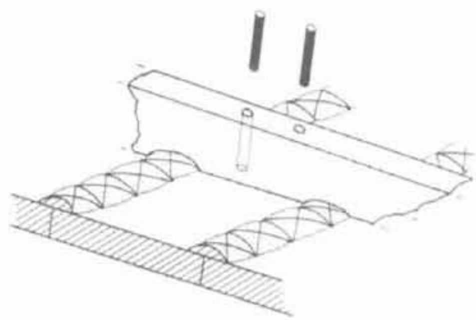

Fig. 3

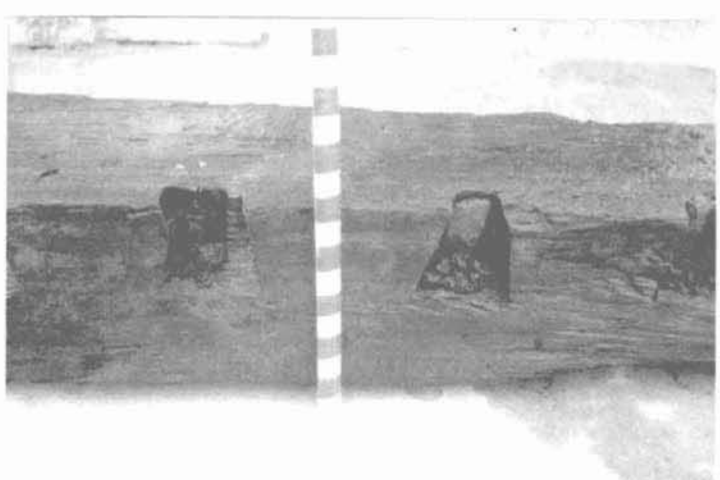

Fig. 2

Fig. 4

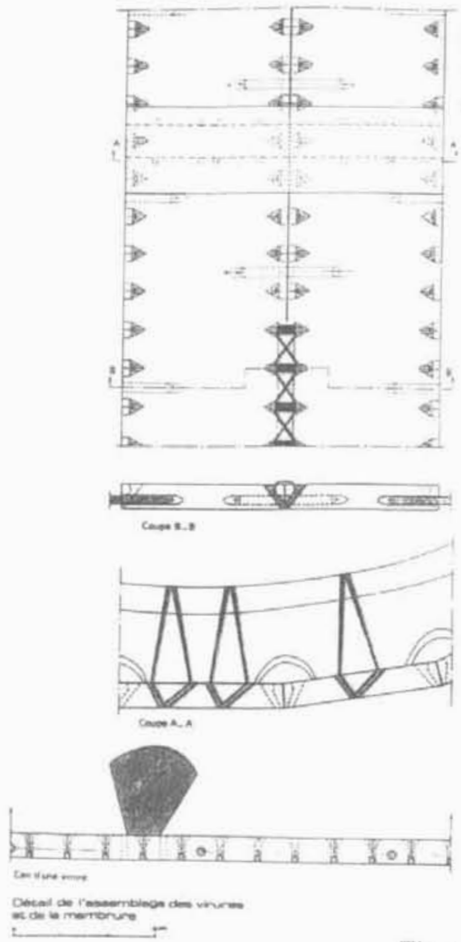

Fig. 6

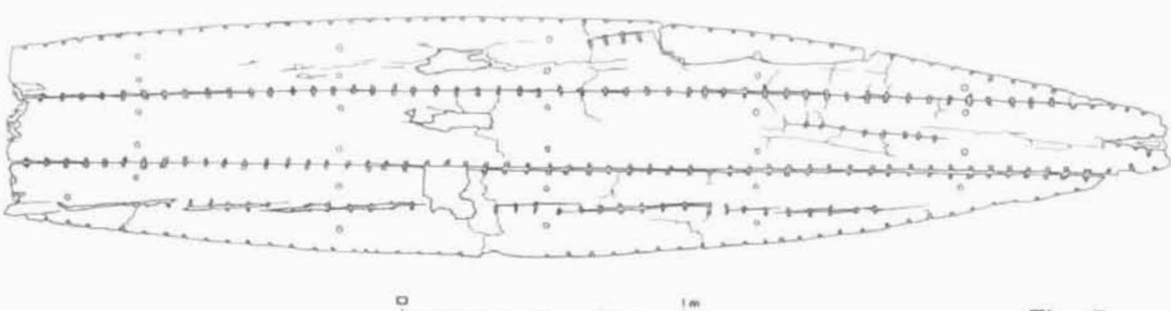

Fig. 5

FROM SITE TO PRESENTATION - FOR *WHOM* THE NAUTICAL TRADITION?

This paper addresses the role played by presentation of the underwater archaeological resource – both *in* and *ex situ* – as central to the notion and preservation of a nautical tradition.

The way we present our UW archaeology is the clearest expression of the value that we place on our historical resource. Ancient coastal sites become potentially accessible to the onlooker throughout the various stages of excavation. But they soon can come under threat when their interpretation and presentation come into conflict with the demands of development due to contemporary national objectives. Shipwrecks, once excavated, create still a different dilemma; a consideration on the part of us, the archaeologists, exactly what we intend to do about them – to extricate a ship means removing it from its original context – if we choose to do so, we must know why, how, where will we place it, how will we study it? It then involves a physical transport to another environment, a permanently foreign context, one for which it was never intended. Once done it requires us to interpret and explain to an audience of all ages and from all backgrounds and walks of life, both local and foreign: why this was done; what was the process of doing it; what it may represent in terms of the cultural and nautical tradition of the place, and what it can mean – to the visitor, today and into the future.

The ultimate knowledge gained is, for most of us, the reason that justifies what we do. We share that knowledge amongst ourselves in venues such as conferences or in the classroom with students at our various universities, and through our publications. But there are other values attributed to these nautical resources which allow entities having nothing to do with education or archaeology, history, or the tradition that these artifacts represent, to take charge, ultimately dictating the path that we, the professionals, must take. It is here that decisions occur which, once taken, cannot be reversed. These values are primarily political and economic – or what has become known as "cultural tourism", most often led by national interests via their respective tourist ministries or bureaus, and have their ultimate expression in seemingly instant national parks which once were excavation sites, or purpose-built museums to house the ships removed from their original context.[1]

What are the questions we ask of our resource? More than asking about a specific harbor construction technique, or how a ship might have been built, or what route might have brought it to this or that place, are we using our knowledge and voices to allow the public, whose history is represented by these artifacts, a clear understanding of what it is we do, and why, and what it might mean to them? In other words, what is the role that *we* – the archaeologists – play in determining the ultimate fate of these resources by presenting the whole picture?

For there to be a nautical tradition we need to recognize that a harbor and a ship require the 'hand of man'. These are *things* that have been built by people who were actively involved in trade, battle, exploration and settlement, ultimately leaving behind a picture or landscape of the culture they represented. Without this there would be no tradition for us to search out. It represents a part of human history. Reversing our perspective for a moment, one could ask; "Was a harbor built to become a national park"? No."Was a ship constructed to be placed in a museum"? Certainly not.

But what, then, is our alternative?

To illustrate my points, I would like to refer to two familiar models in Israel. The first is the coastal site of Caesarea Maritima, and the other, the ship found at Ma'agan Mikhael – a wreck which has been excavated, preserved, and is about to be re-assembled in a purpose-built museum. In the context of this paper, they are examples for the purpose of illustration, only – and not commentary on the excellent academic work that has gone on throughout their study.

Very briefly, the submerged, 2000 year old Herodian Harbor of Caesarea Maritima, lies about mid-way along the length of Israel's Mediterranean coastline and has been extensively excavated and well documented.[2] Figure 1 shows an aerial view overlooking the entire site and figure 2 is a sketch that gives an artist's rendition of what the harbor may have looked like when fully functioning. The table[3] (fig. 3) lists the various habitation levels that have been uncovered and studied (fig. 4) in the inner harbor, the area that silted up as a result of earth tremors which began the destruction process of the harbor.

The full site (Fig. 5) extends to a total length of about 1200 meters and is a few hundred meters wide. It saw activity for hundreds of years that followed the harbor's construction and ultimate demise. Today, the area that one sees appears to be basically two separate areas of the overall ancient city; the northern, Herodian harbor area in what has become known as the Crusader City (since the later Crusader walls surround the earlier harbor site), and the large, southern portion of the city which contains mainly Roman and Byzantine ruins and extends to a theater and promontory which was Herod's palace.[4]

Excavation and Development of the site

While there had been some excavation during the 19th and early 20th centuries, the first systematic excavations were carried out in 1959[5] and from that time almost all excavation has been based on research goals set out by various academic institutions, with the exception of surveys done in 1976 and 1978 on behalf of the Israel Electric Company to advise on tectonic stability of the coastline[6] (Fig. 6).

In 1991, a change occurred in the motivating force behind the excavations, brought about by the sudden necessity to employ recently arrived immigrants to Israel living in neighboring communities. It was an enterprise handed down by the Ministries of Labor, Welfare and Social Affairs, and was turned over to the Government Tourist Bureau to implement. The two stated goals became employment and the promotion of cultural tourism.[7]

A five-year plan was put into operation, creating a site which was being excavated as a job-placement scheme, spearheaded by a non-archaeologically oriented government body.[8] The idea here was that such a large work force would facilitate the more rapid excavation of the site, and by so doing, the sooner the site could be developed to attract tourists. Quite rapidly, by exploiting this unique archaeological resource, the site began to be looked upon as a potential "money maker", first and foremost. One must then ask; *for whom and what the archaeology here*? - the government, the workers, the archaeologists, the tourist agencies, the public who ultimately will view the remains? And what about the archaeology itself — will the inestimable historic, cultural and educational values *benefit* or *suffer* as a result?

What happens when expediency — in this particular case one of integrating a population — meets up with the necessity to carefully uncover, research and understand the past lying under our feet? So long as 200 or so newly arrived former engineers, hairdressers, technicians and homemakers are employed who cares what we find? One could argue that the expanded labor force enabled much more extensive and rapid excavation. But at what cost?

Another major factor affected the site's development. For certain historical reasons, no less than 6 different entities — the National Parks Authority, the Israel Antiquities Authority, the Government Tourist Bureau, the Caesarea Development Corporation, Kibbutz Sdot Yam, and the Wakf [9] – have legal jurisdiction, essentially a form of ownership, of the land on which the archaeology sits, each with its own political, economic and cultural agenda, and have been unable to come to consensus as to how each will participate rather than oppose any movement forward – as Caesarea should be moving ahead into the stages of interpretation and presentation. And at this particular point in time, the archaeological community have less and less of a voice as as to what is the message that should be said.

Interpretation and Presentation

Currently, presentation of the site is potentially three-fold. The first is an underwater park (Fig. 7) in the outer harbor area which has been presented in this forum before.[10] It saw operation for some years but recently became inoperable and fell into disrepair. This is unfortunate, for it offered a wonderful way for the diving community, at least, to enjoy an undersea museum, *in situ*.

As for the second, the overall site itself, there has been some consolidation and restoration of certain buildings in the southern area of the city, and the addition of a newly built promenade along the edge of the sea (Figs. 8 & 9). Initiated at the hands of the tourist bureau, its two stated goals were: to establish a continuous connection between the theater and the Crusader City to convert the site to a unified facility; and to create the conditions for the site to become a tourist anchorage combining visits, expanding commercial activity, and extending the time spent on site (currently about 20 minutes).[11]

With the building of the promenade, this portion of the plan has already been completed, but the message that comes through begs addressing. Here, a recently discovered hippodrome becomes the easily viewable main attraction in the southern Herodian-Roman-Byzantine city. The ancient Herodian harbor is unavailable to the general public, and the inner harbor area is presently referred to as part of the Crusader City and is currently grassed-over (Fig. 10) until a donor can be found who is willing to take on its development.[12] In other words, the facility is being approached and presented as two parts of a potentially whole picture – one in the north and one in the south, separated by Crusader period walls, rather than as an integrated site which was built originally to accommodate the harbor. After all, so long as tourists visit and spend money there, who cares about the message?

Movement through a site is not the same as movement through time.

The introduction of a newly designed and built promenade at the water's edge, running the length of the area – from the theater to the Crusader walls - does not say much for historic accuracy[13]. Interpretation of a site should be done to help explain the past – *and not create a new past*. Here, such a structure confuses and changes the perspective of the visitor as to what was built, why, and when.

If we relate to the archaeological findings, as well as our historical resources[14], we see that first and foremost this was a harbor and remained, throughout its history, a maritime center – the very reason the city which grew around it was built in the first place. And that is just the point. That information is currently sitting with the professional and academic community. How does it get across to the public? Aside from the sea here, the only sign that this is a maritime site is sitting at the entrance to the Crusader City – and that is a lovely set of carefully placed ersatz amphoras and different types of anchors.[15] (Fig. 11). Increased input on the part of the archaeological community is essential here to provide the correct historical message of the presentation.

Lastly, there is an entirely new theme park which has been proposed, but not yet built, at the southern extremity of the area. Strictly entrepreneurial in nature, it is called "Caesarea Maritima – the Revival of a Vision" (Fig. 12). The idea is fairly straightforward: it is to construct a totally new facility, on available land adjacent to the southern-most end of the site (Figs. 13 & 14).[16] In the plan of the New Caesarea Maritima, all the newly-built structures throughout the actual facility would be represented here "telescoped" one onto the other, as an *imitation* of the way it originally was (Fig. 15). The sense of place, the way the city was, or might have been lived in and used, its magnitude and atmosphere, would be seriously compromised by placing these structures out of context (Figs. 16 & 17). It would become a *manipulation – a sexy media interpretation but manifestly unsupportable view of history* – and only distort the information about past events or conditions represented by the actual resource nearby.

By communicating through spectacle, this plan ignores the most important point about what has been happening over the many years of archaeological investigation, and that is research for the purpose of knowledge. By emphasizing attractions, the opportunity for the visitor to question or understand the site is eliminated – through sheer confusion. And any possible future educational role which it might offer, if presented with its full archaeological integrity intact, would also be seriously lessened. It would thereby render irrelevant the location of the park, which could just as well be placed in the desert, the hills of the Galilee, or in Lake Havasu, Arizona, alongside the *real* London Bridge. What Caesarea Maritima has to say, would really not matter, and now represents a singular opportunity being missed, slipping away by the inability of addressing the real point which is: to focus on the uniqueness of the site and let the archaeology tell its story, consistant with the evidence. Increased input on the part of the archaeological community is essential here to provide the correct historical message.

Caesarea's current role can best be defined by its potential contribution to knowledge and public awareness. Interpretation of an archaeological site is supposed to explain the past and, in so doing, tell us about ourselves and our attitudes toward the resource, first.

It is clear that the process of moving Caesarea Maritima from archaeological site towards its presentation, is at an impasse. In asking why, I think the reasons are threefold. The first has to do with the complications brought about by the different entities having their respective jurisdictions to maintain. Each one recognizes the importance of the site and the value of the resource, only from different perspectives. The second reason is that the body which has taken the initiative to develop the site is the Government Tourist Bureau and doing so with its main agenda being that of attracting tourism. The third, and to my mind the most critical factor here, is that it seems no one has a clear idea of what should be said.

A few kilometers north of Caesarea is Kibbutz Ma'agan Mikhael. By chance, in 1985 while swimming, a member of the Kibbutz came across some debris on the sandy, very shallow sea floor, about 50 meters into the water off the bathing beach. After some inspection and surveys, this turned out to be a 2400 year-old wooden hulled ship, in an excellent state of preservation, about 13m long and 5m wide, lying more or less perpendicular to shore.[17] A team was brought together and excavation began. Excavation took place over three seasons during which the contents and ballast were extricated from the sea and the ship's structure was photographed, recorded and fully dismantled, put into sweet water baths, and underwent over a four year period of immersion in polyethyleneglycol. The preserved pieces now await re-assembly in a beautiful museum recently built for the purpose of displaying the ship. As a new and unique museum attraction, certainly in Israel at least, it will also allow students, scholars, and visitors to watch throughout the various stages of re-building before becoming another *static* remnant of the ancient past.

For lack of any other means of identification, we refer to ancient ships mostly by the name of the place where they were found (the Kyrenia, Yassi Ada, etc.), sometimes according to the period of their context underwater, or sometimes by the style of their construction (sewn boats, clinker-built, or shell-first construction, for instance). Unlike later vessels, such as the Wasa[18] or the Mary Rose,[19] or the yet-to-be-raised Amsterdam,[20] where there may be written records, names carved on the sides of the ships themselves, or other accessible information, ancient vessels reach too far back in time for any records to exist – except perhaps for anecdotal clues. When named according to the place they were found, we have an excellent means of identification for a data bank, to marine archaeologists, and other professionals dealing with the information. However, these ships then ultimately become identified with that particular place. This ship is now called The Ma'agan Mikhael Ship and will become known to future generations as The Ma'agan Mikhail Ship. But is it, really? Do we not perhaps *create a "new past"* here, as well?

The sea-going ship represents movement between places. But a shipwreck points to a moment in time where, due to any number of possible causes, the vessel went down. Consequently, we cannot be certain as to the origin or intended destination of our ancient, sea-going vessels. This poses some challenging dilemmas when faced with presentation: how can we express the cosmopolitan nature of these vessels? And just whose heritage does the ancient, sea-going ship represent?[21] There are those who will argue that these ships represent the heritage of the place they were found simply because they were there longer than anywhere else. Perhaps this is so. But it is an issue all the same and must be addressed in its interpretation to the public.

Conclusion

Interpretation of our past is not solely for the purpose of tourism. Its done to satisfy society's demands and is expressed as its values. What we choose to display and how we choose to do it reflect the current state of our knowledge and it is that knowledge rather than spectacle that should lead any discussion. We cannot know today what past future generations will want to know or deem important.

A maritime site and a shipwreck are the most dramatic examples we have of past interaction with other cultures, proof of movement between places, and are cosmopolitan by nature. This needs to be expressed and in such a way that is clearly understood. Consequently our presentation should be clear, vivid, and flexible. Questioning the resource need not cease when the archaeologist concludes his or her work. It can and must continue via the public who can only appreciate them if they know of their existence.

As the researchers and managers of a site or shipwreck, who have had intimate contact with the resource throughout all the stages of discovery and study, we must take an active role at the pivotal point in the determination of their ultimate fate by becoming the advocates of the message that must be put across, and see to it that the nautical object is presented in a way that makes it accessible, physically and spiritually – so that it will stimulate public interest and encourage public involvement. Otherwise there will be no movement forward except in the academic, professional, or political arena to prove an empirical objective. While this is not shared with the public they cannot know. Interpretation clarifies what happened and allows us to transmit the rapport we have built with the resource to the viewing public. Presentation, then, becomes our vehicle for achieving this.

Eve Black

NOTES

1. As "... a notable feature of recent years, (site) interpretation has been embraced by the tourism, leisure and public relations industries ... as a novel way of pepping up tired tourist attractions". (Uzzel 1994:298).
2. Hohlfelder 1987, Holum, et al. 1988, Raban, et al. 1993.
3. This table was originally prepared by the author in Raban, et al. 1993:9, from material by Raban and Holum.
4. Hohlfelder 1987 and Holum, et al. 1988.
5. Vann 1992.
6. Black 1997:29, compiled from Holum, et al. 1988, Vann 1992:275, and Raban 1990, 1993, and 1994.
7. Ibid: 30-31.
8. Ibid: 31-32.
9. Ibid: 34.
10. Raban 1992.
11. Hushba 1995.
12. The idea is to bring this area back to irs original "inner harbor" status.
13. Caesarea was seen differently by different inhabitants at the same time, depending on their social station. Also, throughout different periods of time, the site was utilized very differently. This needs expression. And lastly, as we look at the site in today's light, there is yet another possible set of interpretations – what about the Rabin Orot Power Station? It surely cannot be ignored. A walk through a city reveals many facets, not just one story.
14. See Josephus' description of the harbor in Holum, et al. 1988:72-3.
15. Non-representative of the area and made from polyester.
16. By placing it here any possible involvement into the intricacies of the jurisdictional mire discussed before are avoided.
17. Linder 1992.

18. Kvarning 1993.
19. Rule 1982.
20. Marsden 1971.
21. After all, throughout more than 2000 years of history, there has been fluidity of populations with new borders replacing older ones, and entities which were not part of the ancient world at all have risen to become part of the contemporary scene. Therefore, is there really any point – for one country or another – in trying to claim as their heritage our ancient, sea-going vessels?

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Fig. 1

Fig. 5

Fig. 3 Stratigraphy / Chronology - Inner harbor Habitation Areas

HABITATION	STRATUM	DATES
Bosnian	I	1880 - 1948 CE
Crusader	II	1100 - 1265
Islamic		
Late Fatimid	III	1040 - 1100
Early Fatimid	IV	960 - 1040
Ihshidic, Late Abbasid	V	910 - 960
Middle Abbasid	VI	830 - 910
Early Abbasid	VII	760 - 830
Umayyid	VIII	640 - 760
Byzantine		
Late Byzantine	IX	600 - 640
Middle Byzantine	X	560 - 600
Early Byzantine	XI	480 - 560
Late Roman - Early Byzantine	XII	300 - 480
Roman		
Early Roman	XIV	1 - 130 CE
Herodian	XV	20 - 1 BCE
Late Hellenistic	XVI	200 - 80 BCE

Fig. 4

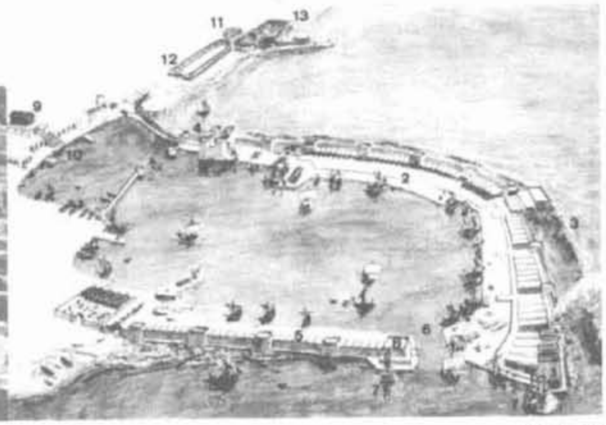

Fig. 2

Fig. 8

SCHEMATIC MAP OF HERODIAN PORT IN CAESAREA

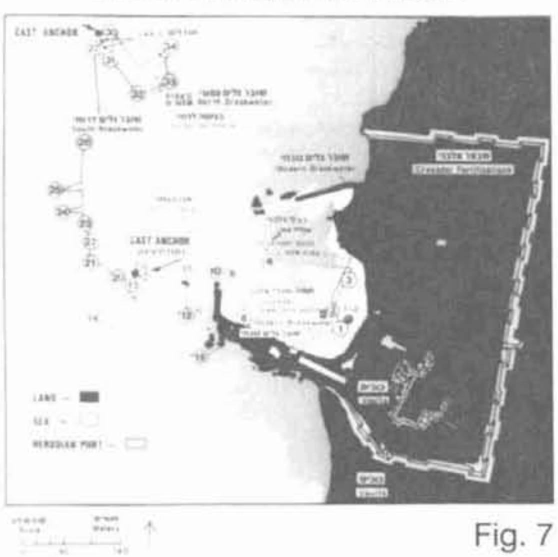

Fig. 7

Fig. 9

Fig. 6 Archaelogical Expeditions to Caesarea

Stage	Dates	Expedition	Areas Excavated	Findings
First formally organized expedition	1873	Conder and Kitchener 'Survey of Western Palestine'	General vicinity	Published first scientific survey identifying the outer Roman fortification walls, Crusader walls, sea walls, theater, rock-cut basins, and hippodrome
I Discovery based	1940	Kibbutz Sdot Yam	General vicinity between kibbutz and Crusader city	Statuary, coins, mosaics.
II Short term. Research based. Specific goals set	1945	MdoA (J. Ory)	General vicinity	Assorted small artifacts, marble, pottery.
	1951	IsoA (S. Yeivin)	Southeast of Crusader city	Porphyry statue - discovered by agricultural workers and Byzantine esplanade.
	1956-63	M. Avi-Yonah	Seashore, some 100m north of Crusader city	Synagogue, building foundations of Straton's Tower, (preceding Caesarea).
	1959-65	Italian Mission	About 100m NE of Avi-Yonah's area; aqueduct, north wall, the theater	1st century BCE fortifications near shore.
	1960	E. Link	Sea	Harbor.
	1960	Joint project: NPA and Kibbutz Sdot-Yam*	Crusader city	Crusader fortifications, and ruins within.
	1972	R. Bull	South of Crusader city, toward theater	Sanctuary of Mithras.
	1976	A. Raban	Tower within Crusader city	Crusader fortifications.
	1976	A. Raban and N. Flemming	Archaeological and geological underwater survey	To determine geologic stability.
	1978	D. Roller for Israel Electric Co. contract research	Surveyed east of Avi-Yonah's area	To determine geologic stability.
III Long term Large scale. Research based; academic, archaeological community.	1975-6, 1979	D. Bahat, E. Netzer, L. Levine	Northern part of Crusader fortification and west of theater	Byzantine building, promontory palace.
	1971-86	JECM (A consortium of 22 academic and religious institutions)	Entire ancient city	Its development throughout the centuries.
	1980-89	CAHEP (Academic consortium)	Harbor facilities	Sructure, building techniques
	1988/9-1999/2000	CCE (incl. CMVP and CIHEP(93-97)	Inner harbor, temple platform area, southern city between theater and hippodrome	Further expose the hippodrome, investigate buildings in southern city.
IV Long term. Large scale. Initiated by GTB. Economically and politically motivated	1991-2000	Caesarea Tourist Development Project (CTDP)	Harbor area, temple platform, southern city between theater and hippodrome	Develop site to increase tourism and provide employment.

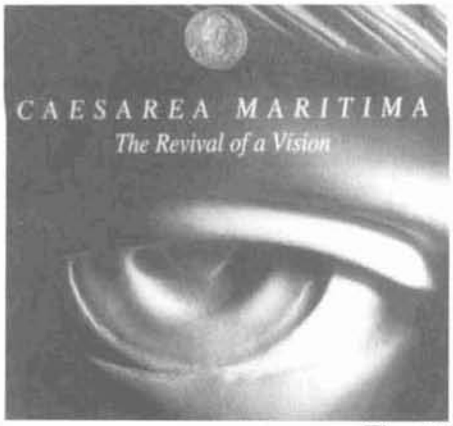

Fig.12

Fig. 10

Fig. 11

Fig. 14

Fig.13

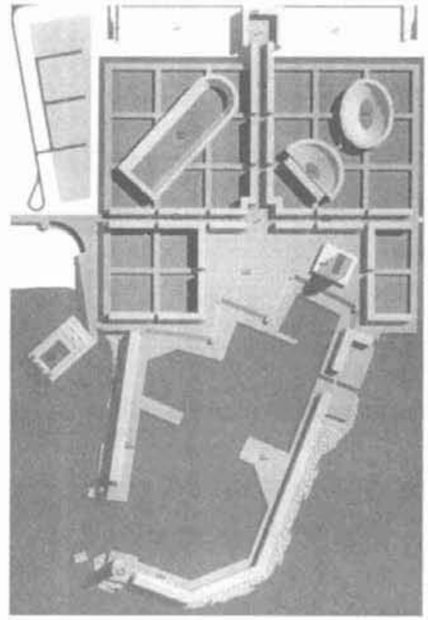

Fig. 15

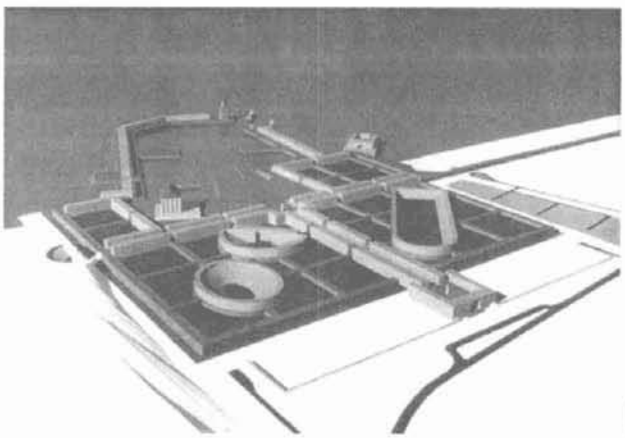

Fig. 16

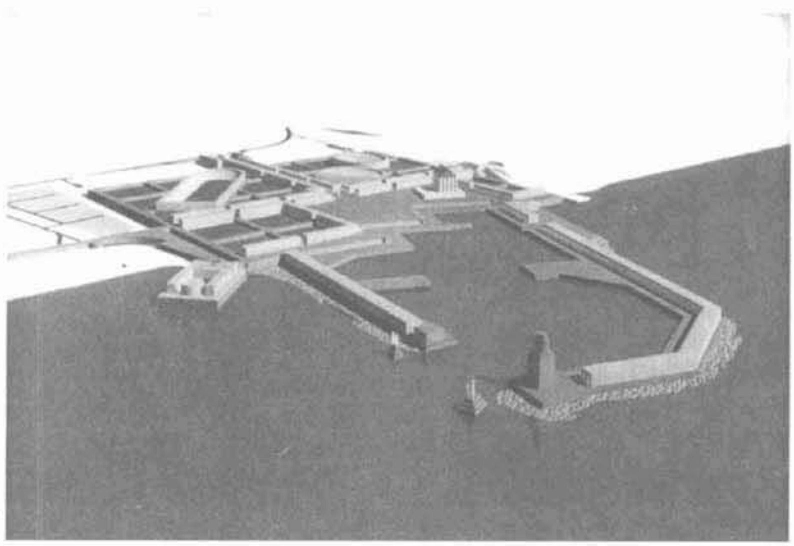

Fig. 17

NEW RESEARCHES ON THE ANCIENT PORT OF SICILIAN NAXOS (1998-99) *

In October 1997 I was invited to attend the "XII Rassegna di archeologia subaquea" at Giardini Naxos, in order to speak in a Round Table discussion on the protection of the underwater cultural heritage. During the weekend, guidebook in hand, I visited the site for the first time, and was particularly interested by some parallel walls shown on the plan, at right angles to the coast and at some distance from it (ca. 160m). I learned from the Director of Antiquities at Naxos, Dssa Maria Costanza Lentini, that the remains had been excavated in 1982-83, and had not been fully understood, but had been preserved from building development. Learning that the walls were not horizontal, I checked their clear width (5.5m) and suggested that they might belong to ancient slipways, despite their elevation and distance from the sea[1].

Dssa Lentini, who had already suggested that the remains were related to the ancient port, invited me to return and join her in a re-examination of the remains in order to test this interpretation. I spent one week on site in June 1998; with architect Maria Ricciardi, a student assistant and two workmen, the site (cleared of undergrowth in advance) was planned in detail and a test trench (A) was cut across part of one compartment, approximately at mid length, beside an opening in the side wall (Fig. 1). Under what I interpreted as the destruction debris of 5th-century AD houses and a relatively sterile deposit accumulated over centuries, the bedrock was found to slope eastwards (seawards), as do the side walls of the compartments (Fig. 2). Pottery from the fill of pits in the bedrock dates no later than the last quarter of the fifth century BC, indicating construction not long before the city was destroyed by Dionysios I of Syracuse after the Peloponnesian War (404/3).

This summer (since writing the abstract of this paper) I have been able to spend another week at Naxos, with the same small team of 2 workmen. Work in trench A was completed, with removal of the 'step' on the west side of the trench and clearance of a pit which may have been at least partly a foundation trench for the east side of the doorway. (It was also possible to take photos from the nearby school roof: Fig. 3).

The trench was then continued further south as trench B, as far as wall 2 and the doorway there (not fully in line with the doorway in wall 1, but ca. 50cm farther east). At first a 1m baulk was left. South of the baulk the stratigraphy was very different from that to the north – the shallow 5th century AD destruction level became so deep (just over 1m) that it reached virtually to bedrock, with no intervening levels of long-period accumulation (Fig. 4).

We decided to remove the baulk in order to excavate the rest of the trench as one unit, in view of the abrupt change in stratigraphy, but it was not possible to complete the work this season (Fig. 5). The bedrock is appearing in places, but the situation is not yet fully clear (Fig. 6).

What *did* become clear to us, on reinspecting the areas to the east, dug in 1982, is that a similar abrupt change is visible there, with a destruction level of (apparently) the 5th century AD deepening sharply southwards (Fig.7). A workman who took part in the 1982 excavation remembers finding bedrock somewhere in this area (or the next trench to the south) which is a priority for the next phase of our investigation (along with the area at the top of shipshed 1 which *could* provide evidence for hauling machinery).

The gradient of the structure was approximately 1 in 9 (the N wall descended by 2.92 over 27m, from +6.54 to +3.62m); on the hypothesis of a normal trireme shipshed slip with a dry length of 38m plus, we have here evidence of considerable uplift (ca. 1.5m) since the end of the 5th century BC. This finding has interested geologists who have assumed an uplift of 130m over the last 125ka in the Taormina area but are not used to such precise figures.[2]

It is hoped to carry out further investigation to confirm the identification, the gradient of the slips as opposed to the side wall, and the dating.

Two final points. There have been no finds so far of stone column drums or fragments, which indicates that the roof supports were of timber. The roof probably descended in a series of horizontal steps (like the wall construction).[3] Secondly, the circular pit in a doorway in wall 1 needs explanation. Maybe it was one of a series holding vertical timbers to hold the ship steady as it was hauled up or down (this seems to me more likely than reliance on roof supports, as John Coates suggests in his paper at this Symposium).[4]

Unfortunately the key area of the supposed ancient shoreline is probably now lost under modern buildings.

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ILLUSTRATIONS

* I am grateful to Dssa Giovanna Bacci for her support and to Dssa Maria Costanza Lentini for her help and encouragement and for her agreement that I give my first report on the 1999 season at Pylos.

1 Early reports in Lentini 1982, 1998; Pelagatti 1993, 278.
Lentini 1998, 78 & n.10 takes account of the suggested identification (a good plan appears on p.72, Fig. 1). A preliminary report on the 1998 season will appear in Blackman 1997-98, and on the 1998-99 seasons in Blackman (forthcoming).

2 I benefited from discussion of this subject at the Corinth conference in September 1998 with Gianluca Valensise and others. See Bordoni-Valensise 1998.

3 For a parallel see Callot 1997. I am grateful for comments on shipshed roofing from John Coates and Richard Tomlinson; a debate is now under way.

4 See pp 00-000.

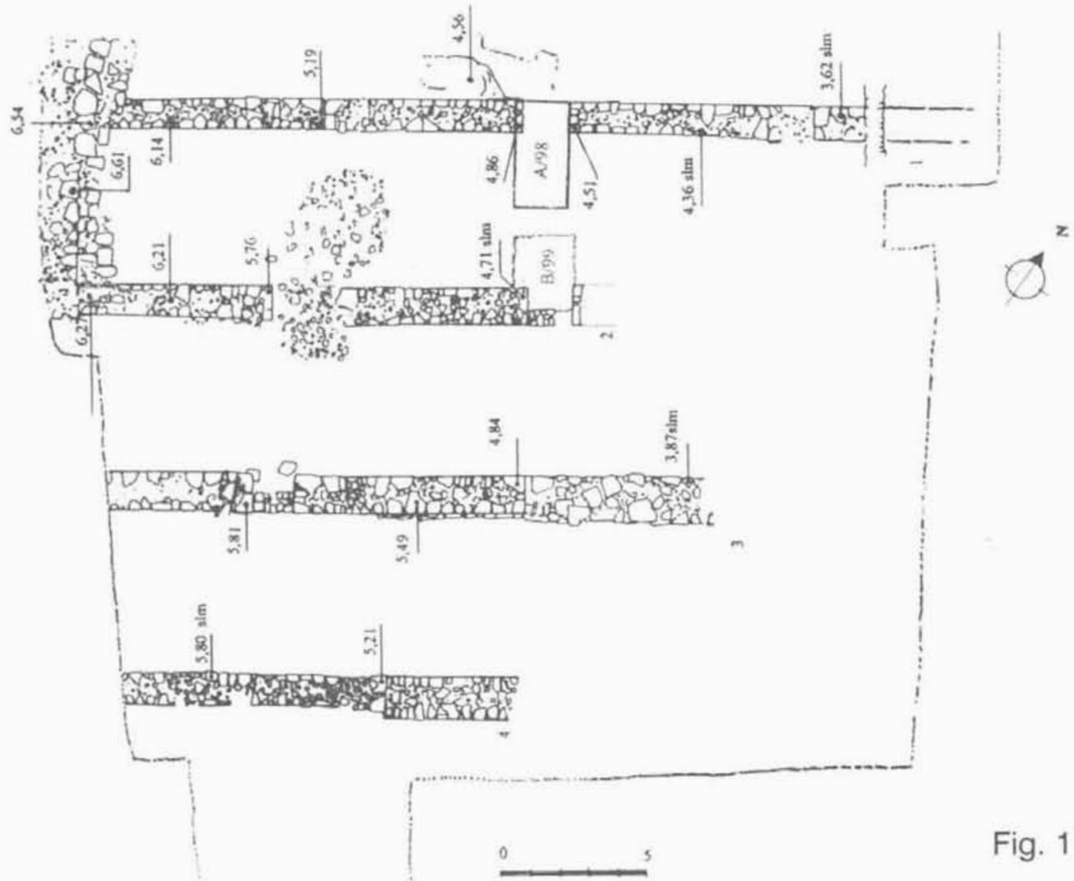
6,54
6,61
6,14
5,19
4,56
4,86
A/98
4,51
4,36 slm
3,62 slm
6,21
5,76
4,71 slm
B/99
6,27
4,84
3,87slm
5,81
5,49
5,80 slm
5,21
N
0
5

Fig. 1

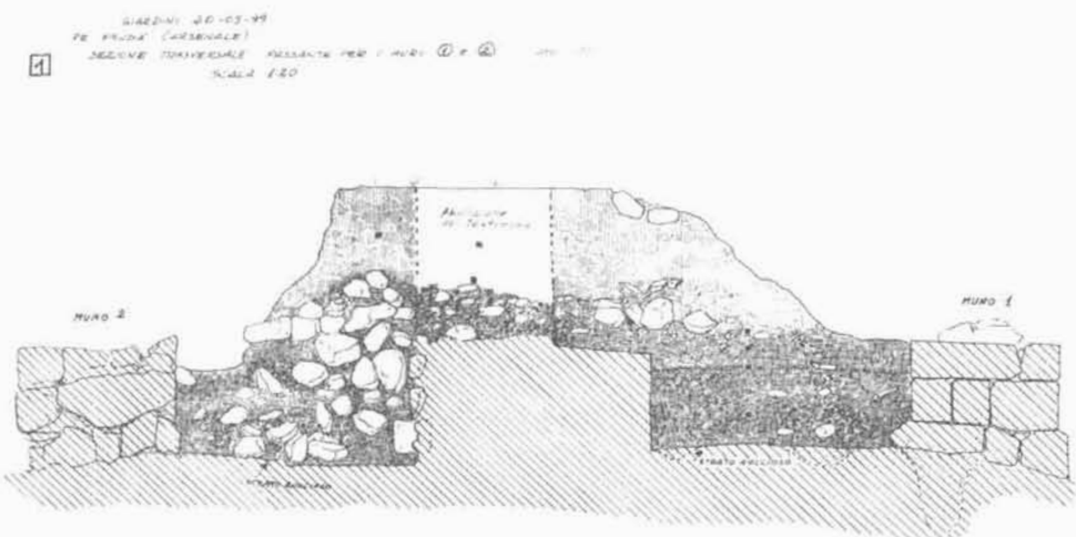
MURO 2
MURO 1

Fig. 4

Fig. 3

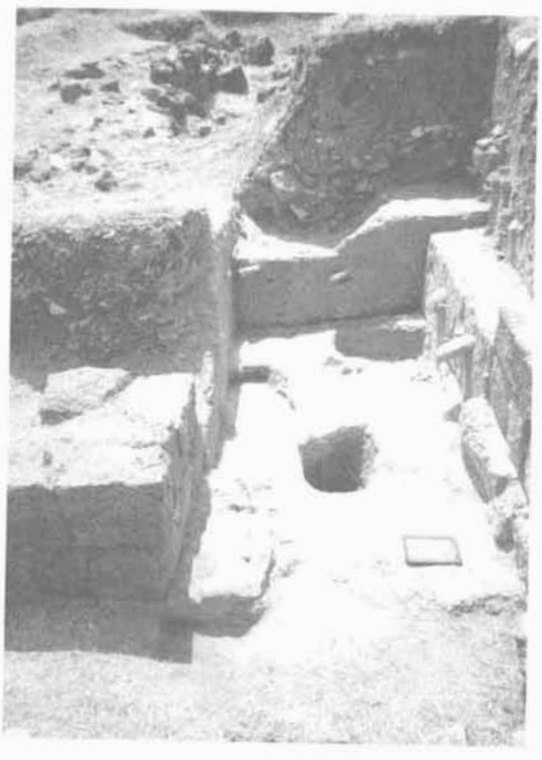

Fig. 2

Fig. 6

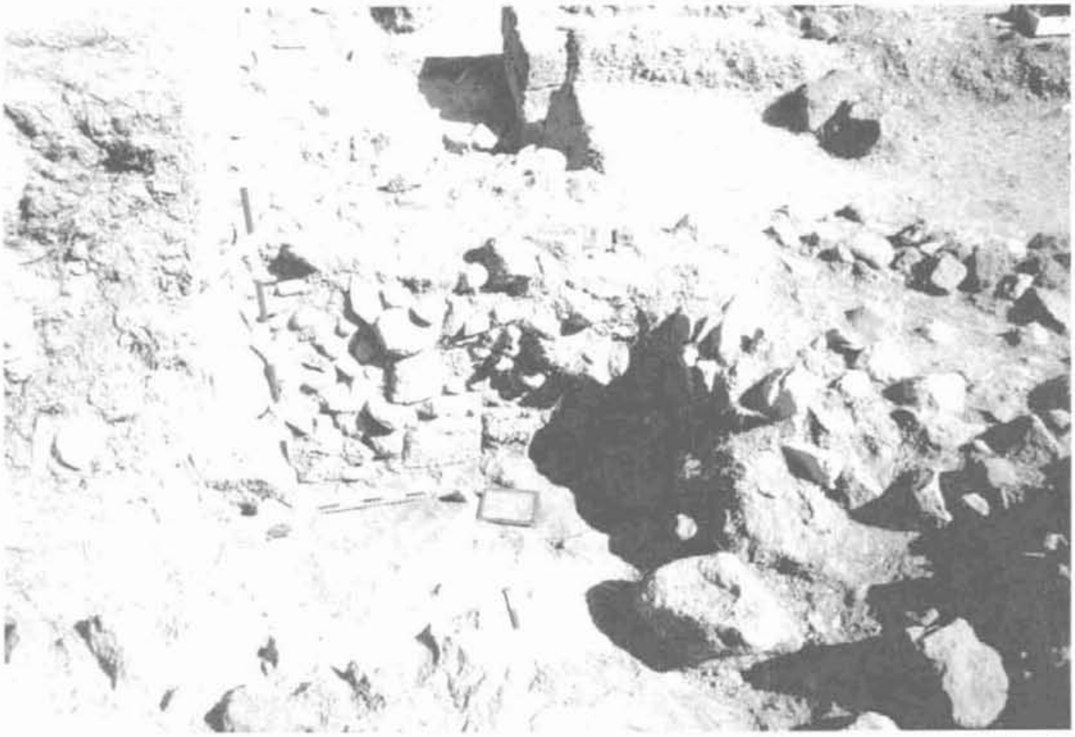

Fig. 5

Fig. 7

RESEARCHES ON THE ISLAND OF ALIMNIA NEAR RHODES

Introduction (DJB)

In 1991 and 1992 I had paid brief visits to the now uninhabited island of Alimnia off the coast of Rhodes at the request of Ioannis Papachristodoulou, Ephor of the 22nd Ephoreia of Prehistoric and Classical Antiquities, in order to check the identification of remains discovered by Adamantios Sampson in 1980 during excavation of a Neolithic site on the island. I was able to confirm the existence of 10 and 11 shipsheds in the bays of Ag. Georgios and Emporeio. Their remarkable feature is the apparent great width of the rock-cut slips – much greater than that of the standard trireme type – combined with short surviving length. They may have been 'double' shipsheds; however, so far no remains have been found of any internal divisions within the slips, cut in bedrock which is now very weathered, nor any evidence of roofing or hauling machinery. I reported on these remains at our Symposia in 1991 and 1993[1]. In view of the importance of the site, which seems to have been a naval base for guard-ships of Hellenistic Rhodes, underwater investigation has now started in cooperation with the Ephoreia of Marine Antiquities, in order to complete the survey already carried out above the surface. A preliminary reconnaissance was carried out in August 1995 with Angeliki Simosi of that Ephoreia, and a first season took place in November 1997[2].

In the first season we concentrated on the bay of Emporeio (Figs 1-2). Search of the sea bed revealed no clear indication of the underwater continuation of the slips on the south side of the bay (before the season was cut short by the arrival of winter storms), but a number of interesting piles of stones and sherds were located mainly towards the north shore of the bay. Analysis of the pottery is not yet complete, but the sequence seems to start in the Hellenistic period; investigation of the north shore led to our discovery of a major settlement, with wall remains and considerable concentrations of sherds, indicating occupation until the 19th century, on the slopes up to the ridge above. This investigation was not pursued since it would have been outside our permit area.

On the south shore few remains were found on the slopes above the shipsheds. Excavation of one shipshed was started, but was not completed before the onset of storms.

The shipsheds on Emporeios Bay (DJB)

In all there are 11 compartments cut in the limestone bedrock (the three referred to by Sampson as 'very damaged' were not located). The shipsheds can be divided into three groups, of four, two and five.
The four of the first group have the following dimensions. The westernmost (I) is the largest (18.50m wide and 17m long); the width of the other three varies between 8 and 10m and the length between 17 and 18m. Between these compartments are unhewn sections of sloping rock 3m wide (I-II), 2.5-3.5m (II-III) and 1-2m (III-IV). At a distance of 26.5m to the east we have a second group (shipsheds V-VI). Their width varies between 9 and 10.5m and their length is 21m; the unhewn space between them is 2.5m (Fig. 3). There follows a distance of about 20m before we reach the third group: 5 shipsheds varying in width between 8 and 10.5m and in length between 18 and 20m. The unhewn sloping sections between them vary in width between 5 and 8.50m.

The seawards gradient of the floor of the shipsheds will be calculated more accurately in the next excavation season; our first measurements gave a gradient of 1,75-1,95°.

Shipshed V was chosen for excavation as the best preserved (Figs 4-5); a test trench 2x2m was opened in its south-west corner (Trench 1). The depth of deposit is 85cm, and we went down to a depth of up to 1.70m below our reference point (on the top edge of the back rock-cut wall of the shipshed) before reaching the floor (Fig 6). The sherds collected which are datable are mainly Early Christian. A second trench (2x2m) was excavated to the north of the first, leaving a 1m baulk. In the middle of this trench a circular hollow was found about 50cm in diameter at a depth of 1.81m (Fig 7); because of the weathering of the rock we cannot say if it is natural or man-made. If man-made, its use is not yet known; we presume that perhaps a timber was placed in it to support the ship.

A third trench (2x2m) was opened on the rock above the south-east corner of the shipshed, and a fourth immediately to the east (2.80x2m), on the unhewn section dividing shipsheds V and VI (Fig. 8). The last trench could not be completed but a hollow was found in the rock; again we are not certain whether it is natural or man-made (Fig. 9). If it is man-made, our first impression is that here could have been placed the mechanism for hauling up the hulls.

No traces of roofing of these compartments have yet been found; possibly our next season will do so. West of Trench 3 and above (south of) shipshed V a row of stones may form a wall, possibly of a later building (Fig. 9).

Rain and storms terminated work in November 1997; we hope to continue excavation here in a future season.

The Underwater Research (AS)

In the sea were located 12 stone piles – massive heaps of unworked stones, highly concreted, with a large number of sherds, mainly amphora fragments of the Early Christian period. The stone piles can be divided into 4 groups. A group of 3 lies in front of shipsheds I-IV; the second (of 2) in front of shipsheds V-VI; the third (of 6) has one in front of IX and the other 5 in front of XI; the twelfth and last lies to the east. Their distance from the shore varies between 20 and 40m and their depth between 3 and 7m below sea level. (Figs. 10-11).

Many similar stone piles (again incorporating Early Christian amphora fragments) were found on the seabed along the north shore, but they have not yet been plotted. However, a large number of isolated amphora fragments were located, dating to the Early Christian and Byzantine periods (Fig. 12). The use of the stone piles is not yet clear and there is no other published example of such stone piles so far as I know. However we may distinguish such an example on the island of Aegina. In 1987 during an autopsy for permission for new installations in the modern harbour of Aegina a diving-team of our Department directed by archaeologist-diver D. Haniotis located underwater about 45 stone piles. The first stone pile lies 65m east of the ancient breakwater at a depth of 10m below sea level. The stone piles follow a roughly straight row on the bottom and they have a height of 5m and a diameter of about 20m. A lot of sherds are incorporated among the massive heaps of unworked stones. This row of stone piles extends from the northern ancient breakwater 200m outside the two ancient harbours, the so-called "military" and "commercial".

The existence of this harbour work, not only outside the two harbour basins but also outside the perimeter of the sea walls of the ancient city, shows that it had a protective purpose. It protected the two harbours from the winds and rough seas, thus making the anchorage safer. In addition, it could certainly provide a form of defensive fortification beyond the sea walls for the inner space of the two harbours which were without any doubt an integral part of the city. In the case of Alimnia the existence of stone piles along the bay would have protected the ancient maritime settlement of Emporio. However, they would have impeded access by ships to the slipways.

Therefore, the most likely explanation is that they result from the jettisoning of ballast before hulls were drawn up the slipways. This, however, would mean that the shipsheds may have been used by merchant ships for repairs, rather than by warships which did not carry ballast.

The gradient of the shipshed from 1,75-1,95^0 is very slight as now preserved. This does indeed make it difficult to believe that hulls wintered there, and we incline to the view that the compartments were used to haul up hulls for repair. The excavation data do not define the date of construction of the rock-cut compartments, since we cannot excavate any foundations. We can, however, say that they were widely used in Early Christian times, on the basis of the pottery from the fill, which has not been carried far since there are no other ancient structures at a higher level. There was, however, certainly an earlier phase, shown by the pottery and walls of Hellenistic date found in the area.

Shoreline structures (AS)

In fact there are significant ancient remains all along the shore of the bay which is about half way down the East side of the island. On the South side of the back of the bay are visible the foundations of a large rectangular building built of unworked stones visible in one or two rows width. At the centre of the back of the bay there is the apse of an ECh Basilica with two phases; also visible is the east wall of the north aisle. Also distinguishable along the shore are other foundations of buildings, probably structures contemporary with the basilica to judge from the construction methods, that is, unworked stones with mortar and tiles. At the same time, however, one may note traces of earlier settlement in the area, to judge from the surface pottery finds which besides ECh sherds include also Hellenistic (for example, bases of sharp-pointed amphorae of the late 4th Ct and rims of fish-plates of the 3rd-2nd Ct BC). Another indication is the presence of a wall on the shore near the basilica preserved to two courses of ashlar headers above the foundations.

However, along the whole north side of the bay there are buildings which are clearly ECh, to judge by their construction and the surface pottery. Walls are preserved on at least 3 parallel man-made terraces created recently with ancient building material. This is clear from the fact that these terraces cut through foundations of ECh walls which run parallel to and at right angles to the shore. The latter run down to the shore and stop before they reach the sea; they are preserved in places to quite a height and occupy the north shore as far as the north machine gun emplacement. On the second terrace, walls of the same period are preserved up to 2m high; they seem to belong to large buildings.

On the south shore of the bay stretches a line of 11 compartments cut in the rock, described above; they have been identified as shipsheds and belong to a Rhodian dockyard of the Hellenistic period.

At the south-east end of the bay, on a terrace above the last shipshed (xi) modern pens have been constructed re-using ancient building material. The floor of the terrace is literally strewn with pottery, mainly of the ECh period, and tiles; a small double column of grayish marble lies fallen and it is difficult to distinguish modern from ancient structures.

A little to the west is a cistern lined with hydraulic mortar, with a clay pipe preserved in section on one side. On the south shore there are no other structures at higher levels above the shore – clear also from the lack of pottery.

Conclusions

It is at all events clear that there was a significant coastal and maritime settlement in Emporeios Bay in the Early Christian period (4^{th}-7^{th} Cts AD), yet another of the many staging posts in the Dodecanese on the sea route for corn transport in that period from Alexandreia to Constantinople (Bakirtzis 1995). This settlement had a basilica like all the others to protect seafarers, but also an important ship repair facility, as we would now say, which seems to have started already in Hellenistic times and served the Rhodian military fleet which had about 200 vessels in Hellenistic period. But also for Rhodian merchant ships of that period, which crossed the Mediterranean to the great commercial and economic centres of the Greek world, Emporeios bay was probably an interesting intermediate supply point before a long voyage.

In the Hellenistic period Emporeios bay served as a fleet station for the Rhodian fleet. It continued to be used later too, until Early Christian times, where a significant coastal settlement developed precisely opposite that of Kameiros Skala and the shore of Glyphada to the south. In Byzantine times it seems to have continued to be used as a harbour.

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NOTES

1. Blackman 1996, with full bibliography on Alimnia 119 n.12; 1999.
2. We wish to thank the Ephorate of Maritime Antiquities (EEA) for supporting this project by inclusion in its work programme, and the Ministry of Culture for approving a permit. It has unfortunately not been possible to continue the work since 1997. On 1995: Blackman – Simosi 2000

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ILLUSTRATIONS

1. Plan of Emporeios Bay (A. Tagonidou, EEA, November 1997)
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10. Stone pile in Emporeios Bay
11. Stone pile in Emporeios Bay
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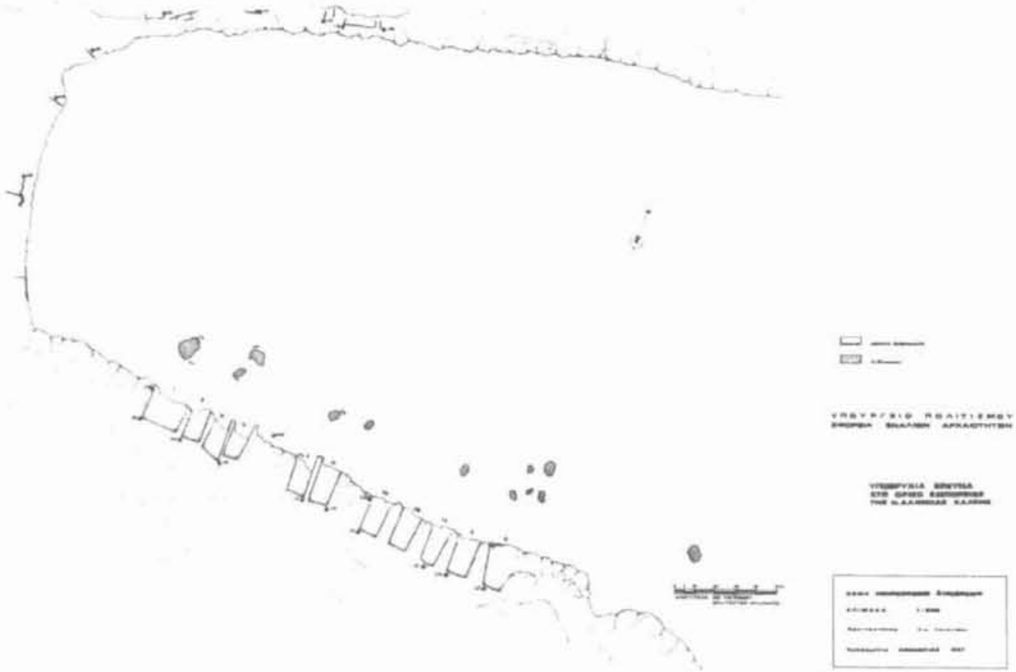

Fig. 1

Fig. 2

Fig. 3

Fig. 4

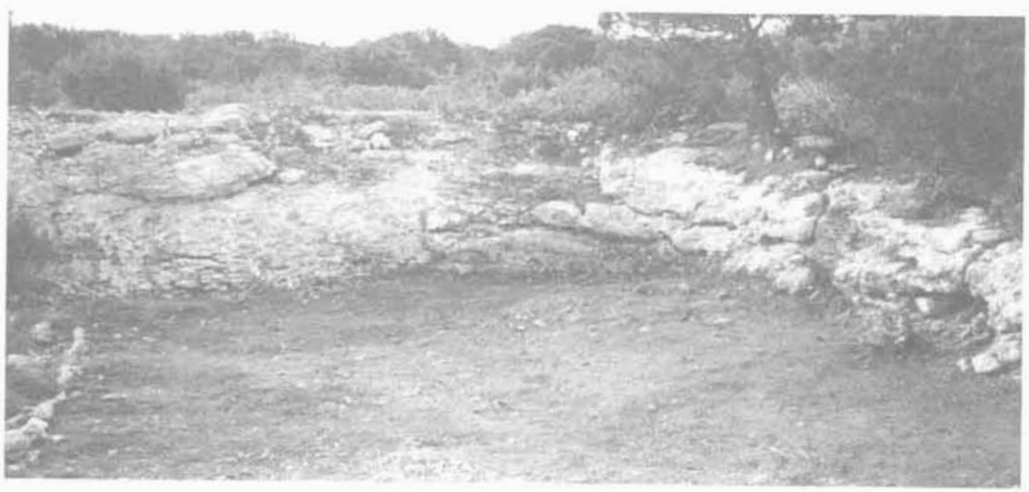

Fig. 5

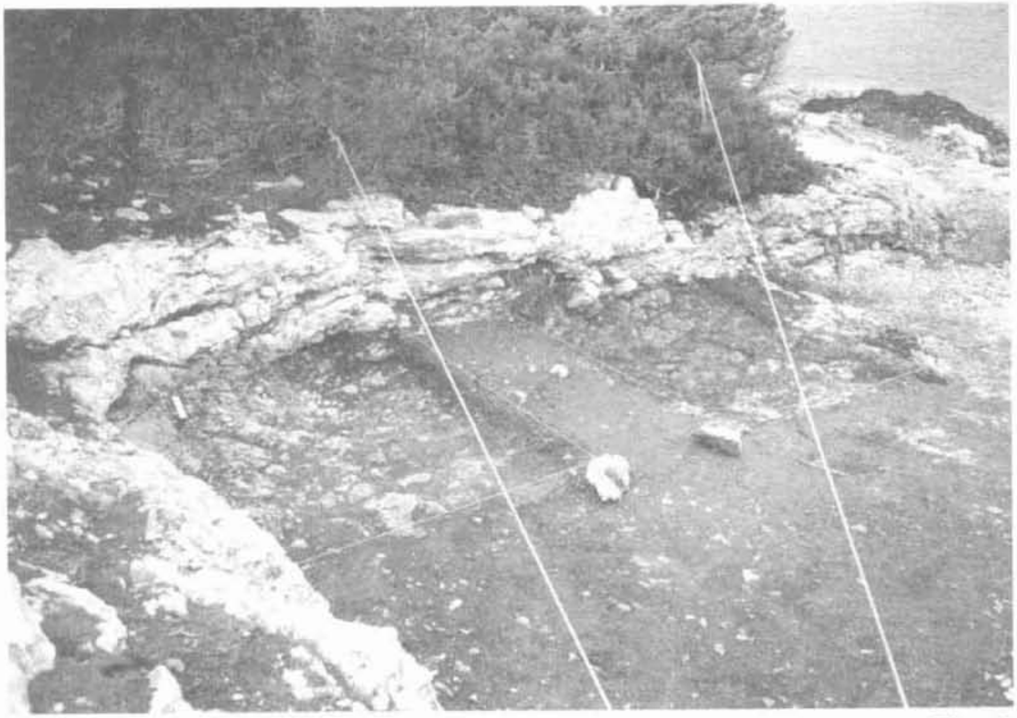

Fig. 6

Fig. 8

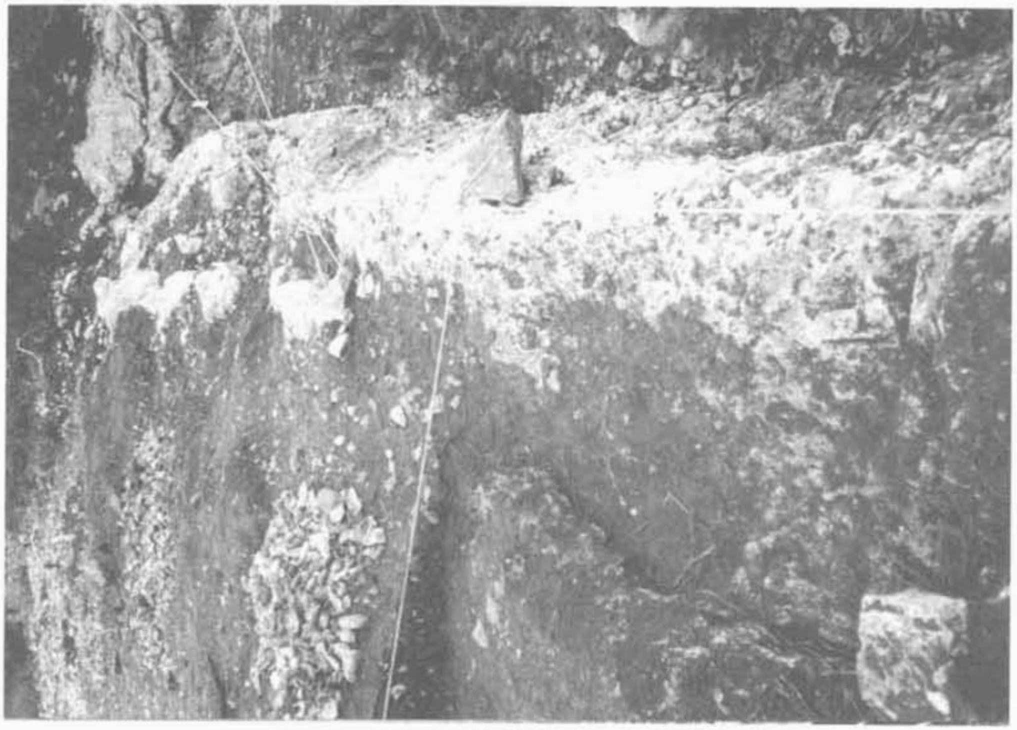

Fig. 9

Fig. 7

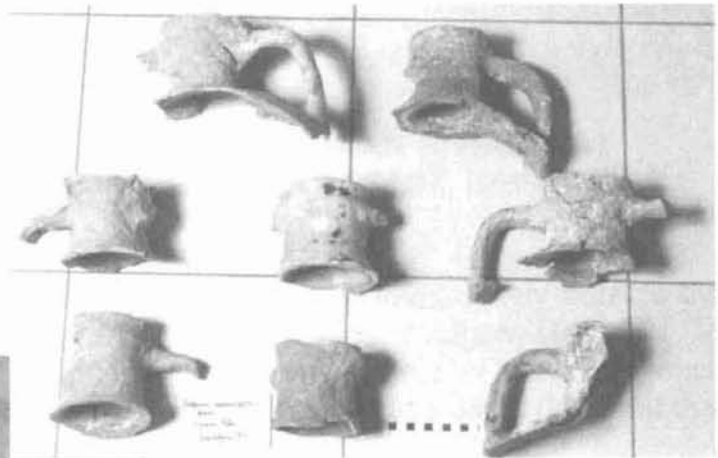

Fig. 12

Fig. 10

Fig. 11

ON THE RECONSTRUCTION OF A ROMAN RIVER BOAT FOUND AT OBERSTIMM NEAR INGOLSTADT, BAVARIA

In 1986, an archaeological survey took place immediately outside the ramparts of a Roman camp at Oberstimm, Bavaria, southern Germany. To investigate the area west of the fort, a trench was drawn by a dredger which cut two ship wrecks. The vessels discovered rested in a silted river bed that had obviously been an ancient tributary of the near river Danube.

Although only small parts of the midship sections have been uncovered, it could be shown that the wrecks represent a type of oared river craft which had been constructed according to Mediterranean ship building tradition (Höckmann 1989; 1990; 1991). As dendrochronological examinations of some of the timbers found proved, the wood was cut in Emperor Trajan's reign at the latest (datings A.D. 90 resp. 102 +/- 10 years) when the Roman camp was still garrisoned by troops (Becker 1989; Schönberger 1978: 143-150).

With regard to the archaeological situation, i.e. either the neighbourhood of a contemporaneous Roman fort, the Mediterranean ship construction, and the supposed highspeed capabilities of the boats found, the wrecks have been interpreted as remains of Roman military craft employed for service on the river Danube resp. as troop carriers, too (Höckmann 1989: 349-350; 1990: 217; 1991: 16-18; 1995: 85-87).

Because of the importance of these ship finds, the protection of which being endangered by a low subsoil water level, the complete excavation of the wrecks seemed to be reasonable and necessary as well. Organized by the Museum of Ancient Navigation the field investigations took place in collaboration with other authorities in 1994. Over almost eight months the wrecks were uncovered (figs.1-2) and – after a systematical documentation – raised (Jahresber. RGZM 1994; Hüssen et al.1995a; 1995b; Kremer 1997); provided for display in a local museum in Bavaria, the ships have been treated in the labs of the Mainz institute where they are at present under restoration.

Both wrecks are well preserved, no. 1 at 15.1, no. 2 at 14.5 metres length; wreck 1 is almost complete on starboard, ranging from the keel to the sheer-strake with a broadened gunwale; no. 2 consists of the ship's bottom on both sides of the keel; from the more complete walls on starboard only the uppermost strake is missing. The oak keels are slightly rounded over their whole length, that of wreck 2 with the after end preserved. The 3.5 to 4 centimetres thick shell is made of pine wood planks running through without any joint, the seams with a relatively wide-spaced arrangement of mortise-and-tenon joints (most distances approx. 20 to 25 centimetres). Because the carpentry of the seams were poor, it is less surprising than remarkable that they had been luted by cords of lime-tree fibres (*tilia;* analysed by Archeo Tex, Switzerland). The inboard and outboard skins of the vessels were pitched, probably restricted to the wetted areas (internally to the bilge).

Strakes nos. 3 and 5 (wreck 2) resp. no. 5 only (wreck 1) are stealers. The seventh strake of each wreck is shaped as a prismatic profile; almost twice as thick as the planks it protruded the carvel built shell outboards. So far, that element can be identified as a combination of longitudinal stiffener and permanent fender. At the upper edges of these wales series of approx. 20 centimetres long releases are visible (fig. 2), appearently each with a single peg in the center; where the regular arrangement of slots seem to be interrupted, an iron nail marks the position of a thwart originally fastened on top of the wales. Two of such transversals are preserved as fragments in wreck 1 indicating that the oarsmen were banked on oak thwarts with 6 centimetres thick flanks reduced to 3 centimetres towards the centre (fig. 3). If all traces are considered, the boats had been oared by crews of 18 (no. 2) resp. 20 men (no. 1).

The upper half of the sheer strake preserved in wreck 1 (strake no. 8) is thickened to nearly 8 centimetres; squared plug holes had been driven into the flat top side, most of them containing thole pins with conical bases; the latter were secured by wooden pins driven from inboards horizontally to the plugs wedging them in their sockets. A few centimetres forward of some of the tholes clenched iron spikes had been driven into the gunwale pointing to some protection, probably from leather, to avoid a too quick abrasion of the oars.

Whilst the arrangements of thwarts and thole-pins prove a regular scheme of crew accommodation and oar propulsion (Bockius 2000a:116-119 fig. 7; 2000b:79 fig. 4), the distribution of the ribs seems to be non homogenous (fig. 2). The frame system is compound of sequences of floor-timbers and pairs of half-frames, the former completed by futtocks fastened to the shell in the same transversal axis as the floors but not joined to them. All of the ribs are attached by strong wooden pegs with rounded heads, the shafts turned on a lathe (shaft diameter approx. 1.5 to 2.0 centimetres), a good deal of them additionally tightened by wedges inboards. As far as examined for most of the frames natural bent oak wood was used but sporadically other hard wood, too. Only single floor-timbers of wreck 2 are signified by limber-holes cut into the lower face at the centre. As intimated by small pegs a pair of stringers was attached to the ribs by treenails, each girdle at a distance of about 0.4 metres from the centre line (fig. 4).

In wreck 2 an oak keelson was found, almost 7.5 metres long with an oblong log-like segment in the foreship section; here, a mast-step formed by a squared hole is visible whereas a system of much smaller plug-holes carved into the more slender parts of the keelson corresponds to the arrangement of the thwarts indicated by the releases in the wale mentioned. So, there is good reason to assume that the thwarts had originally been reinforced by stanchions along the centre-line of the vessel (Höckmann 1989:328 fig. 4; 340-341), and, self evident, that the benches were one-piece elements (figs. 2; 8). The same seems to be true for wreck no. 1 where only a fragment of a keelson was found, made of pine wood, the girder slightly different in shape to that from wreck 2 but with identical features, i.e. mast-step and small plug holes. Releases cut into the lower sides of both keelsons are corresponding to the frame arrangements. The almost complete element found in wreck 2 makes sure that the keelsons were fastened to the ribs by single iron nails but not to the keels. The fragment of wreck 1 had been cut off almost amidships, and there are a few more indications for that this ship was already dismantled in antiquity after being wrecked.

Concerning her cross-section, no. 1 is better preserved than wreck 2 but the latter delivers more reliable information and three-dimensional data about the geometry of the ship body. Moreover, the original after ends of strakes nos. 1, 2 and 4 are preserved with bore-holes for iron nails used to fasten a stern post; remains of that timber being characterized by bevels and traces of a strong nail have been discovered under loose finds which perfectly fit either to the contour of the aftermost portion of the shell and to technical features indicated by the keel (fig. 5): Here, two solid iron nails protrude vertically, the after one nearly 10 centimetres higher than its 16 centimetres long neighbour. Both nails pierce an almost 0.5 metres long release cut in the upper face of the keel end which can clearly be identified as the joint of some kind of a stern post. Because of the extraordinary long nails for this element, a voluminous body has to be assumed, just for its lower part. The fragments found also point to a strong stern post, supposed to have been slightly rounded at the after and forward faces, the elevation shaped like a sack to cover the nail shafts (fig. 8).

Although the bow of boat 2 is destroyed, a certain part of the foreship missing, there are clues to be found which help to estimate the original length. The starboard half of the ship body can be transformed into coordinates by measurements of the frame curves and even by the planking system (fig. 6). If these data are replaced to stations of regular spacings to trace back ship shape, more than a tentative reconstruction seems to be possible. On the supposition that the ship body was symmetrical at either side of the centre line and, too, that the sheer strake of no. 2 had been of identical size as the one found with wreck 1, also the maximum beam and hight of boat 2 can be derived from the water lines.

By this method, lines plans have been developed (fig. 7), initially based on body plans of wreck 2 which were added and – unessentially – corrected by data available from the planking. The run of lines towards the bow may include an error that influences the ship length to plus-minus some ten centimetres extent but as calculations of the hydrostatics indicate (see below) the missing bow section lay more or less completely above the supposed line of flotation. The water lines available for the upper parts of the ship body, which run to positions shortly forward of the rotten keel end, point to a bow construction characterized by a concave stem (figs. 7-8). So, the keel composed the foremost point of boat 2, and it had been completed so that the extremity protruded the line of flotation to a degree which is indicated by an archaeological hint, too: about 2.4 metres from the after end, the keel shows a hump-like increase that was also found in the foreship near the rotten keel end (fig. 3). According to the reconstructed ram-like bow construction, each distance would have been equal, and such a symmetry seems to me to be convincing. However, the minimum length of boat 2 can be supposed as 15.4 metres.

Because of the near relationship of both vessels, particulary because the level of thwarts is also known for wreck 2 (of which the sheerstrake is missing), it appeared to be reasonable to complete boat 2 by the measurements of the sheerstrake found with ship 1: if the width of her uppermost strake is added to the curves of the frames preserved, the ship body of Oberstimm 2 can be reconstructed to a depth of 1.05 metres (keel inclusive) and – assuming that the port side was identical to starboard – to a maximum beam of a little more than 2.7 metres.

Based on the three-dimensional data found some calculations may be of interest (table fig. 9). Because of the comprehensively preserved wreck that indicates a complex system of internals and even the number of the oar crew, the ship weight can be estimated at approx. 4 tons (including rates for different moistures of the timbers and approximations for men, rigg, rudders, oars etc.). This caused a draft of less than 0.5 metres resp. a freeboard of almost 0.6 metres. If the gear of oars and the room athwartships needed by each pair of oarsmen are considered, the crew were doubtless seated nearer to the centre line of the hull than to the sides where the thickened flanks of the thwarts (figs. 3; 4) were not provided for crew accommodation. So, Höckmann's theory about the Oberstimm boats as troop carriers that could take over a third or even more "passengers" between each pair of crew members (Höckmann 1995:85-86) seems to be most improbable, the more so as at least 0.8 metres room athwartships is needed per single man for oaring, not to mention the inboard length of the oar levers (fig. 4). Nevertheless, as particulary the hydrostatic data and the coefficients imply, boat 2 can be interpreted as an extraordinary light, slender vessel of relatively low resistence. Though the mast step suggests the existence of a rigg – presumably for auxiliary propulsion (fig. 8), all calculations point to high speed capabilities under oars. Comparisons with data of other ancient and medieval water craft (e.g. Timmermann 1956:610; McGrail 1987:192-201 tables 11.2-4; 1988; 1990; Coates 1996:323; 345 appendix D; Jensen 1997:312) prove an astonishing high state of ship architecture (fig. 10). Apart from their Mediterranean ship construction, north of the Alps solely found on sites with a military background the know-how to develop resp. to build such vessels is most easily imaginable for Roman military authorities. Obviously representing a variant of ancient *moneres* the Oberstimm boats are connected with the frontier defense at the upper Danube, probably acting as patrol units or appointed for communication between the military camps situated along the river (Bockius 2000b:75-80 fig. 3-4).

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CAPTIONS

Fig. 1 Oberstimm, Bavaria. Ship wrecks under excavation.

Fig. 2 Oberstimm, Bavaria. Section of field plan showing wrecks in a heeled position, disturbed by pales of Roman harbour installations or embankment (scale 1 to 160).

Fig. 3 Fragment of thwart preserved on Oberstimm, wreck 1 (scale 1 to 15).

Fig. 4 Cross-section of Oberstimm, boat 2 at section of frame A7 (near amidship), completed by components mentioned in the text (scale 1 to 160).

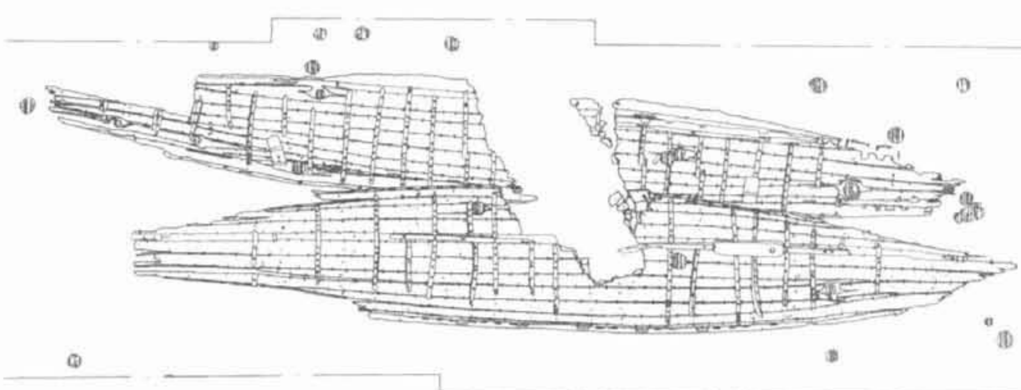
Fig. 5 Oberstimm, wreck 2; details at the after keel end seen from starboard.

Fig. 6 Body plans of Oberstimm, boat 2, with the outer faces of frames outlined; left: uncomplete curves; right: curves adjusted, rendered with the run of seams (scale 1 to 50).

Fig. 7 Oberstimm, boat 2; lines plans based on three-dimensional data and interpolations of the hull's extremities (scale 1 to 120).

Fig. 8 Oberstimm, boat 2, reconstruction; top-view, elevation and longitudinal section (scale 1 to 120).

Fig. 1



M 1:80

Fig. 2

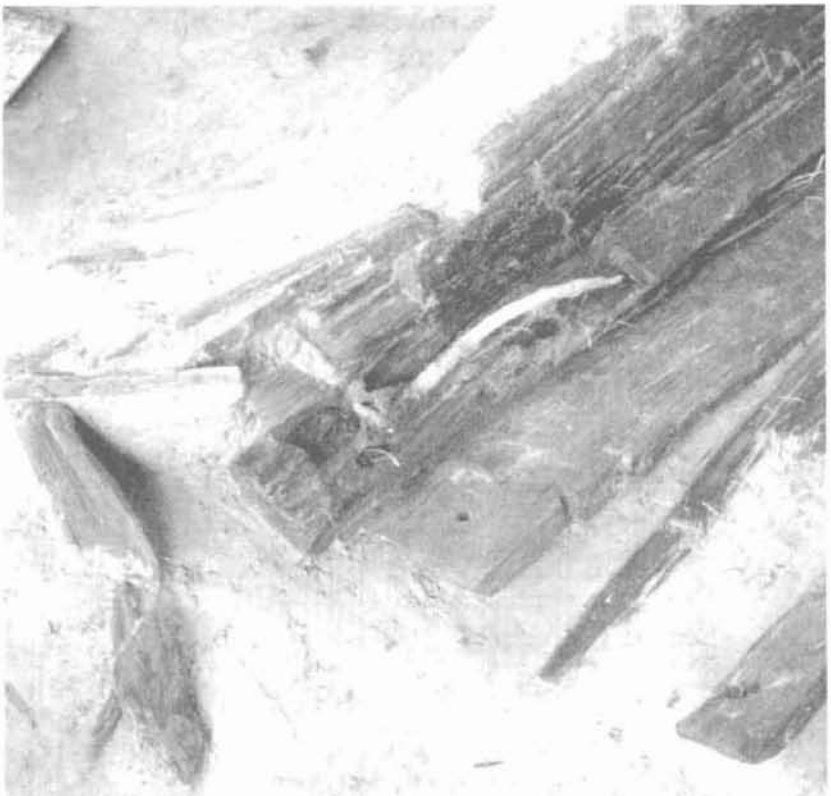


Fig. 5

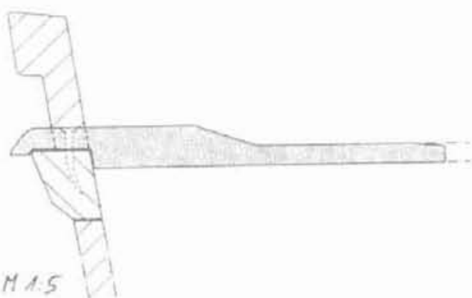
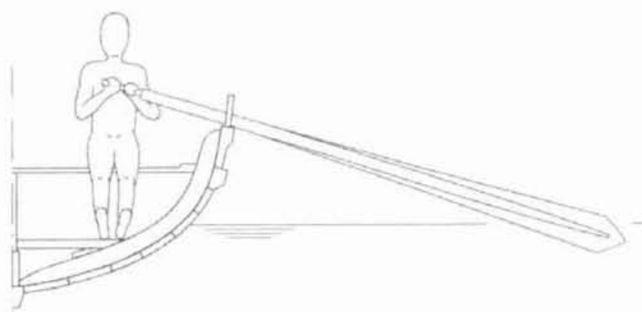
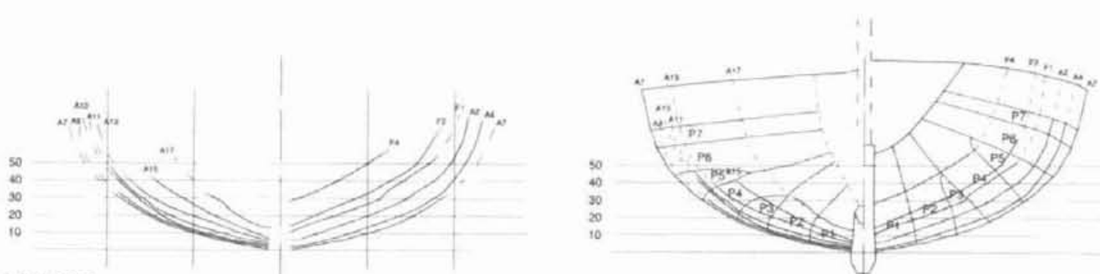


Fig. 3



M 1:20

Fig. 4



M 1:25

Fig. 6

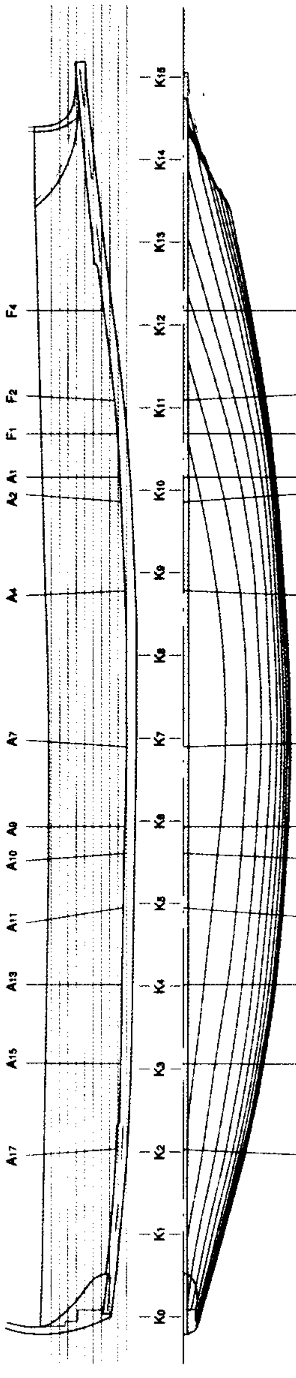


Fig. 7 M 1:60

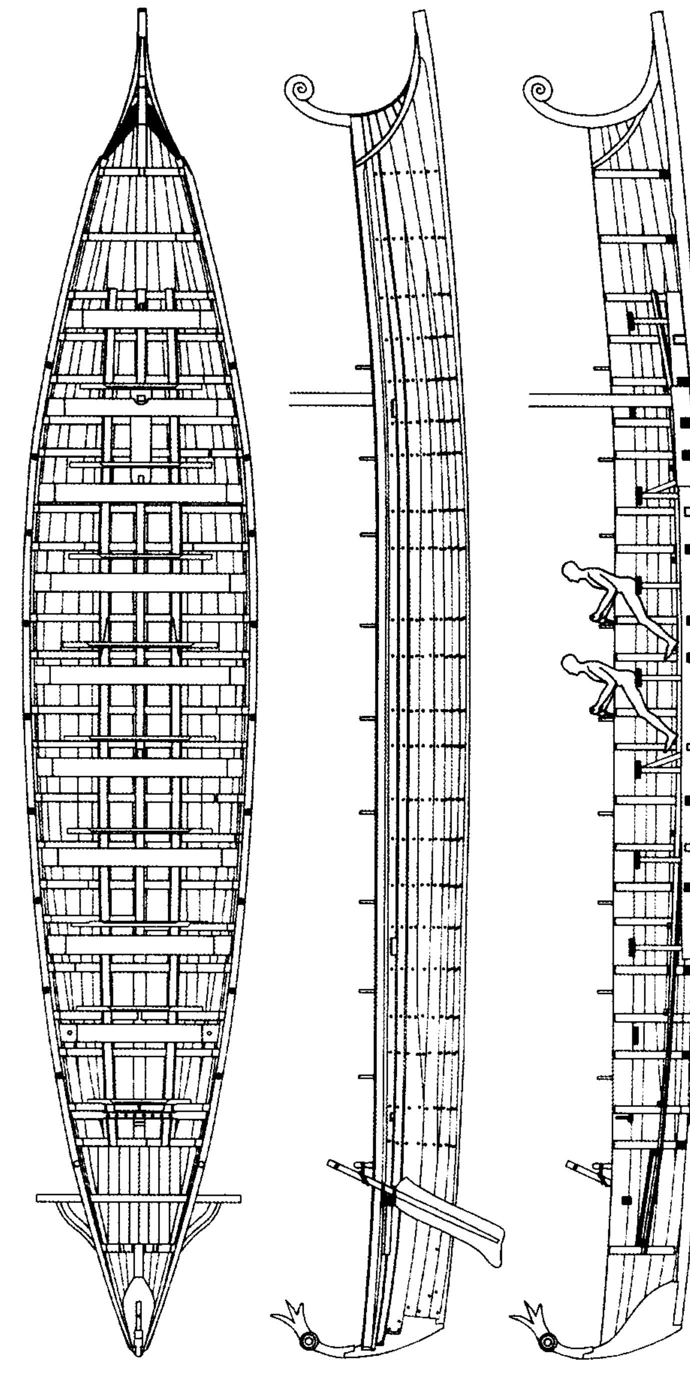


Fig. 8 M 1:60

Ship data of Oberstimm Boat 2 (reconstruction)

L_{OA}	15,40 m	C_{WP}	0,576	FN	0,4
L_{WL}	14,66 m	C_{MS}	0,576	R	9,3 Kn
B_{MAX}	2,66 m	C_B	0,297	$\Delta_{/CREW}$	267 kg
B_{WL}	2,20 m	C_P	0,516	A_S	28,5 m²
T	0,50 m	C_V	8,691	R_{AS}	3,165
F	0,55 m	L/B	6,66		
D_{MIN}	1,05 m	L/T	29,32		
∇	4,83 m³	B/T	4,4		
$\Delta_{0,995}$	4,8 t				
A_{WP}	18,530 m²				
A_{MS}	0,635 m²				

Fig. 9

Coefficients of Greek, Roman and Viking Vessels

		Oberstimm -boat 2 - [reconstruction]	Oseberg [reconstruction]	'Olympias' (for = 47t) [replica]
Waterplane coeff.	$[C_{WP}]$	0,576	0,548	0,77
Midships coeff.	$[C_{MS}]$	0,576	0,559	0,485
Block coeff.	$[C_B]$	0,297	0,295	0,339
Prismatic coeff.	$[C_P]$	0,516	0,528	0,704
Volumetric coeff.	$[C_V]$	8,691	9,175	8,84

Fig. 10

Νηῦς Ὀδυσσῆος γλαφυρή, εὐεργής, κυανόπρῳρος: ΣΧΟΛΙΑ ΝΑΥΠΗΓΙΚΗΣ ΣΕ ΠΑΡΑΣΤΑΣΕΙΣ ΠΛΟΙΩΝ ΤΟΥ ΟΔΥΣΣΕΑ

Δυώδεκα νῆες μιλτοπάρηοι μετέφεραν τους πολεμιστές του βασιλιά της Ιθάκης στην Τροία (Β΄637) και με τα ίδια πλοία άρχισε το ταξίδι της επιστροφής τους (ι΄159).[1] Η οργή όμως των θεών από τις *ύβρεις* των νοστούντων είχε ως αποτέλεσμα την αύτανδρη βύθιση των ένδεκα συνοδών πλοίων στη χώρα των Λαιστρυγόνων μετά την τύφλωση του Κύκλωπα Πολυφήμου (κ΄ 121-123) αλλά και της ιδίας της μεγακήτους (Θ΄ 223, Λ΄ 5) ναυαρχίδος μετά τη σφαγή των ζώων του Ηλίου στη Θρινακία (μ΄ 407-425), αφού προηγουμένως δοκιμάσθηκε το πλήρωμά της στο πέρασμα από τη χώρα των Σειρήνων (μ΄ 157-200) και της Σκύλλας (μ΄ 235-259). Συμφώνως προς την ομηρική διήγηση ο Οδυσσέας προσκολλήθηκε στην αποχωρισθείσα τρόπιδα και τον ιστό (μ΄ 424-425) για να σωθεί αλλά αναγκάσθηκε να τα εγκαταλείψει την επόμενη ημέρα στην αναμέτρησή του με τη Χάρυβδη (μ΄ 429-447). Εννέα ημέρες αργότερα ο ναυαγός έφθασε στην Ογυγία, όπου συντρόφευσε για επτά χρόνια τη νύμφη Καλυψώ. Η τελευταία αναγκάσθηκε από τους Ολυμπίους θεούς να προμηθεύσει τον νοσταλγό Οδυσσέα με τα απαραίτητα υλικά για την κατασκευή μιας σχεδίας. Η κατασκευή της διήρκεσε τέσσερις ημέρες. Δεκαοκτώ ημέρες μετά τον απόπλου του βρέθηκε αναίσθητος σε ακτή των Φαιάκων από την Ναυσικά, κόρη του άρχοντα της χώρας. Με «νῆα μέλαιναν ... πρωτόπλοον, κούρω δὲ δύω καὶ πεντήκοντα» (η΄ 34-36) αυτού του βασιλείου θα κατορθώσει ο πολύπλαγκτος ήρωας να φθάσει στην Ιθάκη.

Η αρχαία γραμματεία -με προεξάρχοντα τα ομηρικά ποιήματα και Ύμνους- και τέχνη είναι οι κυριότερες πηγές πληροφοριών σχετικά με τα πλοία, τα οποία συνδέονται με τον Οδυσσέα. Τα τεχνικά συμπεράσματα από τις παραστάσεις αυτών των πλοίων οφείλουν βεβαίως να λαμβάνουν υπ'όψιν το γεγονός ότι οι καλλιτεχνικές δημιουργίες δεν σκόπευαν στην πιστή αντιγραφή συγχρόνων τους κατασκευών[2] αλλά ποιητική ἀδεία αφαιρούσαν ή πρόσθεταν στοιχεία και υπάκουαν ανάλογα με την εποχή σε συγκεκριμένες αρχές για την απόδοση τρισδιαστάτων αντικειμένων. Η σε μεγάλο βαθμό συμφωνία όμως μεταξύ κειμένων και εικονογραφίας συνηγορεί για την αξιοπιστία της τελευταίας. Η δε κατανόησή της υποβοηθείται περαιτέρω και από ευρήματα αρχαίων ναυαγίων.

Στο έπος τα πλοία του Οδυσσέα, όπως και των υπολοίπων Αχαιών, είναι κωπήλατα (νῆες ἐπήρετμοι: δ΄ 559, ε΄ 141) και ιστιοφόρα.[3] Τα επίθετα, τα οποία αναφέρονται σε αυτά, περιγράφουν μερικές βασικές, γενικές ιδιότητές τους ή παραπέμπουν στην κατασκευή και την εξάρτυσή τους. Έτσι χαρακτηρίζονται γρήγορα, μαύρα και κοίλα (αντιστοίχως θοαὶ, μέλαιναι, γλαφυραί, κοῖλαι). Το μαύρο χρώμα συνδέεται με το στρώμα πίσσας, η οποία εξασφάλιζε τη στεγανότητά τους. Εάν το επίθετο κυανόπρωρος, το οποίο αποδίδεται στο ίδιο σκάφος του Οδυσσέα δεν αποτελεί ποιητικότερο συνώνυμο του μέλαινα, τότε η συγκεκριμένη πλώρη θα είχε βαθύ κυανό χρώμα. Ότι το τμήμα αυτό του πλοίου διαφοροποιείτο μερικές φορές χρωματικώς προκύπτει και από τον ειδικότερο χαρακτηρισμό των πλοίων του Οδυσσέα ως *μιλτοπαρήων*, συνώνυμο του όρου φοινικοπάρηοι (κοκκινομάγουλα). Ίσως αυτή η μεταφορά είναι υπαινιγμός στο ζεύγος των οφθαλμών, οι οποίοι ζωγραφίζονταν άλλοτε φυσιοκρατικότερα και άλλοτε σχηματικότερα από την ΥΕ ΙΙΙΓ και εξής εκατέρωθεν της πλώρης.[4] Η έννοια μιας σειράς άλλων, συχνών επίσης επιθέτων, ἐΰσσελμος (καλοφτιαγμένο πλοίο· με ωραία καταστρώματα στην πρύμνη και την πλώρη), ἀμφιέλισσα (ερχόμενο και από τις δύο κατευθύνσεις· με διπλή καμπύλη και στα δύο άκρα,[5]· εύκολο στο χειρισμό), κορωνίς (καμπύλου περιγράμματος,[6] με πτηνόμορφο άφλαστο ή/και ακροστόλιο[7]), πολυκλήϊς (με πολλούς σκαλμούς ή καθίσματα ερετών[8]), δεν είναι εξ ίσου σαφής και μονοσήμαντη.

Πάντως τα ομηρικά πλοία του Οδυσσέα[9] ήταν άφρακτα με πρωραίο και πρυμναίο κατάστρωμα (ἴκρια). Στο τελευταίο καθόταν ο πηδαλιούχος για να οδηγεί το πλοίο με ένα ή ενδεχομένως και δύο *πηδάλια*. Είχαν τρόπιδα, η οποία απέληγε στο πρόσθιο τμήμα της στη στείρα, ενώ στο άλλο άκρο η πρύμνη τελείωνε σε άφλαστον, καθίσματα ερετών (ζυγά ή κληΐδες) και γόμφους κατά μήκος του περιτοναίου (κληΐδες) για τη στερέωση των κωπών (ἐρετμά). Ο ιστός του μοναδικού πανιού πακτωνόταν σε εντορμία νομέα στο κέντρο του πλοίου (μεσόδμη), η οποία περιβαλλόταν από μια θήκη (ἱστοπέδη). Όταν κατέβαζαν τον ιστό, στήριζαν την ανώτερη άκρη του στην ιστοδόκη. Το πανί κρεμόταν από οριζόντια κεραία (ἐπίκριον) και στερεωνόταν με σχοινιά και προς το μέρος της πλώρης (πρότονοι) και προς το μέρος της πρύμνης (ἐπίτονοι). Κατονομάζονται τέσσερεις ακόμη κατηγορίες σχοινιών -όπλων, όπως αποκαλούνται στην Οδύσσεια- για τη στερέωση και τη λειτουργία του ιστίου (σπεῖρα, ὑπέραι, κάλοι, πόδες). Τα πρυμνήσια και τα πείσματα ήταν σχοινιά για πρόσδεση. Η αγκυροβόληση επετυγχάνετο με διατρήτους λίθους (εὐναί) ποντιζομένους από την πλώρη.

Μόνη ένδειξη για το μέγεθος των πλοίων του Οδυσσέα -και συνεπώς τον τύπο τους- είναι ο αριθμός των κωπηλατών, οι οποίοι ήταν αὐτερέται καὶ μάχιμοι (Θουκ. 1.10.4 αλλά και στο Β'719-720). Έμμεση αναφορά στον τύπο του πλοίου -μια εικοσάκωπο- γίνεται στο επεισόδιο της αποστολής του Οδυσσέα με είκοσι ερέτες για την επιστροφή της Χρυσηίδος (Α'309). Κατά τα λοιπά τόσο η ναυαρχίδα του, όταν προσέγγισε τη χώρα της Κίρκης (ι' 203, θ'289, 311, 344), όσο και το πλοίο της επιστροφής, το οποίο του διέθεσαν οι Φαίακες, υποτίθεται ότι ήταν του τύπου της πεντηκοντόρου[10], αφού επανδρώνονταν με πενήντα άνδρες και δύο αξιωματούχους, αν και δεν είναι δυνατόν να αποκλεισθεί το ενδεχόμενο ότι επρόκειτο για εικοσόρους με το πλήρωμα να κωπηλατεί σε βάρδιες.[11] Ας σημειωθεί επίσης ότι ευλόγως έχει υποστηριχθεί ότι ο χαρακτηριστικός τύπος σκάφους κατά την ανατολίζουσα και αρχαϊκή εποχή και μέχρι την οριστική επικράτηση της πεντηκοντόρου ήταν η τριακόντορος.[12] Σε κάθε περίπτωση πρόκειται για πολεμικά πλοία, κατά πάσα πιθανότητα μονόκροτα. Η ύπαρξη εμπορικής εικοσόρου (θ' 323: φορτίδος εὐρείης) μνημονεύεται στην Οδύσσεια αλλά όχι στην Ιλιάδα. Το στοιχείο αυτό επιβεβαιώνει την άποψη ότι η Οδύσσεια, η οποία συντέθηκε προς το τέλος του 8ου αι. π.Χ., αντανακλά κυρίως τον υλικό πολιτισμό από τον 10ο έως τον 8ο αι. π.Χ., ενώ η Ιλιάδα, έργο των αρχών του 8ου αι. π.Χ., αναφέρεται στην περίοδο από τον 13ο έως τον 10ο αι. π.Χ.[13]

Αν και πλοία απεικονίζονται συχνά σε γεωμετρικά -κυρίως αττικά- αγγεία, μόνον στον λαιμό μιας αττικής οινοχόης (π. 730 π.Χ.) φαίνεται να έχει αποτυπωθεί το ναυάγιο του ήρωα μετά την Θρινακία.[14] Το ανεστραμμένο σκάφος ακολουθεί τις εικονογραφικές συμβάσεις της εποχής. Έχει οκτώ κυκλοτερείς οπές εξόδου για τα χαμένα κουπιά και πηδάλιο, οφθαλμό στην πλώρη με το κερατοειδές ακροστόλιο, ισοϋψές κεκαμμένο άφλαστο και δρύφρακτο στην πρύμνη.

Η πρωϊμότερη βέβαιη παράσταση επεισοδίου της Οδυσσείας σχετιζομένου με πλοία χρονολογείται περί το 600 π.Χ. Σώζεται αποσπασματικώς σε ένα όστρακο και πρέπει να απεικονίζει τη διάβαση του ήρωα και των συντρόφων του από τις Σειρήνες.[15] Το θέμα θα αποδειχθεί το δημοφιλέστερο στην εικονογραφία υπό εξέταση. Παρουσιάζεται ως κύριο θέμα σε αγγεία διαφόρων τύπων μέχρι τον 3ο αι. π.Χ., ετρουσκικές τεφροδόχους κίστες ελληνιστικής εποχής, ελληνορωμαϊκούς γλυπτούς λίθους, ρωμαϊκά λυχνάρια, ζωγραφικούς πίνακες των πρωίμων αυτοκρατορικών χρόνων και χριστιανικές σαρκοφάγους των υστέρων ρωμαϊκών χρόνων καθώς και σε ψηφιδωτά με ναυτικά θέματα στη Ρώμη και στις βορειοαφρικανικές επαρχίες της. Δεν απουσιάζει επίσης από ελληνιστικούς κύκλους επεισοδίων της Οδυσσείας στους λεγόμενους «ομηρικούς σκύφους» από τις Φθιώτιδες Θήβες, σε ελληνιστικά ανάγλυφα πινάκια και στην περίφημη σειρά των γραπτών τοπιογραφικών μετοπών κατά τον β΄πομπηϊανό ρυθμό από τον Εσκουϊλίνο λόφο της Ρώμης. Στις ανάγλυφες σκηνές των «ομηρικών» σκύφων και των πινακίων περιλαμβάνεται και η συνάντηση του πλοίου του ήρωα με τη Σκύλλα. Η πάλη των επιβαινόντων στο σκάφος με τη Σκύλλα απαθανατίσθηκε σε χάλκινο τηγανόσχημο αγγείο ελληνιστικής εποχής και στο θώρακα του ανδριάντα της προσωποποιημένης Οδυσσείας στην Αγορά των Αθηνών καθώς και σε σειρά νομισματομόρφων εκδόσεων (μεταλλίων), τους Contorniati, κατα τους ρωμαϊκούς αυτοκρατορικούς χρόνους.[16] Οι τοιχογραφίες της Οδυσσείας από τον Εσκουϊλίνο λόφο καταγράφουν και την καταστροφή των πλοίων από τους Λαιστρυγόνες, τη διάσωση του πλοίου του Οδυσσέα και τον απόπλου του για τον κόσμο των νεκρών. Δύο ακόμη ζωγραφικοί πίνακες κατά τον 3ο πομπηϊανό ρυθμό από villa στο Boscotrecase (μετά το 11 π.Χ)[17] και την Οικία του ιερέα Amandus στην Πομπήϊα, οι οποίοι πραγματεύονται τον έρωτα του Πολυφήμου για τη Γαλάτεια, δεν παραλείπουν να απεικονίσουν σε δεύτερο επίπεδο αντιστοίχως το λιθοβολισμό ή την έλευση του πλοίου του Οδυσσέα στο σπήλαιο του Κύκλωπα. Την αποβίβαση στη περιοχή του Πολυφήμου δείχνουν άλλες ετρουσκικές τεφροδόχες. Η καταστροφή και του πλοίου αυτού συναντάται στο σπήλαιο του Τιβερίου στη Sperlonga και σε όστρακο «ομηρικού» σκύφου από τις Φθιώτιδες Θήβες. Σε ένα άλλο όστρακο τέτοιου σκύφου απεικονίζεται η κατασκευή της σχεδίας, ενώ στο δίσκο ρωμαϊκού λύχνου η σκηνή της καταστροφής της. Η εικονογραφία δηλ. του πλοίου του ήρωα[18] επιλεκτικώς περιορίζεται σε συγκεκριμένα επεισόδια των ραψωδιών ι΄έως μ΄της Οδυσσείας και εστιάζει το ενδιαφέρον της στο πλοίο του αρχηγού της αποστολής.

Ένας κορινθιακός αρύβαλλος από τη Βοιωτία (575-550 π.Χ.)[19] είναι η αρχαιότερη ακέραιη απεικόνιση της διάβασης εμπρός από τις δύο Σειρήνες (**εικ. 1**). Ο Οδυσσέας είναι δεμένος στον ιστό, οι σύντροφοί του κωπηλατούν με αυτιά φραγμένα με κερί για να μη παρασυρθούν από το μαγευτικό τραγούδι τους. Ο καλλιτέχνης δεν δηλώνει το πανί σε συμφωνία με την ομηρική διήγηση αλλά ζωγραφίζει πλοίο της εποχής του.[20] Είναι μια άφρακτη μονήρης με αδιευκρίνιστο αριθμό ερετών δεδομένου ότι οι εικονιζόμενοι πέντε πολεμιστές-κωπηλάτες είναι ενδεικτικοί μόνον του πολεμικού χαρακτήρα του πλοίου.[21] Η οριζόντια γραμμή επάνω από τα κεφάλια δηλώνει πιθανότατα την κουπαστή. Η πλώρη του είναι διαμορφωμένη σε σχήμα κεφαλής κάπρου, όπως συνηθίζεται στην αρχαϊκή αγγειογραφία. Στο πρυμναίο κατάστρωμα, το οποίο αυτή την εποχή αποδίδεται σημαντικά υψηλότερα από το επίπεδο των ερετών, και στη θέση του αναμενόμενου προστατευτικού κιγκλιδώματος του διακρίνεται η απαραίτητη για την επίβαση-αποβίβαση κλίμακα[22] και μια συμπαγής διαμόρφωση. Μερικοί την ταυτίζουν με τελετουργικό ύφασμα (πρυμνοσκεπάσματα) βάσει μεταγενεστέρων και σαφεστέρων -αρχαϊκών και κλασικών- παραστάσεων.[23] Το γεγονός όμως ότι επάνω από αυτό είναι ορατό το κεφάλι του πηδαλιούχου και η λαβή του πηδαλίου (;) ίσως να δικαιώνει την άποψη του Rolland,[24] ότι πρόκειται μάλλον για άκομψη απόδοση του πρυμναίου δρύφρακτου, όπως φαίνεται και στο ομοίωμα από το Γύθειο, έργο κατά τον Höckmann καλλιτέχνη της αρχαϊκής εποχής.[25]

Μια μελανόμορφη οινοχόη (π. 520 π.Χ.) απεικονίζει το ίδιο επεισόδιο[26] (**εικ. 2**). Η σκηνή όμως παρουσιάζει μυθολογικές ασυνέπειες και μια τεχνική ιδιαιτερότητα. Οι Σειρήνες έχουν γίνει τρεις, το πανί είναι αναπεπταμένο, ενώ οι ερέτες κωπηλατούν ανορθόδοξα με το κεφάλι στραμμένο προς την καπρόσχημη πλώρη. Αν οι δύο πρώτες αυθαιρεσίες είναι αποτέλεσμα της ελευθερίας του καλλιτέχνη για έκφραση, ο τρόπος κωπηλασίας της μονήρους έχει ανάγκη μεγαλύτερης προσοχής. Εάν στην αντεστραμμένη αυτή στάση οι ναυτικοί κωπηλατούσαν κατά τον συνηθισμένο τρόπο, τότε το πλοίο θα οπισθοχωρούσε.[27] Το ακροστόλιο είναι κατακόρυφο, τα κουπιά έχουν στερεωθεί στην κουπαστή με δερμάτινες θηλιές (ομηρ. τροποῖς ἐν δερματίνοισι).

Είναι πολύ πιθανόν ότι και οι δύο αρχαϊκοί καλλιτέχνες δανείσθηκαν χαρακτηριστικά των συγχρόνων τους πεντηκοντόρων, οι οποίες μέχρι τις αρχές του 5ου αι. π.Χ., οπότε άρχισαν να εκτοπίζονται από τις τριήρεις, ήταν ο επικρατέστερος τύπος πλοίου στους στόλους των ελληνικών πόλεων για πόλεμο ή πειρατεία.[28] Γραπτές πηγές αλλά και αρχαϊκές απεικονίσεις πλοίων μαρτυρούν για την ύπαρξη διαφόρων ειδών πεντηκοντόρου. Δύο πλοία σε ισάριθμες παραστάσεις με θέμα το πέρασμα από τις Σειρήνες συνδέονται με τον ποντοπόρο αυτό τύπο. Μια μελανόγραφη εικόνα σε οινοχόη του τέλους του 6ου αι. π.Χ. (**εικ. 3**) θεωρείται ως η πρώτη απεικόνιση διήρους του Οδυσσέα, δηλ. σκάφους με δύο σειρές καθ' ύψος ερετών.[29] Οι δύο σειρές των οπών για τα κουπιά (τρητοί) έχουν ανοιγεί κάτω από το χείλος του περιτοναίου σε διάταξη λοξή, κλιμακωτή. Ο Höckmann θεωρεί ότι αυτο το σκάφος πρέπει να διέθετε ένα είδος προεξοχής (παρεξειρεσίας) στο επίπεδο της κουπαστής προκειμένου να χωρέσουν οι ερέτες. Είναι άφρακτο, με καπρόσχημη πλώρη. Ο πρωρεύς -ή ο συγκυβερνήτης του Οδυσσέα, Ευρύλοχος;- κάθεται στα υπερυψωμένα ϊκρια περιβαλλόμενα από κιγκλίδωμα. Το κατάστρωμα του πηδαλιούχου βρίσκεται χαμηλότερα. Πίσω του οι σανίδες του άφλαστου μαρτυρούν για την καταγωγή των μεταγενεστέρων κομψών θυσανοσχήμων κοσμημάτων στη θέση αυτή. Το άφλαστο στην ερυθρόμορφη στάμνο του ζωγράφου των Σειρήνων των αρχών του 5ου αι. π.Χ. είναι μια -κατ' εξαίρεση έξω νεύουσα- πτηνοπροτομή καλυμμένη από πρυμνοσκέπασμα.[30] Η κατακόρυφη πλώρη ενισχύεται με ιδιαίτερα τονισμένο έμβολο. Οι οφθαλμοί αντικατέστησαν την προτομή του κάπρου. Ένα υφασμάτινο στέγαστρο φαίνεται ότι προστάτευε την πρωραία περιοχή. Τα κουπιά αντί να στερεωθούν στο περιτόναιο, όπως συνηθίζεται στις μονήρεις, εξέρχονται από οπές χαμηλότερα από αυτό. Η σχέση τους με τους ερέτες δεν είναι κατανοητή. Υπάρχουν επτά οπές, έξι κουπιά και τέσσερεις μόνον ερέτες. Η κατάσταση θυμίζει την λιγότερο οχληρή αναντιστοιχία στην οινοχόη. Ίσως η θεωρία του Tilley[31] περί προβολής περισσοτέρων ερετών, απ' όσους είναι ορατοί, να βρίσκεται στη σωστή κατεύθυνση, επειδή είναι δύσκολο να χρεωθεί η καλλιτεχνική δημιουργικότητα με αυτές τις οφθαλμοφανείς τεχνικές παρεκκλίσεις. Ο ερευνητής προτείνει -για την συγκεκριμένη περίπτωση- την ύπαρξη τρίτης σειράς ερετών στο κέντρο του σκάφους και στο ίδιο επίπεδο με αυτό των δύο εξωτερικών σειρών. Αυτοί θα χειρίζονταν κουπιά εξερχόμενα εκ περιτροπής και από τις δύο πλευρές.[32] Ο ζωγράφος, παρά την προτίμηση για τρεις Σειρήνες και υψωμένο πανί, αποδίδει πειστικώς τα «κρεμαστά» σκεύη. Σε αυτό το υβρίδιο μακρᾶς νηὸς και ὁλκάδος αναγνωρίζει ο Höckmann μια μονόκροτο πεντηκόντορο.

Στην αγγειογραφία των κλασικών χρόνων δεν απαντά σκηνή με το πλοίο του Οδυσσέα. Ίσως η τριήρης θεωρήθηκε εξαιρετικώς σύγχρονος τύπος σκάφους, ανάρμοστος για ιστόρηση ηρωϊκών πράξεων του απωτάτου παρελθόντος.[33] Οι καλλιτέχνες όμως της ρωμαϊκής εποχής εμπνεύσθηκαν από τα σύγχρονά τους σκάφη, όπως προκύπτει από την εξέταση των παραστάσεων του επεισοδίου των Σειρήνων σε μνημεία διαφόρων κατηγοριών.

Σε ανάγλυφες φιάλες του τύπου Calès από το Orvietto και το Vulci (τέλος 3ου-αρχές 2ου αι. π.Χ.)[34] τέσσερα όμοια πλοία περιμετρικώς του ομφαλού (**εικ. 4**) παρουσιάζουν τις τελευταίες περιπέτειες της ναυαρχίδος: το δέσιμο του ήρωα στον απογυμνωμένο ιστό, το πέρασμα από τις Σειρήνες, την πάλη με τη Σκύλλα, το ναυάγιο μετά τη Θρινακία.[35] Το πλοίο είναι μια κατάφρακτη τριήρης ρωμαϊκού τύπου[36] χωρίς προεμβόλιο. Μέχρι στιγμής αποτελεί την αρχαιότερη παράσταση αυτού του τύπου σκάφους.

Έχει οφθαλμούς και τριμερές έμβολο, τυπικά ρωμαϊκό έσω νεύον ακροστόλιο, πρωραίο υπόζωμα και ένα είδος στυλίδων με ανεμίζουσες ταινίες στο άφλαστο.[37] Τα κουπιά εξέρχονται από επίμηκες προεξέχον κιβώτιο (όγκωπον) σε τρία επίπεδα χιαστί. Επάνω από αυτά δεν δηλώνεται ευκρινώς η ζώνη εξαερισμού.

Στις ετρουσκικές τεφροδόχους κίστες του 2ου αι. π.Χ. από τη Volterra με θέματα από την Οδύσσεια (συνάντηση με τις Σειρήνες:**εικ. 5**, άφιξη στη γη του Πολύφημου, λιθοβολισμός του πλοίου του ήρωα από τον Κύκλωπα) το μηνοειδές σκάφος αφίσταται από τους γνωστούς τύπους της σύγχρονης εικονογραφίας,[38] παρά τις σαφείς επιρροές από την ελληνιστική γλυπτική.[39] Η πλώρη -καμπύλη όπως και η ελληνοπρεπής πρύμνη- έχει ασπιδόμορφο ακροστόλιο, ίσως για περιέλιξη των σχοινιών, και φαινομενικώς μη λειτουργικό έμβολο και κριόσχημο προεμβόλιο. Υπόζωμα διατρέχει όλο το μήκος του κύτους, το οποίο ψηλότερα διατρυπά μια σειρά κουπιών με δερμάτινο περίβλημα (άσκώματα) γύρω από τις οπές εξόδου. Η μονήρης πρέπει να είχε κατάστρωμα δεδομένου ότι οι σύντροφοι του Οδυσσέα δεν κωπηλατούν, εκτός εάν ο καλλιτέχνης υπονοεί ότι το αναπεπταμένο ιστίο έχει επιφορτισθεί με το έργο της ταχυτάτης απομάκρυνσης. Η στερέωση του πηδαλίου -σε μια μόνον περίπτωση λανθασμένα στην πλώρη- δείχνει ότι λειτουργούσε κατά τρόπο διαφορετικό από εκείνο των ελληνικών πλοίων. Θεωρούνται παραστάσεις πλοίων παρωχημένης τεχνολογίας, τα οποία χρησιμοποιούνταν στην Ετρουρία, όταν κυριαρχούσαν στην ανατολική λεκάνη της Μεσογείου οι πολυήρεις.[40] Η σειρά των ασπίδων κατά μήκος της κουπαστής, διακριτικό γνώρισμα των φοινικικών πλοίων, ίσως παραπέμπει στην ανατολική προέλευση αυτών των σκαφών. Σε τέτοιου είδους πλοίο πρέπει να αποδοθεί και η πλώρη στη σκηνή με τη Σκύλλα σε χάλκινο τηγανόσχημο αγγείο από το Boscoreale.[41]

Μια liburna (αρχ. λιβυρνίδα) του ρωμαϊκού αυτοκρατορικού στόλου, πολεμικό πλοίο μικρού μεγέθους με ιλλυρικές καταβολές, αναγνωρίζει ο Höckmann[42] σε γλυπτό λίθο από υαλόμαζα του 1ου αι. π.Χ. με τη σκηνή των Σειρήνων (**εικ. 6**).[43] Και στην περίσταση αυτή οι ερέτες έχουν στραφεί προς την αντίθετη της αναμενομένης κατεύθυνση. Η έλλειψη συνεχούς καταστρώματος -αφού η μονή σειρά ερετών είναι ορατή-, η ύπαρξη μιας στενής διαβάθρας εκτεινόμενης από την πλώρη έως την πρύμνη -όπου στηρίζεται ο Οδυσσέας- και η υπερκατασκευή (σκηνή) στην πρύμνη φαίνεται ότι ήταν βασικά χαρακτηριστικά αυτού του τύπου σκάφους. Γενικότερα όμως μερικές υστερορωμαϊκές naves longae -ακόμη και πεντήρεις- παρουσιάζονται να έχουν μόνον μια σειρά κουπιών, καθένα από τα οποία κινούσαν περισσότεροι του ενός ερέτες.[44] Το ασπιδόμορφο κόσμημα στη βάση του αφλάστου έλκει την καταγωγή του από την αρχαϊκή εποχή[45], ενώ το τριγωνικό πανί επάνω στην κορυφή του μεγάλου ιστού, (αρχ. σίφαρος, supparum[46]) αποτελεί τμήμα της σκευής από το π. 50 μ.Χ.[47]

Σε μια από τις υστερότερες απεικονίσεις του Οδυσσέα με τις Σειρήνες, ένα ψηφιδωτό δάπεδο του 2ου-3ου αι. μ.Χ. από την Dugga της Τυνησίας[48], το σκάφος του διαθέτει μικρότερο λοξό ιστίο στην πλώρη (**εικ. 7**). Ο Pékary, ο οποίος αναγνωρίζει στο πλοίο μια actuaria (ἱστιόκωπο, ἐπακτρίδα), βλέπει σε αυτό τον αρτέμωνα.[49] Πρόκειται όμως μάλλον για δόλωνα σύμφωνα με τη διάκριση του ίδιου ερευνητή, αφού το σκάφος είναι οπωσδήποτε πολεμικό, μεταγωγικό maioris formae δεδομένου ότι είναι κατάφρακτο -οι στρατιώτες με τις ασπίδες στα χέρια στέκονται στο κατάστρωμα-, και τουλάχιστον δίκροτο -κρίνοντας από τη λοξή διάταξη των επαλλήλων σειρών των κουπιών, τα οποία εξέρχονται απ'ευθείας από το κύτος κάτω από επιμήκη προεξοχή με κιλίβαντες (πάροδος;).[50] Στο επίσημον ή παράσημον της πλώρης η μετωπική προτομή συνδέεται με την ονομασία του πλοίου.[51] Το περιεχόμενο και η ατμόσφαιρα στο μνημείο αυτό είναι ξένα προς την ομηρική διήγηση. Η πηγή έμπνευσης του καλλιτέχνη -ίσως αλεξανδρινά εγχειρίδια σχεδίων για γλυπτές συνθέσεις[52]- αλλά και οι αισθητικές απαιτήσεις του κοινού στις πολυεθνικές ρωμαϊκές αποικίες συνέβαλαν στη μετατροπή του θέματος σε απλό θαλασσινό τοπίο. Στις σαρκοφάγους της εποχής της Τετραρχίας οι ίδιες παράμετροι οδήγησαν σε πολύ ανάλογη απόδοση του επεισοδίου.

Ασπίδες έχουν στερεωθεί στο στηθαίο της πολυήρους-πιθανότατα πεντήρους-, η οποία φέρνει τον Οδυσσέα στη χώρα του Πολυφήμου στην τοιχογραφία της Οικίας του Ιερέα Amandus (περί το 79 μ.Χ.).[53] Η παράσταση (**εικ. 8**) είναι πολύ διδακτική για την εικονογραφία πολεμικών πλοίων της ρωμαϊκής αυτοκρατορίας.[54] Το σκάφος έχει τυπικά έσω νεύουσα ρωμαϊκή πλώρη, προεμβόλιο και είναι κατάφρακτο. Η πάροδος στηρίζεται σε σειρά κιλιβάντων. Απο τα κενά μεταξύ τους ή τα μόλις διακρινόμενα επιμήκη ανοίγματα κάτω από αυτά ανανεωνόταν ο αέρας στο χώρο των πολυαρίθμων ερετών. Οι τρεις σειρές κουπιών των τελευταίων δεν φαίνεται ότι εξέρχονται από ειδικά διαμορφωμένο έγκωπο.[55]

Πολύ ανάλογες είναι και οι πλώρες δύο πολυήρων καθώς και εκείνης του Οδυσσέα στις ζωγραφικές σκηνές της καταστροφής των ένδεκα πλοίων από τους Λαιστρυγόνες (**εικ. 9**) και της διαφυγής της ναυαρχίδας αντιστοίχως από τον Εσκουϊλίνο λόφο (β΄μισό του 1ου αι. π.Χ.).[56] Στην σκηνή της καταστροφής ένα μισοβυθισμένο πλοίο έχει έξω νεύον ακροστόλιο καρχηδονιακού τύπου. Και οι δύο παραλλαγές μαρτυρούνται για τα ρωμαϊκά πλοία αυτής της εποχής. Ασπίδες κρέμονται από το θωράκιο (κουρτέλο) επάνω από εξηρημένη ζώνη (εξαερισμού;) και πλήθος κουπιών διατρυπούν τα τοιχώματα των πλοίων κάτω από αυτή. Τα ραδινά άφλαστα θυμίζουν τα των ελληνιστικών νομισμάτων της Φασήλιδος.[57] Τα πρότυπά τους, όπως και οι μορφές, πρέπει να αναζητηθούν στην ελληνιστική τέχνη και πραγματικότητα. Η ένταξή τους όμως σε αυτό την ειδυλλιακή-ουτοπική ατμόσφαιρα είναι ρωμαϊκή ιδέα.[58] Η δραματική αξία όμως από την άμεση αναφορά στο έπος αναζητήθηκε τουλάχιστον στην περίπτωση των γλυπτών σκηνών από την Οδύσσεια στο σπήλαιο του αυτοκράτορα Τιβερίου στη Sperlonga στην τυρρηνική ακτή μεταξύ Ρώμης και Νεαπόλεως (1ος αι. π.Χ.-1ος αι. μ.Χ.). Η από θραύσματα συγκολλημένη κομψή πρύμνη του πλοίου με τον κυβερνήτη προσκολλημένο στη βάση του χαμένου αφλάστου (**εικ. 10**) δικαίως συνδέεται με το επεισόδιο της βύθισης του τελευταίου πλοίου των Ιθακησίων.[59] Αναγνωρίζεται η πλευρική απόληξη του εγκώπου, το άνω άκρο του πηδαλίου (ο οίαξ), το χείλος του στηθαίου (τράφηξ).[60] Βάσει της ομοιότητος αυτού του γλυπτού με άλλα ανάλογα ανάγλυφα ελληνιστικών και ρωμαϊκών χρόνων[61] και της ροδίας καταγωγής των καλλιτεχνών αναγνωρίζεται σε αυτό μια τριημιολία, ελαφρύ άφρακτο -πιθανότατα- πολεμικό πλοίο κατ'εξοχήν του στόλου της Ρόδου και ενδεχομένως δημιούργημα των ναυπηγών του νησιού αυτού. Χωρίς να έχει ακόμη αποδειχθεί, θεωρείται ότι το σκάφος διέθετε δύο σειρές κουπιών στο έγκωπο και μια μισή αμέσως χαμηλότερα στο κύτος, όπως υπαινίσσεται και το όνομά της.[62]

Η παράσταση του ναυαγίου στο όστρακο του μεγαρικού σκύφου δείχνει τον σπασμένο ιστό με το σχισμένο πανί και τον ήρωα να κρατά -μάλλον- τη λαβή του πηδαλίου και ίσως -σε κάτοψη- τα άδεια καθίσματα των συντρόφων-ερετών.[63] Κατά πολύ ανάλογο τρόπο παρουσιάζεται σε ρωμαϊκό λύχνο του Antiquarium του Μονάχου[64] και η κατεστραμένη από την τρικυμία σχεδία (**εικ. 11**), την οποία κατασκεύασε ο Οδυσσέας στο νησί της Καλυψούς. Ο ιστός με τους δακτυλίους (τροχαλίες;) στην κορυφή έχει σπάσει στα δύο. Το επίκριο με τα κομμένα σχοινιά έχει σωριασθεί στο κατάστρωμα της σχεδίας, συναρμοσμένο από ενωμένους κορμούς δένδρων. Ο ήρωας, πεσμένος με την πλάτη σε αυτό, κρατά με το αριστερό χέρι τη λαβή του πηδαλίου και υψώνει το δεξί στον ουρανό για βοήθεια. Αυτή η παράσταση σε συνδυασμό με το ομηρικό χωρίο, το οποίο περιγράφει πολύ γενικά τη δημιουργία του αυτοσχεδίου σκάφους, το οποίο χαρακτηρίζεται ως σχεδία, έχει οδηγήσει τους περισσότερους ερευνητές,[65] όπως τον Assmann,[66] να υποθέτουν ότι επρόκειτο για μια πρόχειρη κατασκευή και όχι για πλοίο.[67] Δυστυχώς η μοναδική σκηνή στο μεγαρικό σκύφο με τον ήρωα ἐπὶ τῷ ἔργῳ δεν είναι καθόλου διαφωτιστική.[68] Με σφύρα στο δεξί προσπαθεί να καθηλώσει ξύλινη σφήνα. Μπροστά του διακρίνονται διπλός πέλεκυς και μακρύτερα κλίμακα και πηδάλιο ή τρυπάνι. Οι κάθετες δοκοί πίσω του ταυτίζονται με την ξυλεία (ίκρια, σταμίνες), τις οποίες διαμόρφωσε. Το ζήτημα δεν φαίνεται να απασχόλησε ιδιαιτέρως, τον πιστό στην σκωπτική κατεύθυνση αγγειογράφο του «καβειρικού» σκύφου (περί το 400 π.Χ.),[69] ο οποίος παρέστησε τη σχεδία με αντωπό ζεύγος οριζοντιωμένων αμφορέων (**εικ. 12**), δεδομένου ότι στην αρχαιότητα δημιουργούνταν πρόχειρες σχεδίες για μεταφορές σε μικρές αποστάσεις από άδειους, σφραγισμένους και δεμένους μεταξύ τους αμφορείς με επίστρωση δοκών στην άνω πλευρά του πλωτού αυτού συσσωματώματος.[70]

Με εξαίρεση το επεισόδιο της καταστροφής του στόλου στη χώρα των Λαιστρυγόνων τα πλοία στις παραστάσεις με τον Οδυσσέα είναι στοιχείο συμπληρωματικό. Χρησιμεύουν για την πληρέστερη τεκμηρίωση του προς ιστόρηση γεγονότος και την ευχερέστερη ταύτισή του. Δεν λείπουν και οι λίγες περιπτώσεις, κατά τις οποίες είτε δηλώνεται ένα μικρό τμήμα τους είτε παραλείπονται εντελώς. Γενικώς απηχούν το επίπεδο της ναυπηγικής τέχνης της εποχής του αντικειμένου, το οποίο διακοσμούν. Όντας όμως και τα ίδια κοσμήματα, δεν είναι δυνατόν να μαρτυρήσουν για την πληθώρα των χαμένων τεχνικών γνώσεων της αρχαιότητος. Μέχρι τους ελληνιστικούς χρόνους συναντώνται στην γραπτή επιφάνεια αγγείων. Κατά τη ρωμαϊκή εποχή εμφανίζονται σε πολλά διακοσμημένα αντικείμενα· κυριαρχούν όμως σε τοιχογραφίες με θαλασσινές πολιτείες (maritimas urbes) ή ναυμαχίες στην Καμπανία και τη Ρώμη[71] ή σε ψηφιδωτές θαλασσογραφίες. Κατά την ύστερη αρχαιότητα συμβολίζουν το πέρασμα στην επέκεινα ζωή, όταν ο ομηρικός χθόνιος χαρακτήρας των Σειρήνων αποκτά θρησκευτικό, εσχατολογικό περιεχόμενο στις ετρουσκικές τεφροδόχους και τις χριστιανικές σαρκοφάγους.[72] Τέλος, είναι αξιοσημείωτος ο ασυνήθης τρόπος κωπηλασίας ή η αναντιστοιχία ερετών-κωπών σε αρκετές από τις εν λόγω παραστάσεις. Η από τεχνική άποψη επιτυχής ερμηνεία αυτών των τελευταίων ζητημάτων θα διαφωτίσει σημαντικές πτυχές της αρχαίας ειρεσίας και, τελικώς, της ναυπηγικής.

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35 100 Λαμία

ΥΠΟΣΗΜΕΙΩΣΕΙΣ

1 Ο Οδυσσέας είναι ο μόνος αρχηγός αποστολής, ο οποίος φέρεται να μην περιέλαβε στα λάφυρά του άρματα, άλογα και αιχμάλωτες Τρωάδες. Για αυτό βλ. Gray, *Seewesen* 109. Για συνοπτική παρουσίαση των ραψωδιών της Οδύσσειας βλ. J. Griffin, *Homer. The Odyssey*, Νέα Υόρκη-New Rochelle-Μελβούρνη-Sydney 1987.

2 C. Phillipson-Lambrou, «The Reliability of Ship's Iconography: The Theran Miniature Marine Fresco as an Example», *ΤΡΟΠΙΣ* 4, 1996, 351-366 και κυρίως 360. Για τις διάφορες απόψεις αναφορικώς προς το βαθμό αξιοπιστίας των αρχαίων παραστάσεων πλοίων βλ. A.F. Tilley, «Rowing Astern-an Ancient Technique Revived», στο ίδιο 481-482.

3 Για τεχνικό σχολιασμό των σχετικών με σκάφη ομηρικών όρων βλ. *GOS* 44-65· Gray, *Seewesen* 92-109 καθώς και τα οικεία λήμματα στους A. Heubeck, S. West και J.B. Hainsworth, *A Commentary on Homer's Odyssey* 1, Οξφόρδη 1988· A. Heubeck και A. Hoekstra, *A Commentary on Homer's Odyssey* 2, Οξφόρδη 1989· K. Porozhanov, «Ships in Homer's Epic Works» στο *ΤΡΟΠΙΣ* 4,1996, 367-374 και στο λεξικό του Ch. Kurt, *Seemännische Fachausdrücke bei Homer,* Göttingen 1979. Για απεικόνιση των μερών των πλοίων ελληνικής και ρωμαϊκής περιόδου και τις αρχαίες ονομασίες τους βλ. O. Höckmann, *Antike Seefahrt*, Μόναχο 1985, 154-155 εικ. 134-135 και Viereck 1974, 42 σχ. 22-25. Για γλωσσάρια αρχαίων και σύγχρονων τεχνικών όρων βλ. εκείνα των *GOS,* Viereck, Greenhill (ό.κ. σημ. 67), Gardiner/Morrison 1995, *GROS*.

4 Ο W. Leaf, *The Iliad* 1, Λονδίνο 1886, 73 σημ. για στ. β' 637 όπως και η C. Torr, *Ancient Ships*, Σικάγο 1964, 37 σημ. 91 επικαλούνται και το χωρίο του Ηροδότου 3.58 «τὸ δὲ παλαιὸν πᾶσαι αἱ νῆες ἔσαν μιλτηλιφέες».

5 W. Helbig, *Das homerische Epos aus den Denkmälern erläutert*, Λειψία 1887, 158-160.

6 Στο ίδιο 158-159.

7 S. Wachsmann, «Bird-head Devices on Mediterranean ships»,*ΤΡΟΠΙΣ* 4, 1996, 542.

8 J.S. Morrison, «Two Men to an Oar in the Sixth Century B.C.?»,*ΤΡΟΠΙΣ* 4, 1996, 331.

9 Για τον εξοπλισμό τους βλ. κυρίως *GOS* 47-61 και Gray, *Seewesen* 98-106.

10 *GOS* 46-47. Ο όρος δεν παραδίδεται από την ομηρική ποίηση αλλά από μεταγενέστερες πηγές.

11 Gray, *Seewesen* 108-109.

12 François Salviat, «Le Bateau de Thésée, le vase François et les triacontoroi», *ΤΡΟΠΙΣ* 1, 1985, 238.

13 Porozhanov, ό.α. σημ. 3, 371-373. Ο K.A. Raaflaub, «Le Temps d'Ulysse» στο *L' Europe au temps d' Ulysse. Dieux et héros de l' âge du bronze*, 1999, 202, υποστηρίζει ότι η περιγραφομένη στα έπη κοινωνία πρέπει να τοποθετηθεί χρονολογικά στο τέλος του 9ου και στις αρχές του 8ου αι. π.Χ.

14 *GOS* 35 Geom. 38· *MIMA* 175, 177 αρ. 370. Γενικώς για την εικονογραφία σε γεωμετρικά -κυρίως αττικά- αγγεία βλ. Gray, *Seewesen* 21-25, 57-61· *MIMA* 155-201. Για το πρόβλημα της απόδοσης ή μη δικρότων πλοίων βλ. και M. Wedde, «Rethinking Greek Geometric Art: Consequences for the Ship Representations»,*ΤΡΟΠΙΣ* 4, 1996, κυρίως 580-582.

15 Touchefeu-Meynier 1968, 145-146 αρ. 244, πίν. XXIII,1.

16 Brommer, *Odysseus* 90-91 εικ. 43-44· Andreae, *Odysseus* 29 εικ. 10 (μαρμάρινος κορμός), 212 (Contorniati).

17 P.H.v. Blanckenhagen και Ch. Alexander, «The Paintings from Boscotrecase», *RM:* Erg. 6, 1962, 39 πίν. 40, 43; Ling, ό.κ. σημ. 56, 114, 115 εικ. 115.

18 Για κατάλογο των παραστάσεων βλ. στα οικεία κεφάλαια των Müller, *Odysseeillustrationen*· Touchefeu-Meynier 1968· Brommer, *Odysseus*· D. Buitron και άλλοι, *The Odyssey and the Ancient Art*, Νέα Υόρκη 1992· Andreae, *Odysseus.*

19 *GOS* Arch. 39 πίν. 12b· Touchefeu-Meynier 1968, 146-147 πίν. XXIII 2· *MIMA* 237-238 εικ. 497; Brommer, *Odysseus* 84 εικ. 40.

20 *MIMA* 202-264.

21 Ο J. Oakley, «An Attic Black-Figure Eye-cup with Ships Around the Interior», *AA* 1994, 20 σημ. 63 σημειώνει τη δυσκολία αναγνώρισης της τάξης των πλοίων στα αττικά αγγεία λόγω ακριβώς της διακύμανσης στον αριθμό των κωπών.

22 Πολυδεύκους, *'Ονομαστικόν* Α 93: 'Αποβάθρα καὶ διαβάθρα, ἣν σκάλαν καλοῦσιν.

23 *MIMA* 238.

24 J.R.T. Rolland, «The Boston Siren Aryballos», *AJA* 53,1949, 357-359.

25 O. Höckman, «Some Thoughts on the Greek Pentekonter», *ΤΡΟΠΙΣ* 3, 1995, 209.

26 Touchefeu-Meynier 1968, 148 αρ. 247 πίν. XXIII 3-4.

27 Ίσως όμως πρόκειται για μη ελληνικό -ίσως ετρουσκικό ή/και ιλλυρικό- τρόπο κωπηλασίας, αφού οι κωπηλάτες και δύο πολεμικών πλοίων σε πυξίδα από το Cerveteri (βλ. Behn, ό.κ. σημ. 38, 13 εικ. 14) και λιβυρνίδων (Höckmann, ό.κ. σημ. 42, 197, 198 εικ. 3 αρ. 3-4, 199 εικ. 4, 206) βλέπουν προς την πλώρη. Είρεσίη (ομηρ. κωπηλασία) με τους κωπηλάτες στραμμένους προς την πλώρη ελληνικών πλοίων έχει θεωρηθεί ιδεώδης για περιπτώσεις, κατά τις οποίες απαιτείται ευχερής προώθηση του σκάφους προς την πλευρά της πρύμνης (π.χ. προσάραξη). Συμφώνως προς τη θεωρία του Tilley (ό.α. σημ. 2, 482-487 και στο *IJNA* 21, 1992, 55-60 αλλά και στο ό.κ. σημ. 32, 16-18) η κατά 180° στροφή κάθε κωπηλάτη και η χρησιμοποίηση, αντί του δικού του κουπιού, εκείνου του διπλανού συναδέλφου του προς την πλευρά της πλώρης, είχε ως αποτέλεσμα ένα κουπί χωρίς κωπηλάτη στην πρύμνη και ένα κωπηλάτη χωρίς κουπί στην πλώρη. Η κατάσταση αυτή αποτυπώνεται σε ένα ψηφιδωτό δάπεδο από την Πορτογαλία του προχωρημένου 3ου αι. μ.Χ., το οποίο παρουσιάζει τον Οδυσσέα δεμένο στο κατάρτι και τέσσερεις από τους πέντε συντρόφους του να κωπηλατούν στραμμένοι προς την πλώρη, ενώ ο ευρισκόμενος εμπρός τους παρατηρεί άπρακτος, ίσως αναμένοντας -κατά τον Tilley- να ποντίσει την άγκυρα. Δεν απεικονίζεται όμως ανενεργό κουπί. Στην αρχαϊκή σκηνή όμως πλεονάζουν κατά ένα τα κουπιά (5) σε σχέση με τους κωπηλάτες, ενώ κατά τη θεωρία όφειλε να συμβαίνει ακριβώς το αντίθετο. Το θέμα παραμένει ανοικτό, αφού αποδίδεται στο αγγείο μόνον το πρωραίο ήμισύ του.

28 Höckmann, ό.α. σημ. 25, 207-208.

29 Brommer, *Odysseus* 84 πίν. 33b, 34· Höckmann, ό.α. σημ. 25, 209-211· Andreae, *Odysseus* 294 εικ. 117.

30 *GOS* 114 Arch. 94 πίν. 21e· Touchefeu-Meynier 1968 149-50 αρ. 249 πίν. XXIV 3· *MIMA* 270-271 εικ. 574· Höckmann ό.α. σημ. 25, 209-211, εικ. 1· Andreae, *Odysseus* 295 εικ. 118.

31 A.F. Tilley, «The Ship of Odysseus», *Antiquity* 44 (1970) 100-104.

32 A.F. Tilley, «Warships of the Ancient Mediterranean: New Theories on Rowing Systems and Techniques», στο M. Bound (εκδ.), *The Archaeology of Ships of War, International Conference held at Greenwich, London 31 October -1 November 1992, The International Maritime Archaeology Series* 1, 1995, 13-14. Συμφώνως προς την θεωρία αυτή η σε δύο επίπεδα και λοξή εικονογραφική απόδοση των τρητών -όπως και στην οινοχόη (ό.α. σημ. 29)- συνιστά ένδειξη τέτοιας διευθέτησης των ερετών.

33 Οι Gray,*Seewesen* 64 και Basch, *MIMA* 271 σημειώνουν πιθανή τάση για σύνδεση των μονήρων με μυθικές προσωπικότητες και πλοία. Ελάχιστες είναι οι σωζόμενες παραστάσεις τριήρων γενικότερα, βλ. *GOS* 169-179. Βλ. όμως και την υπόθεση του Tilley (ό.α. σημ. 32, 15), ότι δηλ. πλοία με τρητούς σε δύο επίπεδα απεικονίζουν τριήρεις.

34 Touchefeu-Meynier 1968 152-154 αρ. 252-257 πίν. XXV 2· Brommer, *Odysseus* 86 εικ. 41· Andreae, *Odysseus* 297 εικ. 120.

35 Δεν είναι σαφές εάν οι μορφές υψώνουν ή υποστέλλουν τον ιστό ή εάν απλώς προσπαθούν να τον απομακρύνουν, επειδή πέφτει. Φαίνεται πάντως λιγότερο πιθανόν να αναγνωρισθεί στο συγκεκριμένο πλοίο εκείνο των Φαιάκων, όπως προτείνει ο R. Pagenstecher, *Die calenische Reliefkeramik JdI:* Erg. 8, 1909, 82.

36 Viereck 1974, 36, 286 εικ. 17· ο Basch, *MIMA* 437-38 εικ. 951και 953 ταυτίζει τις πυκνά διατεταγμένες οπές εξόδου των κουπιών με τα columbaria των πηγών και διακρίνει τρία έγκωπα άν όχι τρεις παρεξειρεσίες· *GROS* 217-18 εικ. 18 ΙΙ διερωτάται μήπως πρόκειται για πεντήρη, επειδή άλλες παραστάσεις τριήρων σε μνημεία ρωμαϊκών χρόνων ακολουθούν τον ελληνικό τύπο, με παρεξειρεσία για τους θρανίτες.

37 Στυλίδες αναφέρονται μόνον για τα ελληνικά και όχι για τα ρωμαϊκά πλοία. Βλ. *GROS* 237 αρ. 36.

38 F. Behn, «Die Schiffe der Etrusker», *RM* 34, 1919, 1-16.

39 E. Brunn, I rilievi delle urne etrusche I: Ciclo troico, Ρώμη 1870, 121-23 πίν. XC-XCIV (Σειρήνες) και 115-16 πίν. LXXXVII 3, 4 (Πολύφημος)· Touchefeu-Meynier 1968, 171-75 αρ. 318-336 πίν. XXX 1; B. Candida, «Ulisse e le Sirene. Contributo alla definizione di quattro office volterrane», *Atti della Accademia nazionale dei Lincei: Rendiconti* σ.8, αρ. 26, 1971, 201-203, 225-233 πίν. I-IV· M. Sannibale, *Le urne cinerarie di età ellenistica*, Ρώμη 1994, 68-70 εικ. 15. Ο ίδιος τύπος εμφανίζεται και στις σκηνές του Φιλοκτήτη στη Λήμνο και της απαγωγής της Ελένης από τον Πάρι· Andreae, Odysseus 30, 298-299 εικ. 121-123.

40 *MIMA* 407, 410 εικ. 874.

41 H.B. Walters, *Catalogue of the Greek, Roman and Etruscan Bronzes*, Λονδίνο 1899, 162 αρ. 882 πίν. XXV· Müller, *Odyssee-Illustrationen* 122-23· Brommer, *Odysseus* 90· Andreae, *Odysseus* 32, 309.

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44 Viereck 1974, 56; Gardiner/Morrison 1995, 88.

45 Oakley, ό.α. σημ. 21, 20.

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48 Touchefeu-Meynier 1968, 167 αρ. 298 πίν. XXVIII 4; C. Poinssot, «Quelques remarques sur les mosaïques de la maison de Dionysos et d'Ulysse à Thugga (Tunisie)», στο *Colloques Internationaux du Centre National de la recherche scientifique. La mosaique gréco-romaine, Paris, 29 Août-3 Septembre 1963* [Παρίσι 1965] 223 εικ. 13.

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ΕΙΚΟΝΕΣ

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2. Η διάβαση του πλοίου του Οδυσσέα από τον βράχο των Σειρήνων σε οινοχόη, π. 520 π.Χ. (από Touchefeu-Meynier 1968, πίν. XXIII 3-4).
3. Η διάβαση του πλοίου του Οδυσσέα από τον βράχο των Σειρήνων σε οινοχόη, τέλος 6ου αι. π.Χ. (από Brommer, *Odysseus* 84 πίν. 34).
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7. Η διάβαση του πλοίου του Οδυσσέα από την περιοχή των Σειρήνων σε ψηφιδωτό δάπεδο στην Dugga/Τυνησία, 2ος-3ος αι. μ.Χ. (από Gardiner/Morrison 1995, εικ. σελ. 88).
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9. Η καταστροφή των πλοίων των συντρόφων του Οδυσσέα στην χώρα των Λαιστρυγόνων σε τοιχογραφία της Ρώμης, β' μισό 1ου αι. π.Χ. (από Biering, *Die Odysseefresken vom Esquilini*, 1995).
10. Η πρύμνη της ναυαρχίδος του Οδυσσέα με τον κυβερνήτη προσκολλημένο στη βάση του αφλάστου σε γλυπτό του σπηλαίου Sperlonga, 1ος αι. π.Χ-1ος αι.μ.Χ. (από Felbermeyer, *Archaeology* 24, 1971, 137).
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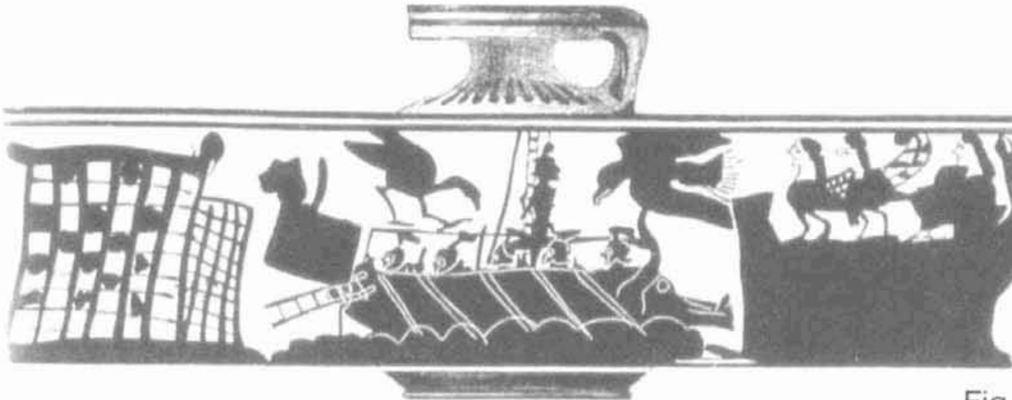

Fig. 1

Fig. 2

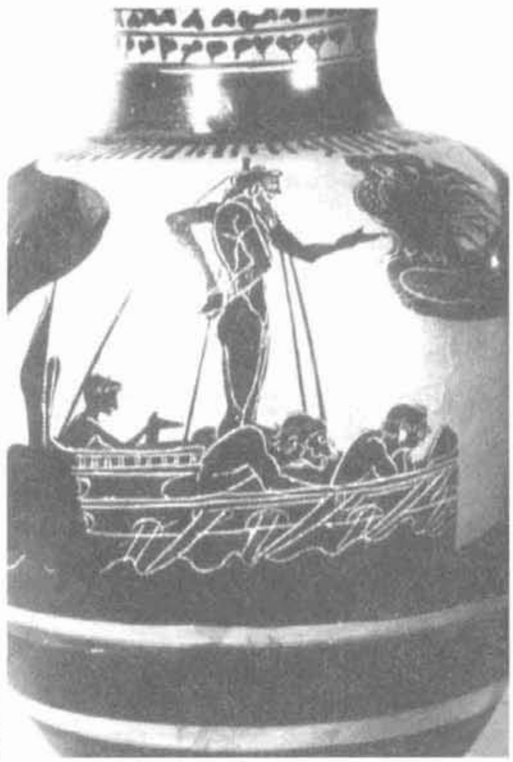

Fig. 3

Fig. 4

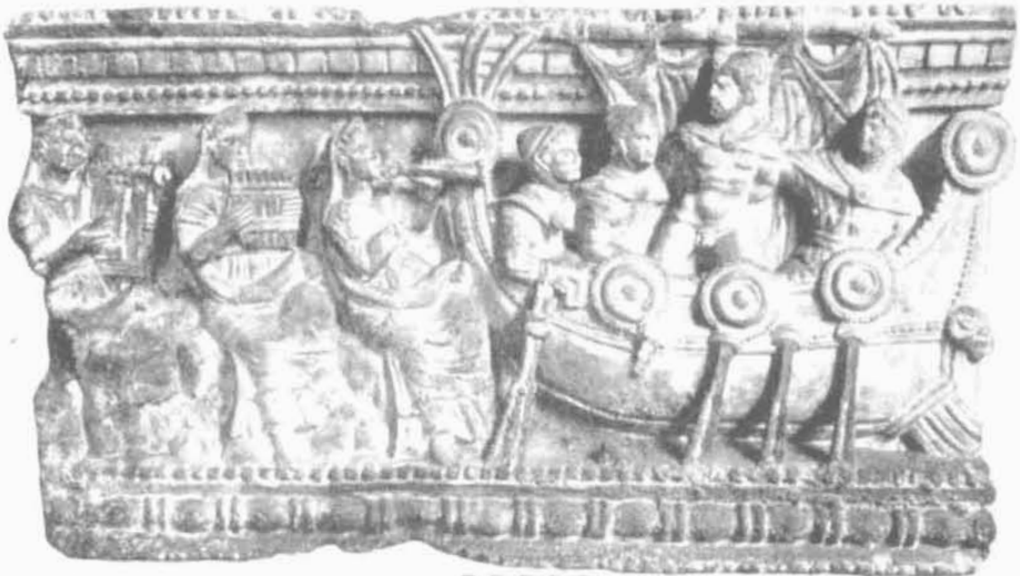

Fig. 5

Fig. 6

Fig. 8

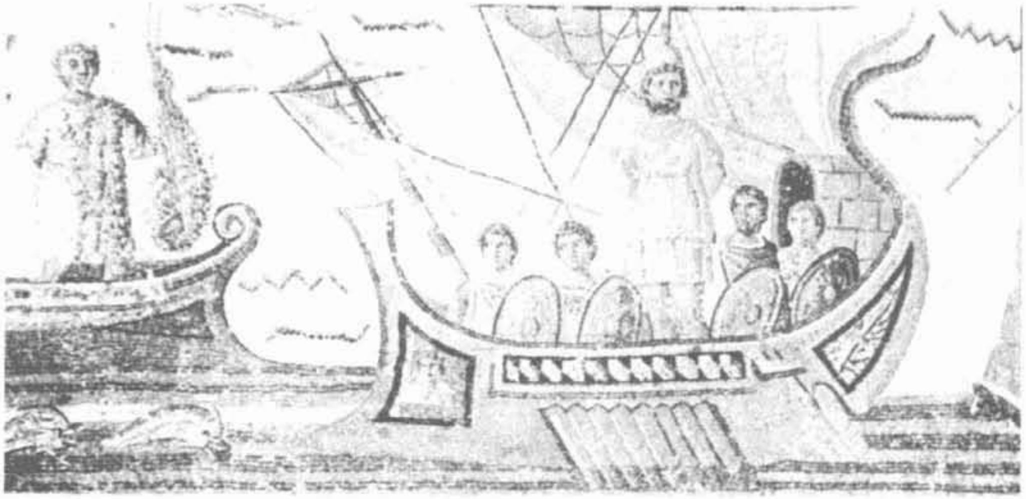
Fig. 7


Fig. 9


Fig. 11


Fig. 10

Fig. 12

HEROD'S CONCRETE BARGES AT CAESAREA MARITIMA: AN UPDATE ON THE RESEARCH CARRIED OUT IN AREA K

Since 1990 Avner Raban of the University of Haifa has directed the study of the unique concrete filled caissons found at the end of the main southern breakwater of the Herodian harbour of Caesarea in Israel (Fig. 1). The extraordinary state of preservation of the concrete and its original formwork has enabled Raban and the author to reconstruct the caissons on paper with a reasonably high level of accuracy (Fig. 2 & 3)[1]. Since 1999 the research has taken on another dimension. Following on from the study of the formwork a parallel and expanding study is looking at the concrete itself.

It has long been recognised that Roman marine engineers were the first to develop hydraulic concrete in the construction of harbours. This happened in the latter part of the 2nd Century BC probably in the vicinity of Puteoli, modern day Pozzuoli[2]. It appears that initially only re-active sands (pozzolana) from the Naples area were used, which is confirmed in Vitruvius' writings (30-20BC)[3]. Later other volcanic sources were used and even crushed pottery.

If, as expected, the source of the pozzolana in the concrete in Area K and other areas of Caesarea's harbour can be shown to have come from the vicinity of Vesuvius as did the raw material for the concrete in Area G (Fig. 1), it would have represented an incredible logistical achievement for the Roman builders[4]. The proportions of the different ingredients lime, sand, pozzolana, and aggregate used in the concretes can be determined by analysing samples. If assumptions are made based on the mix described by Vitruvius and on estimates to the extent of the concrete in the harbour moles at Caesarea, then the volume of pozzolana used can be calculated[3]. There are large concentrations of pozzolanic concrete in areas K, G and U. These sites have been described by Raban as being the remains of "construction islands" and were used as bases from which the breakwaters were extended[5]. The extensions were a combination of rubble, sand infill and double lines of segmented, staggered concrete blocks or pilae. The total volume of concrete used was in excess of 30,000 m^3, which required approximately 13,000 m^3 of pozzolana when allowances are made for wastage, and probably much more if the overlaying structures are included[6]. Shipping this amount of material across the Mediterranean needed extraordinary logistical management and a massive investment in ships.

There is no documentary or archaeological evidence to suggest how this was achieved. It has been suggested that the large freighter wrecked in Area Y at Caesarea, just to the north of the Herodian harbour, was one of the ships bringing in construction material[7]. Is the lack of any archaeological evidence because the pozzolana was either washed away during the wrecking or that it was simply mistaken for silts that filled the ship after its demise? Hohlfelder suggests that grain ships were used on the return leg from Rome; firstly, he argues that they had the capacity, but also Aggripa may have had an interest in the project[8]. Whether the North African grain ships were used or other large freighters, the practical issues involved in transporting this material by sea would be worthy of a study in themselves.

In 1994 samples were taken from the concrete remains in Area K. These blocks were formed within single mission barges or caissons and laid out in a line at the end of the southern breakwater[9]. The first samples taken from this site were simply lumps knocked off the surface with a hammer and chisel. When analysed they did, however, reveal that the structure was formed in layers of differing types of concrete. A non-hydraulic lime mortar and aggregate mix was sandwiched in-between hydraulic pozzolanic rich layers. The fact that the structure contained non-hydraulic material and the presence of un-hydrated lime with cracks radiating from hydrated particles indicates that the material was not placed under water. This suggests that the caissons were dry, and always maintained a freeboard whilst they were being filled[10]. In order to establish the boundaries of the layers with more accuracy and to measure the aggregate spacing a different method of sampling was required. In 1999, with the assistance of the University of Tel Aviv, core samples were taken[11]. The equipment comprised a diamond tipped 50mm diameter, 1m long barrel fitted to an air drill as well as to a pneumatic hammer. The combination of the rotary drill and hammer enabled the barrel to be driven into the hard layers of concrete and aggregate as well as the very soft lime mortar. The use of a compressed air tool was not ideal for this application and, in future, samples will be taken with a hydraulically powered system. This would not suffer the power loss that air systems experience whilst working under water. In addition, a water jet would be fitted onto the barrel jet to flush over the diamond bit and prevent it clogging with a paste from the concrete residue. However, seven samples were successfully taken and analysed by the University of St Andrews in Scotland. These samples were from the outer layer, Core A and inner material, Core B. The inner mass of the middle layer had the consistency of a gravely clay with lumps of limestone and kurkar aggregate. The outer layers, however, had a much harder and consistent matrix. Two types of analytical study were applied to the samples: X-Ray Diffraction (XRD) and Electron Probe Analysis. Core B samples contained a dominance of quartz and calcite material with small amounts of feldspar, clay, aragonite (possibly derived from shell fragments) and Zeolite. This contrasted with the results from the outer layer, Core A. This core contained a significant amount of Zeolite (probably of volcanic origin) together with Sanidine in a dark matrix consisting of the Zeolites Analcime and Philipsite. Some clay (illite) was also present[12]. The distinct chemical differences between the cores correlated with marked difference in appearance and texture. These tests and analyses confirmed earlier studies that concluded that the concrete blocks in Area K were a mixture of hydraulic and non-hydraulic concretes. However, in order to trace the pumice/pozzolana back to its source, further analysis is necessary. Although the concentration of the main elements of pumice is largely similar regardless of their source, minor and trace elements will vary[4]. The trace elements could be accurately measured by inductively coupled plasma emission spectroscopy or, alternatively the signature of the individual site could be recognised with an isotopic analysis[13]. In this way, a fingerprint database of the volcanic aggregates and sands can be established as a means of determining the source of the pozzolana used.

The methodology developed at Area K for sampling and analysing the concrete will be used in a study of Roman harbour concrete. The study will look at sites across the whole Roman Mediterranean basin from Spain in the west to Israel in the east. It will, hopefully, be multi-national, involving those few specialists who are involved in the study of Roman harbour structures and their engineering. The project will allow us to understand how extensive was the use of pozzolana exported from the Bay of Naples and when alternative sources were substituted. It will cover the whole range of aspects related to the construction of concrete quays, breakwaters and moles. The study will be wide ranging but specifically address the following at each site;

- Why concrete structures were used in preference to other forms of construction
- The methods chosen for forming the concrete
- Details and proportions of the mix [sand/lime/pozzolana (or other reactive material), and coarse aggregate]
- Sources of the mix material (a data-base of source materials will be established)
- How did the designs change across regions and over time?

In 1998 a survey of Area K was commenced with the intent to measure and locate the disposition of the overlaying kurkar blocks and relate them to the concrete remains[14]. This would then prehaps allow proposals for the causes and chronology of the harbour mole's collapse to be made. In 1990 an initial survey was carried out to establish the overall massing of the site, however, the results were inconclusive.

Due to the extremely chaotic nature of the site and often-poor visibility and surge conventional survey methods were inefficient. A trial photographic survey was carried out using "PhotoModeler" software that could manipulate images to construct a three-dimensional computer model[15]. It had previously been used underwater by Nick Strange, and the Nautical Archaeology Society, on the "Mary Tavy" shipwreck in Plymouth Sound[16]. To accurately establish the framework for the images and to produce identifiable points on the amorphous masses, over 300 numbered 10cm diameter yellow plastic discs were fixed to the corners of the concrete and kurkar blocks and 20 datum points were arrayed across the site. Nick Rule's direct survey method, "Web"[17], was used to locate the points in three dimensions. Area K is approximately 40m long (north to south) and 20m wide (east to west) and varies in depth from 1.5m to 10m. Over one thousand direct measurements were taken by volunteers during a two-week period. Each block was individually filmed on video and still images were "captured" and fed into the PhotoModeler programme. The intent was to generate a three dimensional image of each block that could be hung onto the web generated model of the site. Difficulties arose in trying to identify common points or features from one image to another and sometimes this proved impossible. It was concluded that more reference points were needed to allow this technique to work. One method that may prove to be feasible is to drape a weighted net over each block during filming. The net would then be moved from block to block in turn. It is hoped that over the course of the next few seasons another attempt will be made to complete a PhotoModeler survey over this type of terrain. There are, of course, alternative methods available for surveying these structures. These range from measuring each element and feature individually by "hand, eye and tape-measure" (found to be almost impossible to use on this type of terrain) to very high resolution swath bathemetry sonar systems, or even the "SHARPS" (Sonic High Accuracy Ranging and Positioning System) as used on the Dokos project[18]. Area K is an ideal testing site for shallow water three-dimensional mapping. Once an accurate remote sensing co-ordinated survey system is affordable and readily available on the open market (systems are currently available to the Military and Oil and Gas Exploration companies) then studies of numerous harbour sites around the Mediterranean could be carried out. The importance of recording these sites cannot be over emphasised. So many harbour remains have already been lost to coastal development; time is not on our side[19].

During the 1998 and 1999 seasons Avner Raban conducted a study of the so-called "towers" at the northern end of Area K, the terminus of the main southern breakwater. These structures fit very conveniently with Josephus's description of the towers at the entrance to the Herodian harbour[20]. Until now there has been no question that they were indeed the bases of the towers as described by Josephus. It is now apparent that these structures have been severely dislodged. The east "tower" has been rotated by almost 90° in the vertical plane and its original position cannot be imagined.

Area K is only a very small portion, less than 1.5%, of the drowned ancient harbour of Caesarea Maritima, yet studies have continued there almost continually since 1990 and still it adds to our knowledge of Roman engineering and harbour design.

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11 Dr. Ma'oz Fine, University of Tel Aviv, provided invaluable assistance not only in allowing us to use his equipment, but also providing practical experience in coring underwater.

12 C. Richard Bates of the University of St. Andrews analysed two of the samples and my thanks goes to Martin Bates of the University of Wales who arranged for the work to be carried out.

13 J. Ingham, Technotrade, Harpenden, UK., personal communication.

14 *Kurkar,* the local building stone, is a relatively soft and porous carbonate-cemented quartz eolianite sandstone (see Oleson and Branton 1992: 58-63).

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ILLUSTRATIONS

1. Site plan of Caesarea Maritima in Israel.
2. North east corner of the well preserved caisson K5.
3. Reconstruction of a K type caisson.

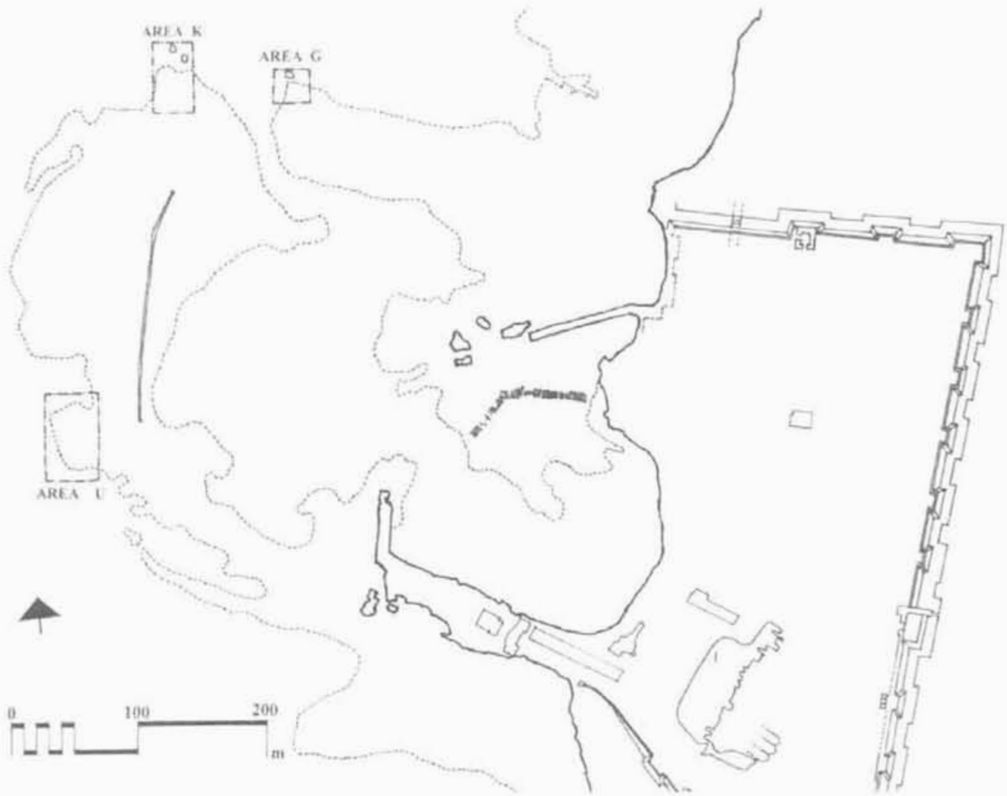

Fig. 1

Fig. 2

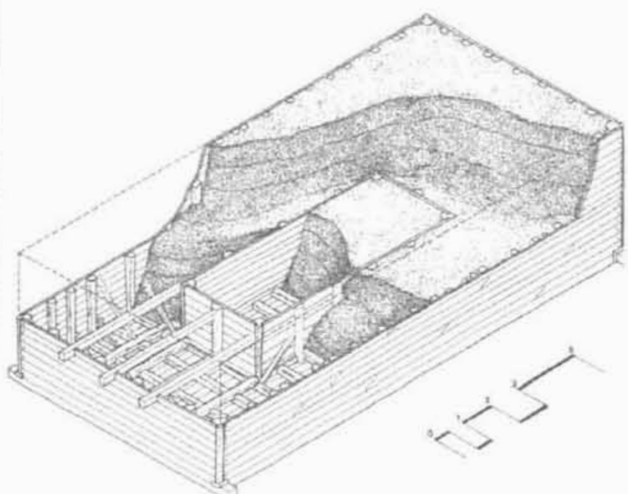

Fig. 3

THE PATRON DEITIES OF CANAANITE AND PHOENICIAN SEAFARERS

Because of the uncertainties and dangers faced at sea, mariners have always turned to patron gods and goddesses to help them safely through a voyage. The waters of the sea itself and voyaging into the unknown posed the largest threats and created the greatest fears for sailors; therefore it was critical to the seafarer to be protected from the depths and its guardian spirits and to seek divine guidance in navigation. The tutelary, or guardian deities of the mariner, as well as the physical presence of the ship, guarded him from the uncertainties of the water and allowed for safe steerage.

Classical and modern traditional sailors typically turn to two types of deities for protection: storm gods who controlled the winds which could benefit or devastate a voyage; and gods whose attributes could influence successful navigation.[1] Similar types of deities were the main guardians of Canaanite and Phoenician mariners.[2]

STORM GODS

The god of primary importance to Canaanite and Phoenician seafarers was the storm god, Baal-Haddu, usually referred to simply as Baal.[3] On land Baal-Haddu brought storms necessary for growing crops in regions dependant on rain, and it was Baal who controlled the winds which could either help or hinder a ship at sea.[4] This threat posed to vessels at sea is portrayed vividly in a treaty between Esarhaddon, the ruler of Assyria, and Baal, the king of Tyre, which dates to the seventh century B. C. E.[5]

The Esarhaddon/Baal of Tyre treaty confirms Assyrian hegemony over Phoenicia and aspects of Phoenician commerce, especially maritime trade in the eastern Mediterranean. Curses against breaking the treaty invoke punishment from different deities, including three Phoenician storm gods (Rev.IV.10'-13'): Baal Shamem, Baal Malage, and Baal Zaphon are called upon to wreck the Tyrian fleet if the king breaks his vow to his Assyrian overlord. The three gods would destroy the ships by causing an "evil wind" to rise up against them and damage the boats, and this wind would churn up a "strong wave," a "violent tide," which would sink the Tyrian vessels.

BAAL SHAMEM AND BAAL MALAGE

The Esarhaddon/Baal of Tyre treaty is our only evidence linking Baal Shamem with marine storms or ships. Baal Shamem continues to function as a storm god in the Phoenician pantheon, but we have no other examples of his specific connection to the welfare of mariners.[6]

Baal Malage's only mention is in the Assyrian vassal treaty, so we know very little about this form of the storm god. Several studies have tried to reveal more about this god by looking at the etymology of his name, with special attention paid to the nautical sense of his power and his importance to sailors[7] These investigations of the word "malage" present ingenious methods for trying to learn more about the nature of the god, yet all have their shortcomings. Until we have further data relating to Baal Malage, it is safest merely to posit that he is one of the numerous aspects or forms of the Phoenician storm god, clearly important to seafarers because of his potential to damage ships.

BAAL ZAPHON

Unlike Baal Shamem or Baal Malage, there is evidence outside of the Esarhaddon/Baal of Tyre treaty which links Baal Zaphon with specialized maritime worship. This evidence demonstrates that Baal Zaphon was a patron deities of Canaanite sailors.

The home of the storm god, Baal Zaphon, was on the mountain from which he took his name, Mt. Zaphon.[8] Mt. Zaphon, identified with modern Jebel el-Aqra, is located forty km. north of Ras Shamra (ancient Ugarit) on the Syrian coast, and rises over 1700 m. in height. Given its proximity to the coast and height, Mt. Zaphon is visible from a great distance out to sea and was likely utilized as a navigational aid for ships coming into or leaving Ugarit's port at Minet el-Beida.[9]

At the site of Ugarit, Canaanite sailors were dedicating stone anchors as votive offerings at one of the two temples on the acropolis of the Late Bronze Age city.[10] Though we have no textual references to add further detail to this cultic practice, the clustering of these anchors around one temple and their complete absence from the second, neighboring temple shows a specific preference of sailors in their maritime rituals.[11] The temple with the anchor votives also contained a stela which is inscribed with a dedication to Baal Zaphon, demonstrating that the storm god was worshipped in this monumental structure which has been identified as the Temple of Baal at Ugarit.[12] The presence of both a stela offered to Baal Zaphon and dedicatory anchors in the same temple suggests another sacral link between the storm god and Canaanite mariners.

No other maritime votives were uncovered in this Temple of Baal at Ugarit. There is contemporary textual evidence, however, which shows that Mt. Zaphon and Baal Zaphon were represented, and likely worshipped, in the form of a ship. This is not an uncommon phenomenon among traditional seafaring societies, given the general belief that a vessel is imbued with the spirit of a divine guardian; therefore the ship itself, or a representation of the ship, becomes a symbol of its protective deity.[13]

In the Ugaritic epic poem of Kirta we find evidence that Mt. Zaphon is compared to a "ship" (Ugaritic *any*). The setting in the epic is a dirge sung by mourning women lamenting the death of king Kirta. They sing out to the deified Mt. Zaphon:

> Baal's mountain weeps for you father,
> Zaphon the holy fortification,
> The ship, the mighty fortification,
> The fortification wide of span.[14]

The last three lines of the lament form a tricolon with repetitive parallelism describing Mt. Zaphon as a fortification, substituting the image of a ship for that of the mountain in the third line.

Baal Zaphon, like his deified mountain, is described with the same West Semitic term *'any*, "ship", in an Egyptian text. Papyrus Sallier IV, whose thirteenth century B. C. E. date is only slightly later than the Ugaritic corpus, lists a triad of Canaanite deities: "to Baalat, to Qudshu, to the ship of Baal Zaphon."[15] The identification of the Egyptian word *'i-na-yat* with West Semitic *'any,* "ship", was first put forth by Albright but has gained acceptance among some Egyptologists.[16] This seems reasonable given the storm god's demonstrated importance to the safety of ships and mariners.

On the way from the Egyptian delta to southern Canaan is a harbor site called *Baal Zaphon,* known to us by its West Semitic name only from sources from the Hebrew Bible.[17] The fact that a port was named after Baal Zaphon is not surprising given the practice of classical sailors to dedicate havens to their patron divinities.[18] Thus this may be taken as further evidence that Baal Zaphon was a guardian of Canaanite seafarers.

Given the amalgamation of maritime evidence, E. Porada has interpreted the depiction of the weather god on a Canaanite cylinder seal from Tell el-Dab'a in the Nile delta as a representation of Baal Zaphon.[19] The seal, found in a Middle Bronze Age level at the site, depicts the storm god striding across two mountains, with typical helmet, curled hair, and weapons in each hand [fig. 1]. A bull, a companion animal of the storm god, is depicted behind the deity while a snake and lion are in the register below. In front of the god and animals is a boat, which Porada views as under the protection of the striding deity; thus she tentatively identifies him as Baal Zaphon.[20] I agree with Porada's identification of Baal Zaphon, but believe he is not the only patron deity shown on the seal. The serpent and lion are companion animals of another divinity who is a guardian of sailors, which I shall discuss in greater detail below.

The Hellenized equivalent to Baal Zaphon, Zeus Kasios, is known to be a patron god of sailors. Kasios is honored for saving a merchant from a storm with an offering of a stone carving of the ship which the god protected.[21] Further evidence is found on anchor stocks which were inscribed with Kasios's name in order to insure the god's protection when the anchors were dropped during a storm.[22]

In connection with Baal Zaphon's importance to mariners, the Ugaritic mythic cycle which describes Baal-Haddu's struggle with the god of the deified waters, Yamm, must be mentioned.[23] The text never refers to the storm god specifically as Baal Zaphon, but does relate that Baal-Haddu is given permission to build his palace on Mt. Zaphon, and thus is clearly the local god referred to elsewhere in the texts at Ugarit as Baal Zaphon.[24] We have no direct evidence of the myth's relevance to seafarers. However, it must be reiterated that sailors fear the water and praise those deities who protect them from the harm of the sea. Thus Baal-Haddu's defeat of Yamm, whose name literally means "Sea" in Ugaritic, may have been an inspiring tale for Canaanite sailors who sought protection and divine intervention from their storm god against the constant dangers of the waters of the Mediterranean sea.

LIBYAN AMMON

Besides the three forms of the storm god described in the Esarhaddon/Baal of Tyre treaty, we have further examples that the storm god was important to Phoenician sailors. From a Roman text detailing the Punic wars, comes evidence that Libyan Ammon was the tutelary deity of a Carthaginian warship.[25] Ammon is specifically called the "deity of the vessel" (Latin *numen carinae*), and a statue of the god was placed at the stern of the ship. A Punic warrior prays to this statue for help during a battle with the Romans, and with the impending destruction of the ship, her navigator sacrifices himself to the god.[26] Making a vow to Ammon, the pilot stabs himself, collects blood in his own hands, and pours it over the head of the statue of the god.

Which Phoenician god was equated with Libyan Ammon? Earlier in

Silius's account, a Carthaginian sets sail for Libya to consult the oracles of Ammon, but in the scene of his return the same god is called by his Latin name, *Iovis,* the thunder god.[27] Later the god's ability to control all the elements of the storm is vividly described, under Jove's epithet Jupiter, *Iuppiter*:

> Jupiter . . . stirred up all his armory—winds and clouds and angry hail, thunder and lightning and black rain storms. A deluge of rain came down, mingled with pitchy hurricanes and black storms.[28]

Thus Libyan Ammon, a patron of Carthaginian warships, is clearly one of the forms of the Phoenician storm god. He should not be confused with Baal Hamon, the patriarchal deity of Carthage, who is identified with *Saturnus* in Latin.[29]

BAAL ROSH

A final aspect of the Phoenician storm god must be discussed, though we have no specific evidence connecting him to specialized religious beliefs or practices of seafarers. This is the "Lord of the promontory", or Baal Rosh.[30]

Despite diverse attestations, almost nothing is known about the nature of the god. From the Annals of the Assyrian king Shalmaneser III we know that a mountain, or promontory, near Tyre was named after Baal Rosh.[31] This same geographical location near Tyre is called "the sacred promontory" in several Egyptian lists from the New Kingdom.[32] Other sources mentioning Baal Rosh, a Punic grave stela from the Tunisian coast, a Greek inscription on an altar from nearby Byblos, and a passage from the Jerusalem Talmud, show that the deity's presence was not limited to the environs of Tyre, but they reveal little of the god's function or the nature of his cult.[33] It must be noted, however, that promontory gods were of special importance to Greek seafarers, who venerated their patron deities by erecting shrines and temples in port or on the gods' sacred headlands.[34]

Canaanite and Phoenician sailors had similar practices, demonstrated by the anchors dedicated to Baal Zaphon in his temple at Ugarit and by the building of a temple on a promontory for the Phoenician "Poseidon," but we do not have the evidence connecting any coastal sanctuaries to Baal Rosh.[35] However, the fact that Canaanites and Phoenicians held the cape near Tyre as sacred, shown by its appellation "the sacred promontory," is reason enough to conjecture that the "lord of the promontory" was a protector of those who sailed within sight of his headland. This promontory could have served as a landmark and navigational reference, much like Mt. Zaphon farther to the north.

MARINE DEITIES

Two marine deities of the Phoenicians shall be discussed in light of their patronage of seafarers. It must be noted that these two deities, "Poseidon" and the god riding on a winged seahorse, have marine affiliations which aided sailors, but are not to be taken as late manifestations of the deified sea, Yamm.[36]

"Poseidon"

It is clear from a number of sources that "Poseidon" was worshiped by the Phoenicians, although we are not sure of his Semitic identity.[37] I place "Poseidon" in quotation marks as it is only preserved already translated into Greek from the equivalent Phoenician god's name; we cannot be certain which deity from the Phoenician pantheon the classical authors identified with their god who lived in the sea, and controlled earthquakes and marine winds.[38] Aegean mariners worshipped and feared Greek Poseidon, and the Phoenician "Poseidon" was venerated by Semitic seafarers, as is suggested by the following evidence.[39]

A temple dedicated to "Poseidon" was built on a promontory by the sea at the orders of Hanno, the captain of a Punic fleet sent out to colonize the northwest coast of Africa in the fifth-fourth century B. C. E.[40] The construction of this temple was likely a votive act to appease "Poseidon," perhaps to guarantee the protection of the voyage, and suggests that the deity was a guardian of Phoenician sailors. A later Punic periplus, recorded by Pseudo-Scylax, relates that this same cape had an altar consecrated to "Poseidon," which demonstrates the continuity of sacral concern of Punic mariners for the promontory and the deity.[41]

Evidence related by Diodorus further suggests that "Poseidon" was a guardian of Carthage's navy.[42] A large sacrifice as prepared for "Poseidon" by Hamilcar, the Carthaginian commander, while his fleet of ships was docked in the harbor at Palermo, Sicily. The text does not clarify if this offering was in thanks to the god for protecting the Punic vessels in their voyage from Carthage to Sicily, or was performed to ask "Poseidon" to protect his men in the upcoming battle with the Greeks, or perhaps both. The rites Hamilcar was performing are not specified by Diodorus, and the commander loses his life during the ceremony in a sneak attack by his Greek enemies.[43]

A Greek mythic story is the source of our final piece of evidence connecting Phoenician "Poseidon" to mariners.[44] The legendary Phoenician prince, Cadmus, is reported to have been sailing across the Mediterranean, searching for Europa, when his vessel was hit by tempests. Cadmus is said to have prayed to "Poseidon" for protection from the storms. In fulfillment of his vows made during the danger at sea, Cadmus built a temple dedicated to "Poseidon" when he had reached the safety of dry ground on the island of Rhodes and left some of his fellow countrymen to manage the sacred precinct.

THE GOD RIDING ON A WINGED SEAHORSE

A second Phoenician marine god is depicted on Tyrian coins and Punic clay plaques riding over the waves of the sea on a mythic, composite creature [fig. 2].[45] This companion beast, with equine head and front legs, bird's wings, and sea serpent body and tail, is known as the hippokamp in Greek myth.[46] In the Greek world the hippokamp is companion to several maritime gods, including Poseidon, which led Fantar to suggest that the Phoenician god riding on the winged seahorse is the Semitic "Poseidon."[47] However, Betlyon calls this god simply a "marine" deity since any firm identification is beyond the scope of our data.[48]

I believe that the "marine" deity was a benefactor of Phoenician mariners, because the winged seahorse, the god's companion animal, is shown riding along beneath ships on coinage from Aradus and Byblos [fig. 3]. More accurately, the vessels are depicted as sailing along on the back of the winged seahorse, a maritime version of a common Near Eastern motif which typically depicts deities or divine symbols riding on the backs of their totem animals. Accordingly, I interpret these Phoenician ships as protected by, or under the guidance of, the winged seahorse as the companion to the "marine" god.

Phoenician ships are frequently depicted with horse-head prows [fig. 4]. These vessels are referred to in classical sources as *hippoi,* literally "horses."[49] I would read this equine prow figure as an abbreviated symbol of the winged seahorse, whose spirit resides in this ship type. Thus the "marine" god is a guardian of these *hippoi* and their crew, since the hippokamp represented by the prow figure is the divine companion to this deity.

GODDESSES AS PROTECTORS OF SAILORS

The goddesses Asherah and Tannit both have links to the maritime world of seafarers. I will suggest that, similar to the deities who influenced winds or marine storms, both Asherah and Tannit had lunar links which were critical for the safety of sea voyages, as the moon was believed to affect the weather.

ASHERAH

The deity Asherah, the mother goddess of the Canaanite pantheon, has definite nautical attributes. One of her common epithets in the texts from Ugarit is "Asherah of the Sea," and the "Fisherman of Asherah" is one of her divine companions.[50] These maritime aspects are interesting, but the goddess' importance to early navigators is linked to Asherah's celestial qualities.

Asherah is represented on pendants with crescent moons in her headdress or riding on the moon's crescent, and Egyptian stelae show her with a headdress crowned by a crescent-and-disk [fig. 5].[51] Identical symbols of the crescent and the crescent-and-disk are depicted on poles found at the stern end of Phoenician ships [fig. 6].[52] The location of this lunar symbol of the goddess at the rear of vessels, the area of ships where navigators steered using twin rudders, suggests that Asherah's aid was being invoked to promote proper navigation.[53] Our knowledge of Phoenician navigation techniques is very scanty, however, lunar light and the presence of the moon as a bearing mark are critical for night time sailing.[54]

The connection between the crescent moon, or the crescent-and-disk, and the piloting of ships is best explained if one views these lunar representations as symbols of the new moon. Varied aspects of the new moon have been "read" by sailors, both ancient and modern, in order to predict future weather at sea.[55] The prediction of upcoming meteorological events based upon the look of the new moon must have been crucial, as proper navigation and wind conditions were critical for safety and well being of a voyage. Thus I would postulate that Asherah's control of natural elements which affected conditions at sea made her patronage important to Canaanite and Phoenician navigators.

Examples of the importance of Asherah to Semitic seafarers are additionally found in textual and pictorial sources. Egyptian coffin text no. 61, dating from the Middle Kingdom, says that the Lady of Byblos (Asherah) "hold(s) the steering oars of . . . (funerary) barks."[56] A Middle Bronze IIA cylinder seal, of Canaanite manufacture, shows two ships stern to stern with the head of the goddess directly above the steering oars of each vessel [fig. 7].[57] The only crew members depicted both face the goddess, one of whom is the ship's navigator as he holds on to vessel's rudder. A harbor located on the northern end of the eastern gulf of the Red Sea is named after the goddess in dedication to Asherah. The port, known to us from the Hebrew Bible, derives its name *Elat* from the proper name of the goddess Asherah, a name used frequently to refer to the goddess in the Ugaritic texts.[58] A Tyrian coin depicts a patron goddess standing in her ship; the tutelary deity's name, "Elat of Tyre," is written on the coin in Phoenician.[59]

The Canaanite cylinder seal from Tell el-Dab'a has already been discussed with regard to its depiction of Baal Zaphon in an attitude of protection over a sailing vessel. A snake and lion are depicted on this same seal, in a register beneath the representation of the smiting storm god and his companion bull [fig. 1]. These animals, which could also be interpreted as guardians over the ship on the seal, are both companions to Asherah, who is typically represented riding on the back of a lion with snakes in her hands, and is referred to as "Lioness" in a Ugaritic text [figs. 5a, 5c, and 8].[60] A lion's head is the prow figure on some of the vessels detailed on coins from Byblos, which may represent the protective presence of Asherah's spirit in these warships [fig. 3a].[61]

TANNIT

The Phoenician mother goddess Tannit, known mostly from sources in the western Mediterranean, has maritime and lunar attributes like Asherah. The two goddesses have been viewed as aspects of the same deity, an opinion which I share and I believe is supported by the following evidence.[62] The crescent moon is a symbol of Tannit, as well as Asherah.[63] The sign of Tannit, a stylized representation of the goddess, is represented together with marine creatures, such as fish and dolphins [fig. 9]. Ancient and modern seafarers revered the dolphin, since it was believed that shifts in conditions at sea or future storms could be predicted by the presence of dolphins around a ship.[64]

Tannit is the guardian of a ship represented on a Carthaginian stela, as the sign of the goddess is shown on top of standards at the prow and stern of the vessel [fig. 10]. Ships, sacred parts of ships, and ship's equipment with sacred connotations, such as anchors and rudders, are also represented on sacrificial stelae with and without the sign of Tannit [fig. 9c and 13]. From formulaic inscriptions on these stelae we know that they were dedicated to Tannit and her consort, Baal Hamon. Baal Hamon, however, lacks any connections to the sea.[65] Therefore, I would interpret the images of ships, ships' prows and sterns, sacred anchors, and steering rudders as dedications to the goddess Tannit protectress of mariners.

MILQART

The consecration of port sites, islands, and headlands to the Semitic "Herakles," known in Phoenician as Milqart, is recorded in classical texts.[66] Coupling this evidence with the appearance of sanctuaries dedicated to Milqart in Phoenician port cities and on promontories important to navigation, Semple determined that Milqart was a guardian of Phoenician seafarers.[67] Further evidence supports this identification.

A ship dedicated to Herakles-Milqart is described in Arrian's account of Alexander the Great's conquest of Tyre.[68] A war ship, depicted on the walls of a Carthaginian tomb in Tunisia, has the guardian figure of Milqart on its prow [fig. 12].[69] This representation of Milqart is in his Semitic, "smiting god," pose, where he is shown with a beard, wearing a cone-shaped helmet, and holding a shield and war axe, and differs from the god's Hellenized depiction with the lion skin cape and club of Herakles.

Before setting sail, Phoenician merchants are known to have made sacrifices to Milqart to ensure safe passage.[70] Strabo records offerings made to Herakles (Milqart) by Tyrian mariners, with the purpose of gaining insight into the safety of travel at sea.[71] Twice the omens were unfavorable, and the voyages were aborted, but the third time the signs were positive and the ships made it safely to found the colony of Gader, on an island off of the southwestern coast of Spain. In thanks to their divine protector, the group founded a temple dedicated to Milqart.

Phoenician inscriptions from Carthage and Sicily mention the "Promontory of Milqart."[72] These are reminiscent of the aforementioned classical sources that verify the dedication of headlands to Milqart.

What attributes made Milqart a patron of seafarers? Milqart had connections to the underworld, and was a god of pestilence which affected the fertility of the land and crop yield. He did not have any celestial or meteorological qualities, however, which gave him control over winds or weather, like the other deities detailed above. Milqart's importance to mariners can be suggested from comparative evidence from equivalent gods in the Greek, Hurrian, and Mesopotamian pantheons.

Herakles was known in the Greek world as the epitome of the intrepid traveller, and accordingly he became a protector of voyagers.[73] His travels at sea are depicted on carved gemstones, which show Herakles crossing the waters on a raft, and are related by Pausanias in a tale of a statue of Herakles which originated in Tyre but came to be placed in a temple in Erythrae after floating over the Mediterranean on a wooden raft.[74] Greek Herakles was also known for his struggles with mythic creatures. In one such adventure, Herakles wrestles a fish-tailed monster, half human and half fish, known variously as Triton, Nereus, or Halios Geron.[75] It is possible that Herakles was venerated by sailors as a vanquisher of sea monsters.

Although the iconography of the fish-tailed monster was borrowed by the Greeks from the Near East, there are no Phoenician images of Milqart wrestling a fish-tailed creature.[76] A Phoenician marine creature, half man and half fish, is represented on a sealstone and on coinage, but is always a lone figure [fig. 11].[77] Could Milqart have been worshipped by seafarers as a guardian of travellers or vanquisher of sea monsters, like Herakles? At the present time this must remain speculative.

Further comparative evidence might also help explain Milqart's patronage of seafarers. The Hurrian god Irshappa and Mesopotamian Nergal are both known as patrons of commerce, and either god is equivalent to Milqart.[78] So it is possible that Milqart, too, was a divine protector of Phoenician commerce, much of which was conducted over the waters of the Mediterranean.

CONCLUSIONS

Canaanite and Phoenician seafarers protected themselves on their voyages through the patronage of gods and goddesses from their divine pantheon of deities. The storm god, Baal-Haddu, whose winds could either benefit or devastate a ship at sea, was a guardian of mariners in several of his aspects. The Phoenician "Poseidon" and the deity riding on the winged seahorse are both marine deities who protected sailors. The specific attributes which made mariner venerate these deities is not known, but it is possible that they were hypostases of the storm god with links to marine winds. The goddesses Asherah and Tannit were worshipped by seafarers. Their ties to the new moon may have made the goddesses crucial for predicting future weather conditions at sea, and their divine powers seem to have been associated with proper navigation. Milqart, a god of pestilence with ties to the underworld, also guarded over sailors. Equivalent deities were worshipped as protectors of travellers, vanquishers of sea monsters, and patrons of commerce, and it is possible that Milqart was venerated by seafarers for equivalent attributes.

In order to appease these sacred benefactors, sailors worshipped their patrons in port temples and in isolated shrines erected on promontories along sea routes, as well as on board ship. Vessels contained sacred areas, at their prow or stern, for conducting ceremonies at sea, and the ships were imbued with the spirit of a tutelary god to ward off the dangers of the deep. Rituals were performed for these gods at transition points in the voyage, to ensure a safe journey: on land, both before sailing and after safe arrival; on board ship, while leaving and entering port; and at sea, when passing sacred promontories, and in times of distress.

This evidence describes the specialized nature of the religion of Canaanite and Phoenician sailors. Each of these patron deities were worshipped on land, as well, but there they served a different set of sacral needs or concerns based on an individual's profession and their role or ranking within their society or kinship structure.

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NOTES

1. Bassett 1885: 36-52; Foucart 1921: 882-83; Queyrel 1987: 283-85; Rougé 1975: 206-10; Semple 1927: 365-69; and Wachsmuth 1967.
2. This paper is based upon my larger work investigating many different aspects of the religious beliefs and practices of Canaanite-Phoenician seafarers, Brody 1998.
3. Albright 1950: 1-14; and 1968: 127-28. Please note that I have anglicized Semitic transcriptions for ease of recognition of Semitic names to a general audience. These transcriptions reflect tradition more than the actual vocalization of West Semitic sounds not found in the English language.
4. See Logan 1995: 34-39, for the critical role that winds play in sailing and in a sailor's mentality.
5. Parpola/Watanabe 1988: 24-27, for the most recent presentation of the text in Akkadian and in translation. Translations in collections of Near Eastern texts include Reiner 1969: 533-4, and Borger 1983: 158-59.
6. A possible exception to this is found in the biblical book of Jonah 1:9. After Yahweh has raised a storm to sink the vessel carrying Jonah, the non-Israelite (likely Phoenician) sailors beseech him through prayer to calm the storm. Here Yahweh is called "god of the heavens" by Jonah, an epithet taken from Baal Shamem (Shamem=heavens), see Mazar 1986: 80-81. For a recent treatment of Baal Shamem see Engelken 1996: 233-48, 391-407.
7. Albright, 1950: 9n. 2; Albright 1968: 227-28; Du Mesnil du Buisson 1973: 48; Eissfeldt 1932: 7n. 4; Hvidberg-Hansen 1973: 57-81.
8. Albright 1950: 1-14; Eissfeldt 1932: 1-30; Hunt 1991: 103-15.

9. Albright 1950: 11; and Hunt 1991: 111-12.
10. Frost 1969: 235-45; and 1991: 355-410.
11. For the lack of textual references to the cultic use of anchors see Tarragon 1980: 182. For the clustering of anchors around one acropolis temple and not the other see Frost 1991: 395.
12. For a recent presentation of the stela and its find spot in the temple see Yon 1991: 284-88.
13. Brody 1998: 63-72; Canney 1936: 50-57; Göttlicher 1992; Hornell 1943: 121-28, and 1946: 285-89; Rivers 1921: 473-74; Rougé 1975: 206-7; Svoronos 1914: 81-152; Wachsmuth 1967: 237-51.
14. *KTU* 1.16.I.6-9, 1.16.II.44-47. Albright 1950: 3-5. For in depth analysis of this passage see Brody 1998: 15-17.
15. Papyrus Sallier IV, verso I, 6. Albright 1950: 6-8; Caminos 1954: 333.
16. 1950: 7; Albright is followed by Stadelmann 1967: 36, and Helck 1970: 35.
17. Exodus 14:2,9, and Numbers 33:7.
18. Pausanias, *Description of Greece,* I.1.3. Garland 1987: 101-38; Semple 1927: 353-86.
19. 1984: 485-88. See also Dijkstra 1991: 127-40.
20. 1984:487. This identification of Baal Zaphon is backed by Dijkstra 1991: 137.
21. Procopius, *De Bello Gothico,* IV:22. For the equation of Baal Zaphon with Zeus Kasios see Albright 1950: 11-12 and Eissfeldt 1932: 1-48
22. Wachsmuth 1967: 396. Anchor stocks were more commonly dedicated simply to Zeus Soter, or Zeus the Savior, see Svoronos 1914: 105-110.
23. *KTU* 1.1 and 1.2.
24. *KTU* 1.4.V.51-57.
25. Silius Italicus, *Punica,* XIV.436-39.
26. *Ibid.*, XIV 440-41, 458-61.
27. *Ibid.*, III.6-11, 647-49.
28. *Ibid.*, XII.605-22. Trans. J. D. Duff, vol. 2, *The Loeb Classical Library* (Cambridge: Harvard University Press, 1989), p. 193.
29. Cross 1973: 24-28, 35-36; and Xella 1991: 145-46.
30. Lipinski 1971: 84-92. Rosh literally means "head", or in geographic terms headland, cape, or promontory.
31. Rev. IV.8 in Safar 1951: 11.
32. Simons 1937: list I.48, XXIII.1, and XXVII.108. These lists date to the reigns of Thutmosis III, Rameses II, and Rameses III, respectively.
33. Février 1946-49: 561; Du Mesnil du Buisson/Mouterde 1914-21: 390-94; Lipinski 1971: 87.
34. Semple 1927: 353-86.
35. The dedication of a temple to "Poseidon" is described in the periplus of the Carthaginian voyager, Hanno. See Müller 1855: 13.
36. Brody 1998: 22n. 63.
37. Fantar 1977.
38. The one bilingual inscription which mentions Poseidon is in Palmyrene Aramaic and not Phoenician, Cantineau 1938: 78-79. On the nature of the Greek Poseidon see Farnell 1907: 1-97.
39. Farnell 1907: 4-5, 13, 26; Semple 1927: 365-69.
40. Harden 1971: 162; Moscati 1968: 182. For the Greek translation or the original account in Phoenician see Müller 1855: 1-14; for Hanno's dedication of the temple to "Poseidon" see *ibid.*: 13.
41. Müller 1855: 93.
42. XI.21.4.

43. In Diodorus XI.22.1 Hamilcar is killed; in Herodotus, *The Persian Wars,* VII.167 he takes his own life.
44. Diodorus, V.58.2.
45. For the coins see Betlyon 1980: pl. 5.; for the terra-cotta plaques see Fantar 1977: pl. IV.1 & VII.2.
46. Lamer 1913: cols. 1748-72 has a summary of the classical evidence.
47. 1977: 43-94.
48. Betlyon 1980: 46. Earlier identifications of the "marine" god with other Phoenician gods Milqart and Baal Shamem is rightfully questioned by Betlyon, 1980: 67-69, n. 44-45.
49. The classical citations see Torr 1964: 113-14.
50. Whitaker 1972: 43, 179.
51. Cross 1973: 31-35.
52. Svoronos 1914: 86; Betlyon 1980: 30n. 37.
53. Bartoloni 1988: 72-77.
54. Phoenician sailing at night, especially following the Little Bear, is detailed by Silius Italicus, *Punica,* III.663-65, XIV.457.
55. Bassett 1885: 45-52.
56. Faulkner 1973: 56. For the equation of the Lady of Byblos with Asherah see Maier 1986: 88-96.
57. Teissier 1996: 102, 104 fig. 206. Teissier links Egyptian Hathor with the patronage of seafaring, travel, and border areas, 1996: 184; see also Stadelmann 1967: 10-11, 143.
58. Deuteronomy 2:8; II Kings 14:22, 16:6; see *KTU* 1.14.IV. 35, 39 for examples of the numerous occurrences of Ilat (=Hebrew Elat) in Ugaritic.
59. Cross 1973: 31.
60. Cross 1973: 34.
61. It is also possible that the lion is the companion of Milqart, described below as another patron of Phoenician sailors.
62. Cross 1973: 31-35; Maier 1986 96-118; Olyan 1988: 53-61.
63. Bertrandy/Sznycer 1987: 62-63; Gsell 1920: 247-50, 360-62; Hours-Miedan 1950: pl. XIII.
64. Bassett 1885: 132-34, 245.
65. Cross 1973: 24-28, 35-36; Xella 1991: 106-40.
66. These geographical references are gathered together by Gsell 1920: 307n. 2.
67. Semple 1927: 366.
68. "*kai ton naun ton Tyrian ton hieran tou Herakleos,*" Arrian, *Anabasis of Alexander,* II.24.6.
69. Ferron 1968: 54.
70. Heliodorus of Emesa, *Aethiopica,* IV.16.8.
71. *Geography,* III.5.5.
72. Bonnet 1988: 267-69.
73. *Ibid.*: 284-86.
74. Courbaud 1892: 274-88; *Description of Greece,* VII.5.5.
75. Luce 1922: 174-92; Shepard 1940; Glynn 1981: 121-32; and Ahlberg-Cornell 1984.
76. Shepard 1940: 4-9.
77. Betlyon 1980: 79-80. Betlyon reviews past identifications of this deity as Dagan or Milqart, but concludes that the name of the god is unknown. "Triton" is one of the gods mentioned in the pantheon of Hannibal's treaty, Polybius, VII.9.2. "Triton" is likely the Carthaginian version of the fish-tailed god from Aradus, showing his presence in the Phoenician expansion to the western Mediterranean. It is possible that he is a representation of *Daggay 'Atirati*, translated from the Ugaritic above as the "Fisherman of Asherah," who might be rendered more accurately as the "Fish-man of Asherah."
78. Moran 1992: 102n. 4. For Irshappa's Semitic equivalences see Laroche 1976: 124-25; for Resheph's links with Nergal and Milqart see Albright 1968: 128n. 43, 139,145n. 95, 243.

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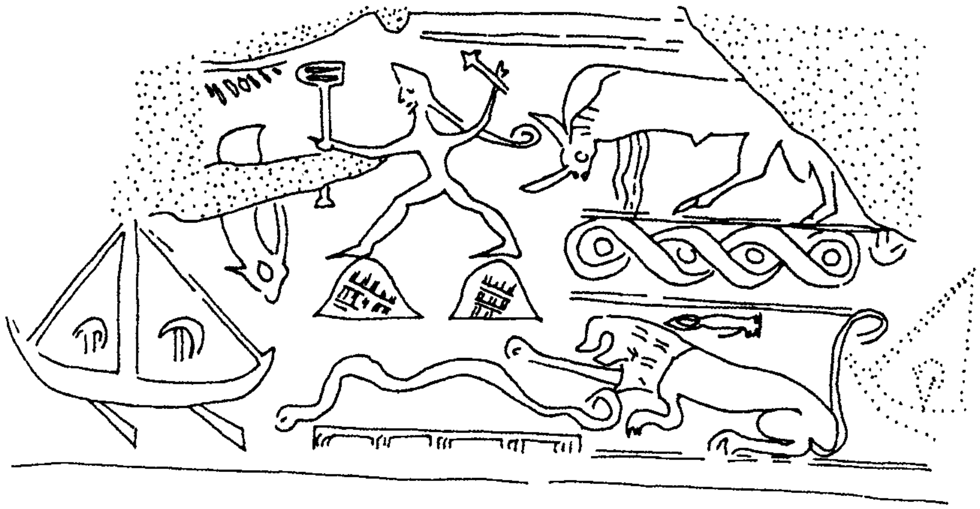


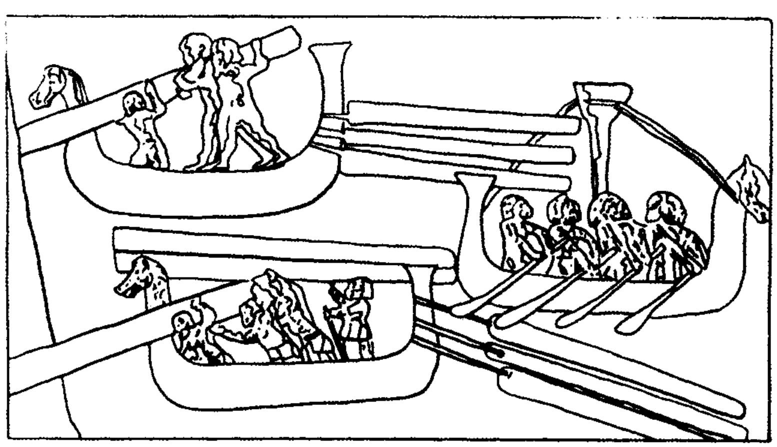
Fig. 1

Fig. 2

a.

b.

Fig. 3



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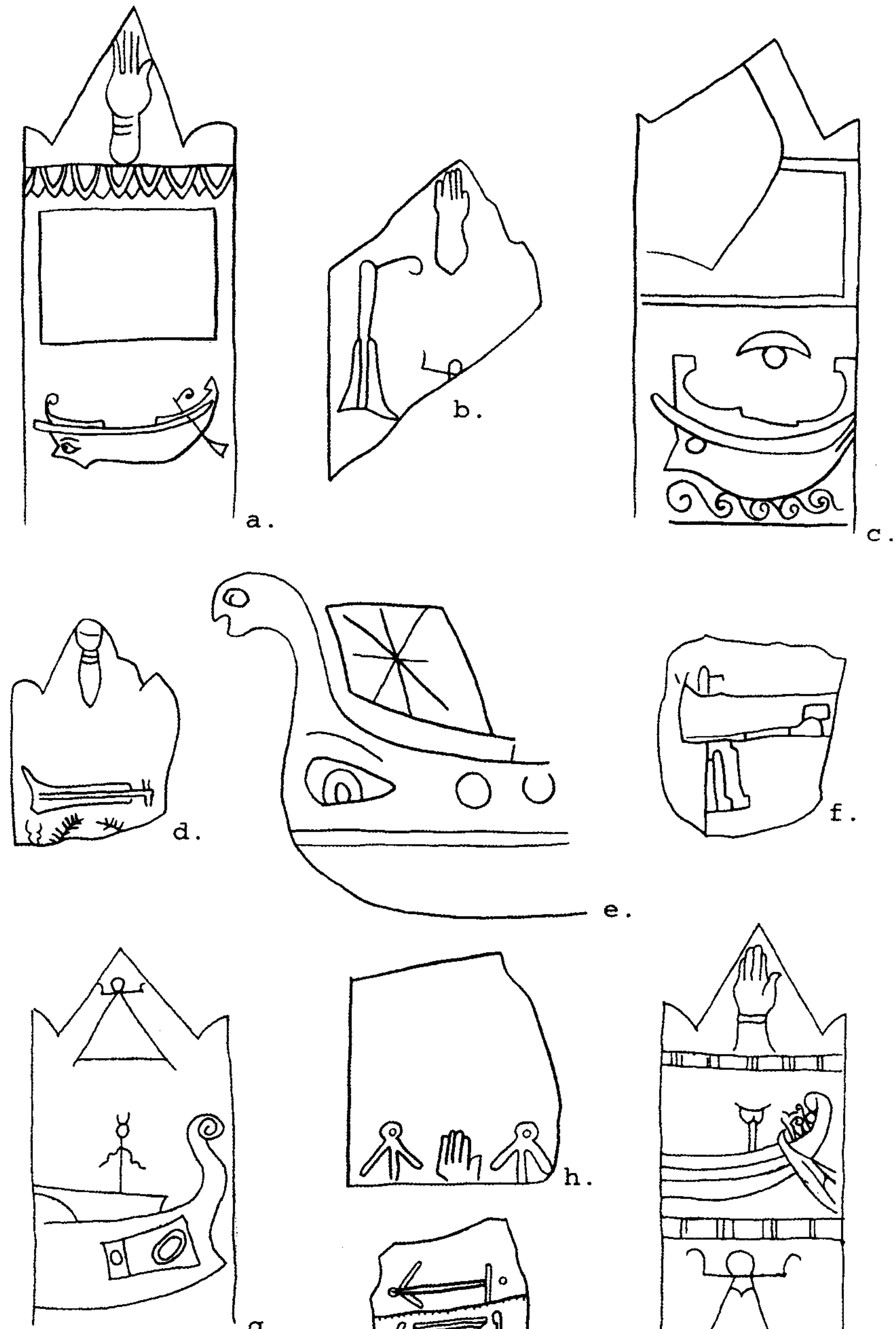

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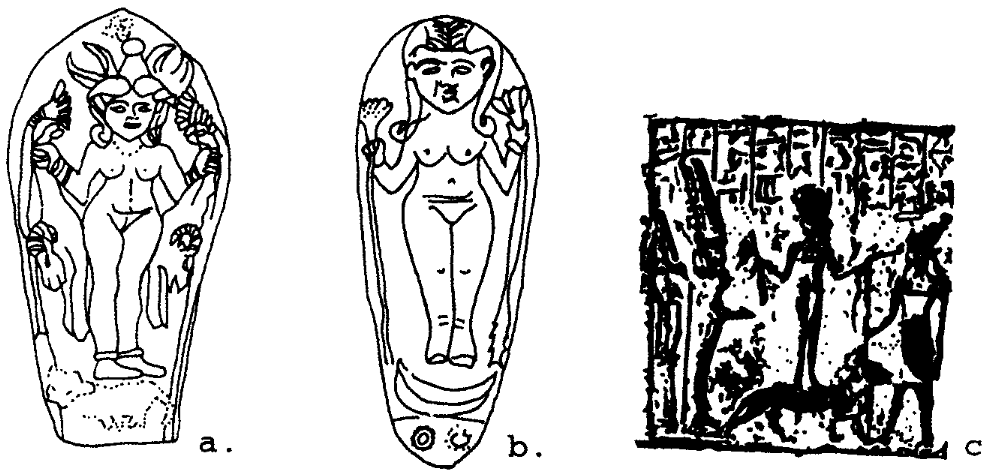

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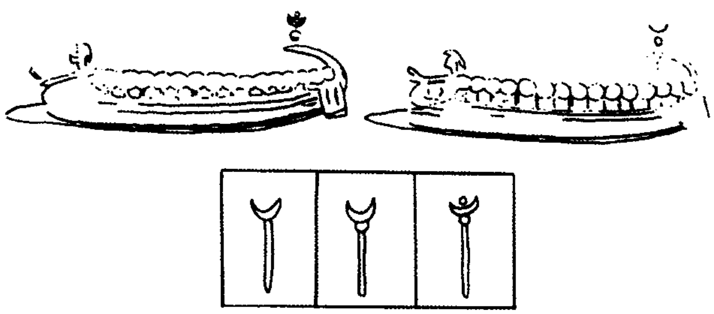

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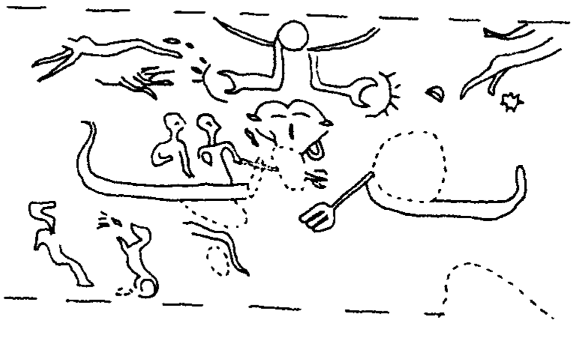
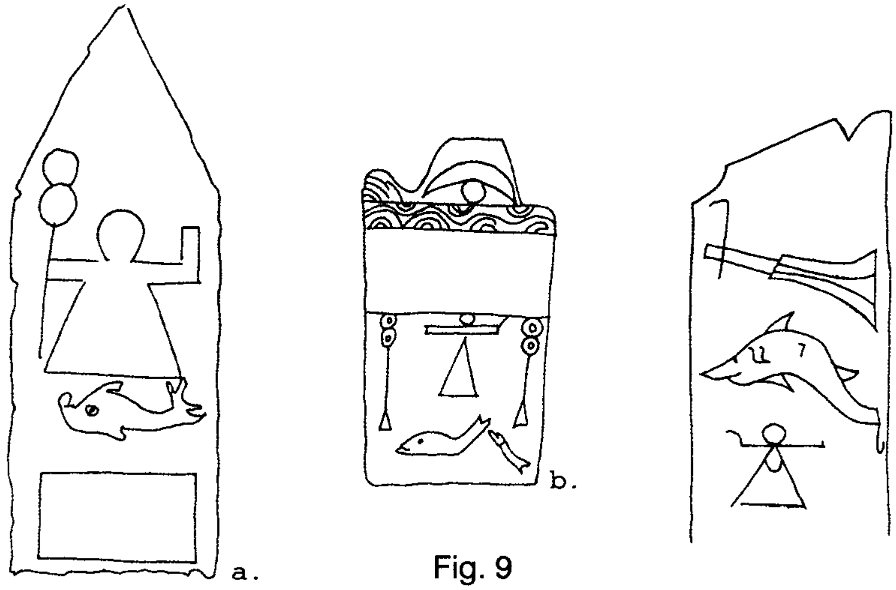


Fig. 7

Fig. 8



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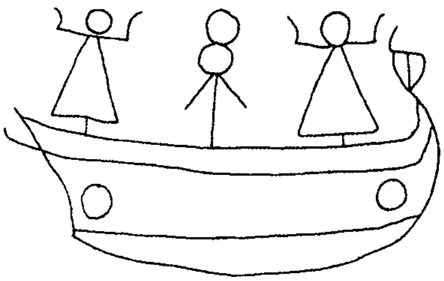

Fig. 10

Fig. 11

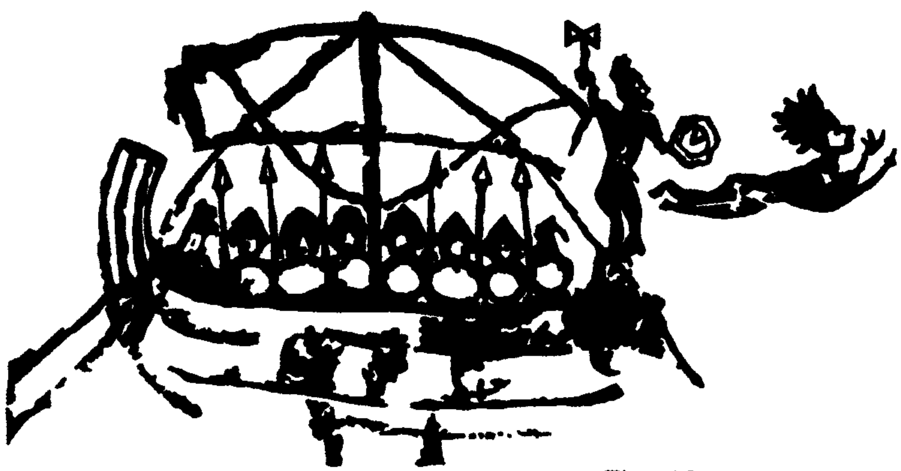

Fig. 12

ROMAN FISHING BOATS AND THE TRANSOM BOW

In the early 1960s, *The Mariner's Mirror* published a series of short editorial notes on the Roman transom stern.[1] Peter Marsden introduced the subject with the publication of a line drawing from a Roman fresco in the Naples Archaeological Museum. Expanding upon Marsden's contribution, Marco Bonino produced additional artistic examples of the Roman transom, and linked it to a distinct type of vessel called a *horeia*. Then, in what appears to have been the final word on the subject, Lionel Casson contended that, in all of the examples cited by Marsden and Bonino, the transom is a feature not of the stern, which carries the steering oars, but of the bow; thus the Roman transom stern became the Roman blunt prow. Thirty years ago, this topic attracted some of the very best in the field of ancient ship construction, and as my own recent research has focused on the topic of ancient fishing boats, I would like to revisit the Roman transom in the light of current archaeological and literary evidence.

The line drawing published by Marsden shows a small, relatively flat-bottomed vessel with a rectangular transom and two oars – the steering oar being slung on the stern, which curves gradually upwards.[2] We are extremely limited in what we can say about the function or context of this boat, as Marsden describes it only as a fragment of a larger Roman fresco. A search for iconographic parallels yields some clues, in the form of a mosaic from the third century, discovered at the North African site of Uadi ez Zgaia.[3] Here, against a background of enormous marine creatures, two fishermen operate a small boat that bears a certain resemblance to Marsden's Roman boat; it is flat-bottomed, with a curving stern and a rectangular transom bow. The boat is under sail and one figure steers from the stern while, in the bow, the other figure attempts to haul in a large fish hooked on the end of his line. Like this one, many of the fishing boats depicted in mosaics from Roman North Africa are not to scale, in that the artist was concerned less with the vessels than with the depiction of fish in a highly detailed, almost taxonomic format; while the boats themselves are a secondary subject, they are nevertheless an important source of nautical iconography from this period.

In his response to Marsden's note in *The Mariner's Mirror,* Bonino identified three mosaics showing boats with transoms, all from Roman bath complexes dated to the third and fourth centuries AD. The first, from the Sicilian site of Piazza Armerina, shows a Cupid spearfishing from the deck of a vessel that has a distinctive semicircular transom.[4] Though not visible in this image, another Cupid sits at the stern with a steering oar, just aft of the fish. The second mosaic, from Themetra, in Tunisia, has a protome of the personified Ocean at center surrounded by a sea full of small boats and fish.[5] Just below the head of Ocean two fishermen work from a partially-decked vessel that has a semicircular, almost triangular, transom at one end. While one figure line-fishes, the other figure, holding a steering oar, sits opposite him, with his back to the transom. The Themetra mosaic may be our best evidence that these small vessels were, in the truest sense double-ended; that is, capable of being maneuvered from either end, depending on the circumstance. A transom bow offered the fisherman a larger working surface and improved visibility, but propelling a vessel with a transom bow poses distinct technical disadvantages; for this reason it would have been desirable to put the finer entry of the stern into the waves while steering the vessel from the blunt end as is suggested by the Themetra mosaic.

Perhaps the most significant aspect of Bonino's 1963 editorial was his association of the Roman transom with the *horeia* from the Catalog of Boats mosaic at Althiburus.[6] Like the boats from Piazza Armerina and Themetra, the Althiburus *horeia* has a semicircular transom at one end and a steering oar slung on the opposite end. The vessel is partially decked and carries what seem to be bundled fishing nets. I will, in a moment, address the use of the term *horeia* but I would first like to note that, in addition to the three mosaics cited by Bonino, we can add at least another two: one from Utica, which shows netfishing from the transom of a small, two-man boat,[7] and a second from a very fine fourth-century mosaic at Aquileia, Italy, in which one Cupid linefishes from the forward end of a small, decorated boat, while the other pilots the vessel with a lone steering oar.[8] Fishing scenes were popular outside the medium of mosaic, as well, as is shown by the depiction of a small boat with a transom bow on the discus of a Roman lamp.[9]

Lionel Casson was the last to contribute to the series of commentaries on the Roman transom. Casson's observations were twofold: first, he maintained that, in all of the examples provided by Marsden and Bonino, the oars are not for propulsion but for steering, making the transom a feature of the bow, not the stern. Secondly, Casson hypothesized that the transom had been developed in order to facilitate the loading of cargo in harbors where dock facilities were available. He illustrated this theory using two well-known sculptural reliefs from the third century A.D., which show merchantmen entering the harbor of Rome towing their tenders, both of which have transom bows.[10] Casson's theory is eminently logical; the transom bow would have enabled a small boat to tie up flush at a dock or quay. Still, the majority of iconographic images show that the transom bow was predominantly a feature of small fishing boats. I do not want to imply that these small boats were incapable of performing multiple tasks; indeed, their versatility is reflected in a wall painting from Pompeii, which shows two dwarves transporting a cargo of amphoras in a small partially-decked boat with a transom.[11] While one figure pilots the boat, the other hauls in what must be a net. The line drawing shown here dates from the late 18th century, and despite thorough research, I have been unable to locate the original image [which may no longer survive] or to determine its specific context within the city of Pompeii. Nevertheless, I suspect that what we are seeing here is a fisherman hauling in his nets, as yet another example of how a transom bow was well-suited for fishing.

With regard to the written evidence, the primary importance of the Althiburus mosaic is that it establishes the *horeia* as a discrete vessel type and offers us a link to the literary record, where the term *horeia* appears in the works of four authors that span a period from the second century B.C. to the fifth century A.D. The earliest and most abundant references come from the comedies of Plautus, in which the poor, luckless fisherman Gripus offers thanks to his patron Neptune and to his healthy *horeia* for bringing him a rich catch in rough seas.[12] In the fragment of one of Plautus' incomplete plays, two fishermen debate about how best to punish a wrongdoer: tie him in a sack and tow him out to sea, or tie him to a *horeia*, so that he might fish for all eternity.[13] *Horeia* appears again as an entry in two catalogs of boat types, one by Aulus Gellius in the second century AD,[14] and the other from the early fourth-century compiler Nonius Marcellus.[15] By the late fifth century AD, the mythographer Fulgentius had included *horeia* in his treatise on the explanation of obsolete words.[16]

As regards the archaeological evidence, we have several examples of ancient fishing boats, including the riverine dugout Zwammerdam 1,[17] the Kinneret boat,[18] and the Ostia boat, with its unique wet well.[19] Recently I learned that two boats, Roman in date, were discovered in the 1980s during the excavation of the harbor at Toulon.[20] It is my understanding that these vessels were well-preserved, some 6 to 8 meters in length, and equipped with transom bows situated above the waterline. The Toulon vessels, which are apparently undergoing conservation, are in need of recording and publication. Their discovery presents us with a rare and valuable opportunity to study a specific Roman boat type against its iconographic representations; such an opportunity should not be missed.

In conclusion, the transom bow was a distinctive (but not exclusive) feature of the Roman fishing boat between the first and fourth centuries A.D. The Althiburus mosaic provides a crucial link by naming the *horeia* as one, if not the only, type of boat with a transom. Ancient authors confirm that the *horeia* was not a cargo boat, not a transport, not a tender, but a fishing boat. The issue of transom stern versus transom bow is secondary; the *horeia* was, in all likelihood, an exercise in versatility – it was double-ended, so as to provide both a working platform for fishing with nets, lines, or spears, as well as a fine entry while underway. As a vessel type, the *horeia* probably represents a small percentage of ancient Roman fishing boats; they are but a fraction of the boats that appear in the various catalog of boats mosaics from Piazza Armerina, Themetra, and Althiburus. Marco Bonino believed the *horeia* to be of African origin, and while this theory is difficult to prove, it is worth considering the frequency with which the *horeia* appears amidst a Nilotic landscape like the one from the Casa del Medico at Pompeii.[21]

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* Many fine people have been kind enough to share with me their interest and ideas about ancient fishing. I would like to thank in particular Patrice Pomey, Hector Williams, George Bass, Fred Hocker, William Murray, Lucien Basch, and Louis Lehmann.

NOTES

1 Marsden 1963, Bonino 1963, Casson 1964.
2 Marsden 1963: fig.1
3 Foucher 1963: figs. 22, 23.
4 Carandini/Ricci/deVos 1982: fig. 151.
5 Foucher 1958: pl. IX.
6 Casson 1971: fig.137.20. See also Duval 1949, a seminal work on the Althiburus mosaic, in which he describes the *horeia* as having a transom bow.

7 *Enciclopedia Classica* X.738b.
8 Tamaro 1980: fig. 182.
9 Walters 1914: pl. 16.527. For a lamp depicting a small one-man boat with probable transom bow, see Bailey 1980: pl. 10, Q858. I owe both of these references to the scrutinizing eye of Hector Williams.
10 The Torlonia Relief and the Ny-Carlsberg Glyptothek sarcophagus appear in Casson 1971: figs. 144 and 147, respectively. Casson also cites the small one-man horse transport shown on Trajan's Column; see Lepper/Frere 1988: pl.xxvi.
11 *Dictionnaire des Antiquités*, p. 1113, fig. 6165.
12 *Rudens* 910.
13 *Vidularia* 13B.
14 *Noctes Atticae* 10.25.5.
15 *de Genere Navigiorum* 13.21.
16 *Expositio Sermonum Antiquorum* 15.
17 De Weerd 1978.
18 Wachsmann 1990.
19 Scrinari 1979.
20 I am grateful to Patrice Pomey for sharing with me the facts and images of the Toulon vessels. J.-M. Gassend published a brief account of their discovery in *Les Chasse-Marée* 33 (1987) 60-62.
21 Donati 1998: fig. 16.

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ILLUSTRATIONS

Fig. 1 Small boat with a transom from an unknown Roman wall painting. (from Marsden (1963) fig.1).
Fig. 2 Fishing mosaic from Uadi ez Zgaia, North Africa. Third century AD. (from Foucher (1963), fig. 23).
Fig. 3 Cupid spearfishing from a vessel with a transom bow. Mosaic from Piazza Armerina, Sicily. Third century AD. (from Carandini et al. (1982) fig. 151).
Fig. 4 The horeia of the Althiburus mosaic. (from O. Höckmann (1985) fig.52).
Fig. 5 Two men net fishing from a vessel with a transom bow. Mosaic from Utica, North Africa. (from Pighi et al. (1957) vol. 10, p. 738).
Fig. 6 Fishing cupids in a vessel with a transom bow. Mosaic from Aquileia, Italy. Fourth century AD. (from Tamaro (1980) fig. 182).
Fig. 7 Roman lamp showing fishing scene and vessel with transom bow. First century AD. (from Walters (1914) pl. 16, fig. 527).
Fig. 8 Line drawing of a wall painting from Pompeii, context unknown. Perhaps first century BC-AD. From Carcani (1757) vol. 5, pl. 67.
Fig. 9 Nilotic landscape from a wall painting in Casa del Medico at Pompeii. (from Donati (1998), fig. 16).

Fig. 1

Fig. 2

Fig. 3

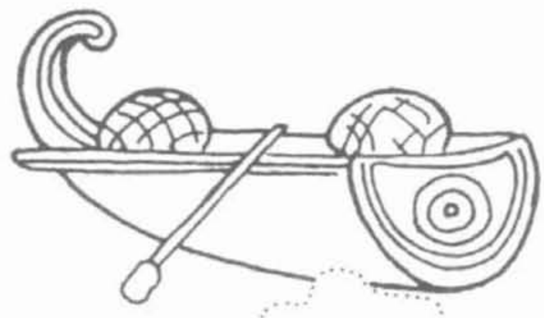

Fig. 4

Fig. 5

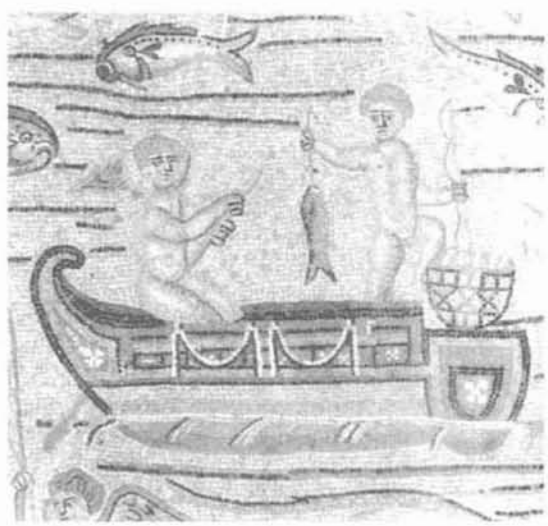

Fig. 6

Fig. 7

Fig. 8

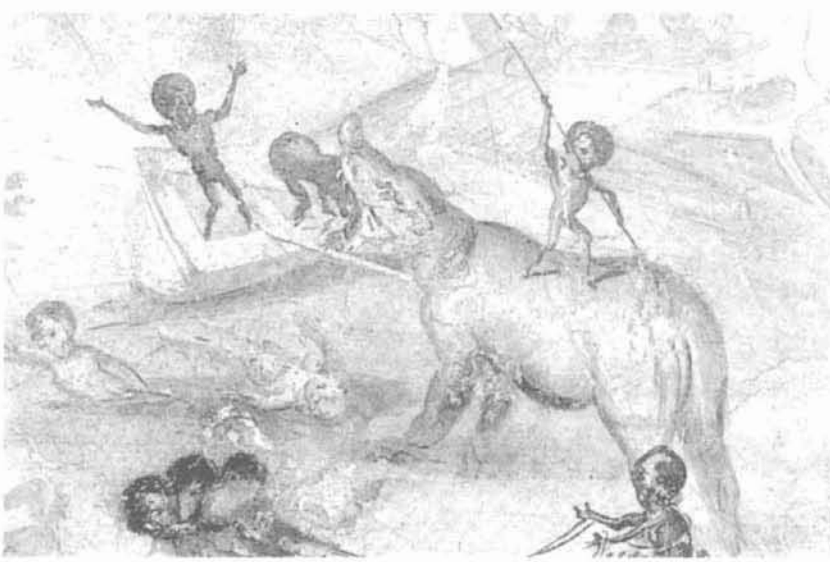

Fig. 9

NAVAL TACTICS AND THE DESIGN OF THE *TRIREME* AT SYRACUSE IN THE PELOPONNESIAN WAR

THUCYDIDES, VII, 88, 5: This event proved to be the greatest of all that had happened in the course of this war, and, as it seems to me, of all Hellenic events of which we have record, for the victors most splendid, for the vanquished most disastrous.

The distinguishing feature of the Syracusan navy at the end of the fifth century BC is its surprising capacity for design and planning. Their expertise in shipbuilding gave rise to innovations in the technical area unprecedented in the history of naval architecture, as well as in the strategies of attack of the early military navy. This constituted a bold triumph of engineering technology about which the Greek historian Thucydides together with Diodorus of Sicily dedicates minimal but detailed information of a structurally-oriented nature, especially in the comparison with the Athenian trireme. Classical literary sources place emphasis on the maritime role played by Syracuse during antiquity, in peace time as well as in war. The Syracusans were renowned as a great naval power; they possessed a remarkable harbour system (Fig. 1) and were the centre of nautical innovations. However, it should be pointed out that there is a wide gap between the historical documentation and the archaeological evidence. Indeed, Syracuse inherited her nautical technology from her mother city, Corinth, by which she was founded in 734 BC.

During the Peloponnesian War, in the late fifth century BC, the Syracusan navy made a number of nautical advances with respect to the arrangement of the prow of its galleys. The Greek historian Thucydides (VII,36) reports the strategy adopted by the Syracusans on that occasion. He stresses that it was a combined strategy made up of two tactical elements, *'stern attack'* and *'side assault'.* The prow of the Syracuse *trireme* was, according to Thucydides, reduced in size and reinforced with the help of two longitudinal beams *"anteridas".* It can be readily understood that the *embolos*, thus modified, worked much better by comparison with the weaker Athenian prow which was still designed in the traditional manner.

1- The design of the Syracusan *trireme*: shipbuilding methods and problems of interpretation.

I will not discuss here the general lines of action by sea and land or the general approach of the warring parties. My concern will be focused on how the strategies adopted by the Syracusans were the product of careful targeted preliminary study which sought to reveal the weaknesses and limitations of the opponent.

Following the valuable advice of the Corinthian pilot *Ariston* (Diod., BH, XIII, 10), the Syracusans first established that the 'Achilles' heel' of the Athenian fleet lay in the fragility of the prow section and in the systematic, almost ritual, attacking manoeuvre of surrounding the enemy vessel in order to pierce it through its side. They then worked towards the total disruption of this sophisticated attacking action, as well as on technological innovations which would maximise the strength of the bow of their own fleet.

Indeed, the new Syracusan attacking strategy lay in the optimisation of the technical qualities of the 'embolos'. As Thucydides wrote (VII, 36, 2), the bow section of the Syracusan trireme was reduced in size but notably reinforced and thus rendered more sturdy; equipped with a system which consisted of *"pacheias epotidas"* connected to *"anteridas"* of 6 cubits in length of which 6 cubits are extended inside and 6 protrude outside the end of the prow. This structural modification is also reflected in the attacking strategy adopted by the Syracusans which upset the old way of waging war, signalling a veritable revolution in the tactics of naval warfare: namely, the tactic of the prow-to-prow collision which would have smashed in the opponents' prows by driving its massive rams into the fragile Athenian prows.

This was a strategic attacking manoeuvre which departed from the familiar technique of the *'periplous'* which guarded against attack from the side; the Athenian ships were thus compelled to thrust backwards on their oars, towards land, towards the coastal interior of the port which was under Syracusan control.

What is certain is that in the history of military naval shipbuilding this is the first case where there is explicit evidence of the use of the *'epotides-anteridas'* solution.

Although it may be simple to understand the rationale behind the workings of the prow unit devised by the Syracusans, there are distinct difficulties of interpretation regarding the system of assemblage of the two girders at the sides of the rostrum. If the reduction in dimensions of the *'embolos'* came together with the addition of the lateral *'epotides'*, on which were fixed the edged girders (clearly covered in metal, or perhaps in melted bronze), these must have jutted out far enough to be able to reach the planks of the enemy prow, and thus strike it and tear through it, with the force of the collision.

The experiments carried out in an attempt to establish the point at which the lateral *'epotides'* were joined, as well as the angle of curvature of the *'anterides'*, raised a number of questions. Chief among these was to seek to determine the exact position which would have achieved the maximum effect in the context of the collision with the opposing vessel.

Among the various possibilities considered, the most plausible answer would be that which sees them as having been mounted below the water-line, with a slightly pincer-like profile. This hypothesis is based on at least two sorts of reasons, both tactical and practical: firstly, the concealment of the attacking device by hiding it under the surface of the water; secondly, the effecting of damage to the working-hull of the opposing vessel, causing an immediate influx of water. Smashing in the ship's upper hull would have brought about no immediate negative effect. This solution seems also to emerge from Diodorus Siculus (BH, XIII, 10, 3.6) who has defined the Syracusan prow *"iskuròn kai tapeinón"* which suggests that it was stronger as well as fixed on the lower point and so above the water line. Diodorus emphasized the Syracusan sea power in his account in the XIII book, where, comparatively speaking, he wrote that *" [...] when they (the Attic triremes) rammed, they damaged only the parts of a ship that extended above the water, so that the enemy suffered no great damage; whereas the ships of the Syracusans, built as they were with the structure about the prow strong and low, would often, as they delivered their ramming, sink with one shock the triremes of the Athenians"* (BH, XIII, 10, 3). There can be no doubt that from this line we learn that the Athenian triremes used to damage the opposing vessels just on the upper hull, while the Syracusans used to smash its massive rams into the fragile lower hull and so under the waterline. Anyway, rejecting this hypothesis concerning a ram system mounted near the waterline or even under it, along with the ideas of Morrison (1968: 319), Mr Tzahos (the previous speaker at this Symposium) believes that the "epotides" were located on the outrigger cheeks as a sort of dual weapon protruding on each side of the outrigged frame. It should, however, be noted in this regard that there is not even a single item of iconographic or archaeological/monumental remains of a ram mounted on an outrigger cheek and that there is a huge difference between a ram system and anchors-bitts. The beams projecting on either side of the beak serve to strengthen it; it is a completely different matter which has nothing to do with the ram set-up in the Syracusan or Corinthian manner.

There is also another remark regarding the dimensions. Thucydides (VII, 36, 2) writes that the *'anteridas'*, like protruding girders, had a length of 6 cubits extending inside and 6 cubits protruding outside. Indeed, this is the length necessary to surpass the rostrum of the enemy ship and reach the most fragile part of the prow section, to the side of the rostrum, or the bow planks which offered least resistance. We have ascertained that to achieve a functional and efficient bow set-up it would have been necessary for the girders to protrude by 6 cubits in relation to the line of the *'embolos'*, and that they would have been welded to an internal bracket which secured them to the ship to lend them greater substance. In the ramming phase, with the opposing vessel impaled, two possible situations might be envisaged for the Syracusan ships: one was to push the enemy vessel towards the shore, or rather towards the relevant stretch of coast; the other was to reverse quickly to allow the water to enter through the freshly made gashes. The reconstructive hypothesis of the prow of the Syracusan 'trireme' proposed here takes account of these observations and of the suggestions of Thucydides together with Diodorus Siculus (Fig. 2).

2- Some points of comparison.

Despite this technical advance, the new attacking bow configuration *'epotides-anteridas'* was only employed to a limited extent on this particular occasion; there is only one other case of its adoption, at Naupatto, by the mother-city Corinth and perhaps one other later case at Chios by the Rhodians. Indeed it is to the episodic nature of the use of this particular set-up of the prow section of the Syracusan trireme that we may attribute the almost total absence – at least up until the current state of research – of precise iconographic points of reference. The only reference point for comparison, even if at a later stage and with differing characteristics from a technical point of view, is a clay model of a warship, preserved at the Museum of Sparta (Fig. 3).

The model, dated to between the 1st century BC and the 1st century AD, in addition to the "embolos", has two girders protruding from the bow section of the ship, placed just behind the ram and fixed more or less near the water-line. These seem to recall the 'concept' of the Syracusan attacking apparatus, but from the purely tactical point of view they do not appear to have been able to achieve the same devastating effect.

Taking into consideration the previously discussed approach to attacking strategy of the Syracusan military navy, which was oriented towards prow-to-prow ramming, it is easy to comprehend how the two girders fixed further back in relation to the prow itself did not fulfil any attacking function; only by assuming a rolling-type manoeuvre accompanied by a lateral assault can we then recognise an attacking potential for the girders which would then practically have slid all along the outrigger of the opposing vessel, putting the rowing system out of action. But we know for certain from Thucydides that the Syracusan fleet operated according to another plan of attack which was considered as being extremely unsophisticated by the Athenians, that of the prow-to-prow attack.

Another reference point for comparison, although partial and also later, would be that of the so-called "Punic sister-ship of Marsala", supposedly a military ship of the *liburnian* type dated to the middle of the III century BC (Basch and Frost, 1975: 224-227). This finding in the waters of SW Sicily has allowed the clarification of the system of assembly of the prow and the ram in relation to the keel of the ship. These elements appear practically independent in relation to the hull: the ram, at the tip end of the prow, was fixed upon two protruding timber beams riveted onto both sides of the keel and projecting upwards the water-line (Fig. 4). Structurally, these protruding timbers which were joined to each other by bolts or iron nails were attached to either side of the sternpost forming a pair of tusks that curved upwards from the keel. It was conceived like a sort of "replaceable ram" (Basch and Frost, 1975: 225) which could be lost and afterwards replaced with another similar ram, rather than to remain attached to the enemy ship in the collision phase (Fig. 5). The equipment system of the prow unit of the Syracusan trireme would probably have been assembled according to the same structural principle, or possibly with the two protruding beams connected to the lower sternpost, located below the water-line. Indeed, both of these rams which could be either mounted or replaced as a whole item were conceived with a purely strategic attacking function and were more or less independent from the *embolos*. The essential difference of these ram structures is that in the warship of Marsala they seem designed as a pair of elephant tusks curved upwards, while those of Syracuse, also mounted below the water-line, seem designed with a slightly pincer-like profile.

Finally, though this structural comparison appears as the only direct archaeological evidence available, it must be recognised that the only written source, the veracity and competence of which are guaranteed by genuine military experience, remains the great historian, Thucydides, who, having served in the early Athenian military navy, was also a general in the Athenian fleet. Indeed it was this that provided him with knowledge and expertise concerning maritime military problems.

Furthermore, in the later written classical sources, we can find some accounts of naval battles which refer to ramming under the waterline as well as of technical modifications aimed at a better protection of the prow section both above and below the waterline. A description by Polybius (Histories, XVI,3, 1-2; XVI,4, 11-13) of the battle of Chios in 201 BC, between the Rhodians and the Macedonian fleets refers to a strategy of ramming directed towards striking the underwater part of the ships.

Later Plutarch, in describing the battle of Actium, stresses the strengthened sides of Octavian's ship which were *"constructed of huge square timbers fastened together with iron"* (Anthologia, LXVI,2).

3- Successful use and subsequent disuse of the Syracusan trireme's prow.

The fact that the singular bow set-up did not find favour as a "model" for other military navies may be attributable to the limited spatio-temporal context of the war in question: that is, within the great port of Syracuse, in the late summer of 413 BC.

We must also take into consideration the fact that it was easy for the Syracusan military navy, with the logistical support of its own shipyards *in situ*, in immediate proximity to the port, to modify and integrate structural elements while the routine maintenance and caulking of the hulls of the entire fleet were carried out; in contrast, it would not be feasible for a trireme equipped with a Syracusan-style bow system to deal with the high seas, and especially difficult for it to undertake long stretches of navigation.

Only in the Syracusan military fleet and only in these particular circumstances within the internal perimeter of the great port, was it possible to install on the Syracusan *trireme* such a sophisticated attacking system.

Nevertheless, we have also to recognise that during the battle of Chios, the Rhodian fleet operated an attacking approach, that of "prow to prow", which seems to recall the Syracusan strategy. As Polybius wrote *"[...]they depressed the bows of their own ships, thus they received the enemy blows above the waterline and rendered their own blows fatal by inflicting their wounds below the waterline"* (Histories, XVI). I do not exclude the possibility that the Rhodian navy would be influenced by the earlier well-known sea-battle occurring in 413 BC and by the nautical knowledge experienced by the Syracusans over the century. It should also be pointed out that the Rhodians themself were involved in the colonisation of Sicily in the late 8th century BC and that they were strictly connected with the foundation of Gela and Lipari with which they used to maintain strong relationships. It should also be underlined that both Gela and Lipari, which were colonised by the Rhodians, were allies of Syracuse for some time and that they all engaged in various naval battles together against the common enemy. It appears that the Rhodian navy could have taken note of the improvements made by the Syracusan fleet, applying the new technical changes to its own war-ships.

4- Naval tactics.

Thucydides describes the crucial moment of the attacking strategy devised by the Syracusan navy as a strategy carried out on the tactical plane by means of two fundamental components: ramming of the bow and lateral assault. He writes as follows:" *[...]the Syracusans manoeuvre the ships taking care to strike with the prow, following an established strategy; equipped with rams, they would smash into the bow planks of the Athenian craft around where the line of oars stopped. But even more serious was the damage wreaked by those Syracusans who on small boats circled around the enemy trireme and darted all along the flanks, slipping under the rows of oars to slay the oarsmen by running them through*" (Thuc.,VII, 40, 5).

The head-on collision with enemy prows was thus only the first move in a more complex tactical strategy which demanded the attention of the prow officer (the *proreus*) and of the soldiers on board (*epibatai*) in the bow section of the trireme; it therefore required a phase of direct attack of an immediate and unpredictable nature upon the oarsmen in the first rank; this was carried out by small craft which would thrust themselves into the ship, killing the aforementioned oarsmen.

This second decisive phase was complementary to the *'bow ramming'* plan of attack, and was undoubtedly the most extraordinary tactical prowess of the Syracusan navy because it resulted in the rowing system of the opposing vessel being thrown into utter disarray. This meant, in technical terms, rendering the enemy ship completely unsteerable, leading to a loss of its only propulsive force and ending in an uncontrollable and uncontrolled tangle of oars thrashing against oars. The use of this manoeuvre was considered by the Athenians a *'sign of gross incompetence on the part of the helmsmen'* while at the same time it is impossible to ignore the extreme logical rigour on which it was based.

This tactical innovation would have been impossible without the development of the attacking qualities of the *'embolos'*, and marks the most important moment in the evolution of naval tactics in antiquity.

5- Defensive installations in the Great Harbour.

The stratagems used on that occasion by the Syracusans were not limited to the study of naval technical and attacking solutions, but extended to the whole sea-going context in which the action of the great battle was waged, not neglecting to consider the potential offered by the sea bottom of the great port as well.

The positioning on the sea bed of long pointed posts, conceived of as a sort of hidden artificial shallows onto which to drive enemy ships, put in place by underwater workers – the first divers in history used for the purposes of war – presupposes a detailed preliminary knowledge of the sea bed and therefore a considered choice of sites to be 'mined'. It therefore presupposes the accomplishment of accurate nautical maps accompanied by soundings, a veritable 'military map' with secret 'traps' into which to direct the enemy ships with a view to bringing about the breaking of the bottom of the hulls of the Athenian fleet and their allies.

Thucydides writes that the paling was most lethal in that hidden beneath the surface of the water were sharpened trunks, fixed in such a way that the tips did not come out above the surface of the sea. A dreadful risk of drifting onto them with the keel: almost like shallows for anyone uncautious enough to run their ship onto them. But divers, mercenaries, swimming underwater could manage to saw these off; obviously the Syracusans would replace the posts.

At this point it is necessary to address the question of how genuinely decisive Syracusan technical and constructive innovation was in the course of military history and naval architecture.

The use of ramming and the ram was to remain the fundamental means of attack of the whole classical age, to the point that a military ship, whether Greek, Roman or Carthaginian, or of whatever other Mediterranean navy, would be inconceivable if not equipped with its own prow ram. And again are not the 'long pointed posts' fixed in the sea bed of the great port, to a height lower than the water-line of the trireme, perhaps a forerunner of that tactic which in the modern era evolved into floating mines over secret military routes?

6- The possibility of discovering remains of ancient warships in the Great Harbour of Syracuse.

In the decisive naval encounter of the Sicilian expedition of the Peloponnesian War, in the late summer of 413 BC, the components of the Syracusan and Athenian fleets with their respective allies approached 200 vessels; at the end of what was proverbially characterised by Thucydides as *"the greatest defeat for the vanquished and the greatest victory for the victors"* (VII, 88, 5), we read, again in Thucydides (VII, 72, 1): ' *"[...] the Syracusans and their allies were victorious and gathered up their wrecks and their dead and after that sailed home and set up a trophy[...]".* As the most basic rules of economy show, and as Thucydides himself explicitly indicates, many of the ships engaged in the conflict were recovered by the Syracusans, apparently to be re-used wholesale as nautical means, or in the worst cases to recover at least the fittings on board or to recycle the timber of the structure for whatever purpose, even as firewood. Thucydides does not want for other precise references to recovery, from which the aim of re-use is evident, whether of the craft or of the naval instrumentation: *"[...] they recovered on the shore the remains of the Syracusan timbers [...]"* (Thuc., VII,23,4), *"[...] the sails and other tackle of forty triremes were requisitioned there, along with three other triremes that had been drawn up on shore [...]"*(Thuc., VII,24,2).

I do not wish here in any way to disappoint the expectations of the many who think they will find on the sea bottom of the great port the *triremes* of the two warring sides, but it is evident that it is impossible to find even a part of the entire fleet. Many exacerbating factors, three in particular, also conspire to appreciably reduce the potential for preservation of these early remains of war. First of all, intense dredging activity has been carried out over the years and is even now in progress, to allow ships with large draughts entry to the port; but fortunately, or unfortunately, this has been limited to a stretch which constitutes only 10% of the area of the great port. There remains a good 90% of the whole basin, the coastal morphology of which must have been quite different as well in classical antiquity, perhaps covering a wider area of water.

A second aggravating factor consists in the large quantity of sediment that has flowed over the centuries from the Ciane and from the Anapo, the waters flowing out into the interior of the port; this has given rise to the formation of a thick layer of sediment. But if we wish to look at this latter aspect in a positive light we can see that this blanket of sediment, like a kind of cloak with a protective covering, has conserved these ships or parts of them over time, saved from raids by the Syracusans aimed at plundering spoils of war; these would have come from ships which had been rammed or smashed on the underwater posts, then sank, coming to rest on the sea bottom of the port. However, if on the one hand this latter aspect constitutes a guarantee of conservation for potential remains or parts of them, on the other hand it constitutes a substantial limitation to underwater archaeological research.

The investigations carried out in the great port in 1987 together with the *Cooperativa Aquarius*, under the direction of the *Soprintendenza Archeologica di Siracusa*, did not reveal anything that could be connected to the great war event which marked the end of the 5th century BC. The research activities, whether on the surface or at depth underwater, made use of a geophysical device installed on board the MV 'Enea'; a diagnostic instrument which, though sophisticated, was unable to penetrate the blanket of sediment which had potentially preserved the 'remains'. This attempt at investigation does not, however, exclude the possibility that more sophisticated geophysical research devices might be utilised, such as a stratigraphic spectroscope which would enable penetration through the sediment and retrieval of the rocky profile of the 'real' sounding, along with the variety of evidence deposited there throughout the centuries.

A third aggravating factor, and decidedly the most important, concerns the technico-constructive aspect of the *trireme*, which, in light of the previously discussed structural elements, namely 'speed, manoeuvrability, and lightness', was devoid of ballast. This technically meant that when the ship was rammed, or put out of action by the enemy vessels, it could not sink because the weight exerted by the ballast – or by the cargo upon it – did not burden it down, as occurred in the case of merchant ships; the most that could occur was a 'shipping of water' through the leak caused by a weighing down of the ship bottom just below the water-line.

Indeed, the simplest laws of physics demonstrate that wood, being a floating material, can only be sunk if pushed down by another element of a heavier weight. There is also no absence of specific references in early historiography from Herodotus to Thucydides to Diodorus Siculus regarding the fact that when subjected to ramming, such a vessel would ship water, but not sink, enabling it to be recovered or perhaps even to be towed back. This last detail in particular is extremely clear from a passage of Diodorus in which, in regard to the naval battle between Ptolomy Soter and Demetrius

Poliorcete in 307 BC., it is recorded that *"[...] of the battleships[...] the victors towed them, full of water [...]"*. Generally, the bottom of both military and merchant ships was subject to rapid breaking-up and dispersion of the upper deck and of all its components, particularly because this type of vessel was not kept down by any greater force, unlike what would occur with the bottoms of mercantile ships which, in the event of wreckage, would sink beneath the weight exerted by their cargo and by their ballast.

According to the same principle, the very idea of being able to find the bottom of an entire *trireme* is absolutely inconceivable, whilst the possibility of identifying the upper works is minimal, apart from in the case of so-called 'beached remains'.

According to the established pratice of early sea-faring, the warships were in fact beached because the timberwork of the bottom had to be in a dry atmosphere, even if for a brief period, while at the same time undergoing the routine process of caulking and overhaul required for the treatment of timber. Recent studies on this particular phenomenon of remains buried under the sand "in beach environments" emphasise in particular how, at the moment of their finding, the remains display conditions of preservation which are frequently better as compared with those found in underwater contexts, promoting a remarkable state of preservation of the hulls and organic material. It is clear then that the *trireme* was not made of wood alone, but it was also equipped with metal instrumentation which would definitely, if not recovered in advance, have swiftly plunged down onto the sea bottom of the great port.

Among the accessories on board the military ships, and the *trireme* in particular, the presence of nautical equipment made of metal was noteworthy: from the anchors, to the runners of the sails (sails were only used during displacements), to the weapons borne by the crew, or by the soldiers on board, the '*epibatai*', and the archers, the '*toxotai*', and particularly the "*embolos*" armed with a ram of cast bronze, as in the well known case of Athlit (Casson, Steffy, 1991). The *triremes* of the Athenian fleet were further equipped with heavy metal components, the so-called 'grappling irons' hung from the mast, set up to smash down onto an approaching opposing vessel.

These observations thus orient the research towards a systematic inquiry aimed at the identification of the remains of the metal parts of the equipment on board, and of the possible remains of the planking or of the hull, along the early coastal strip of the great port.

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LIST OF ILLUSTRATIONS

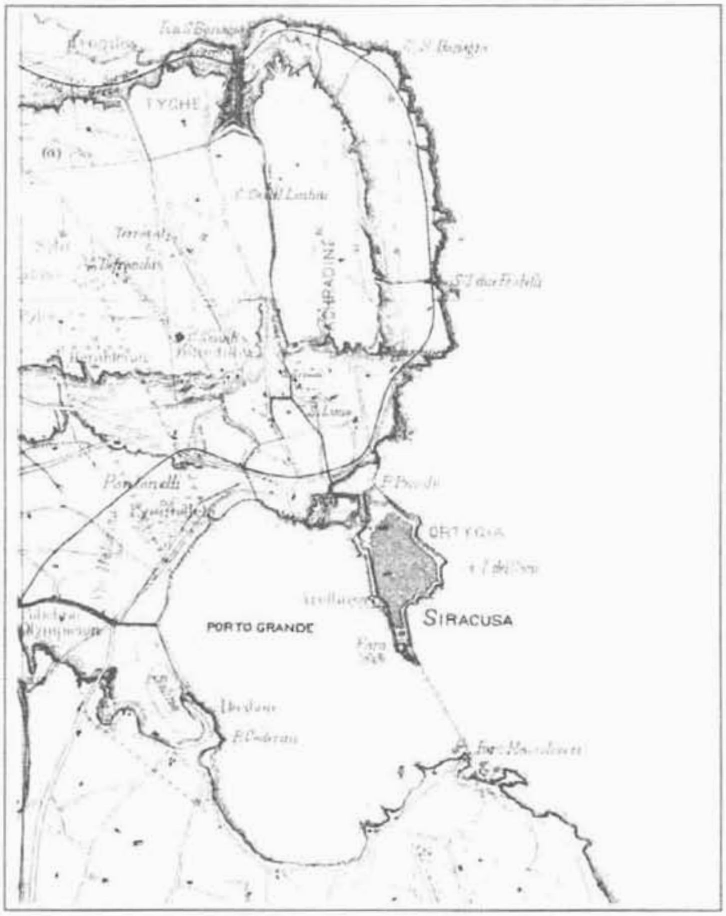


Fig. 1

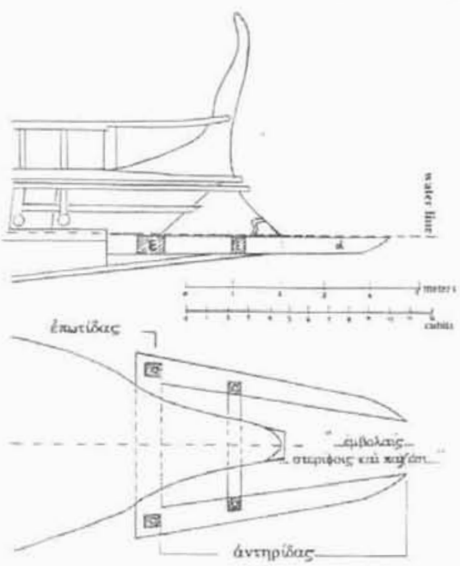


Fig. 2

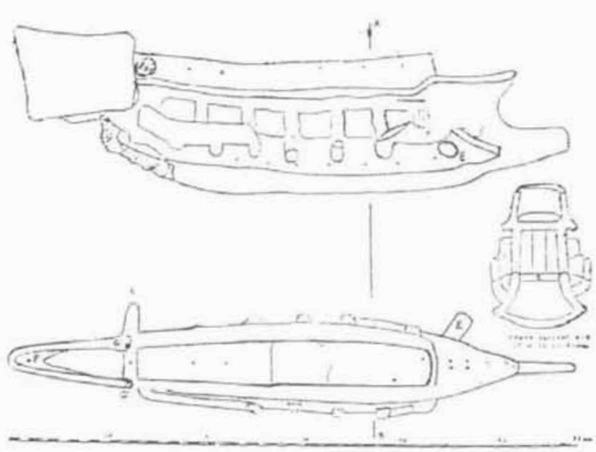
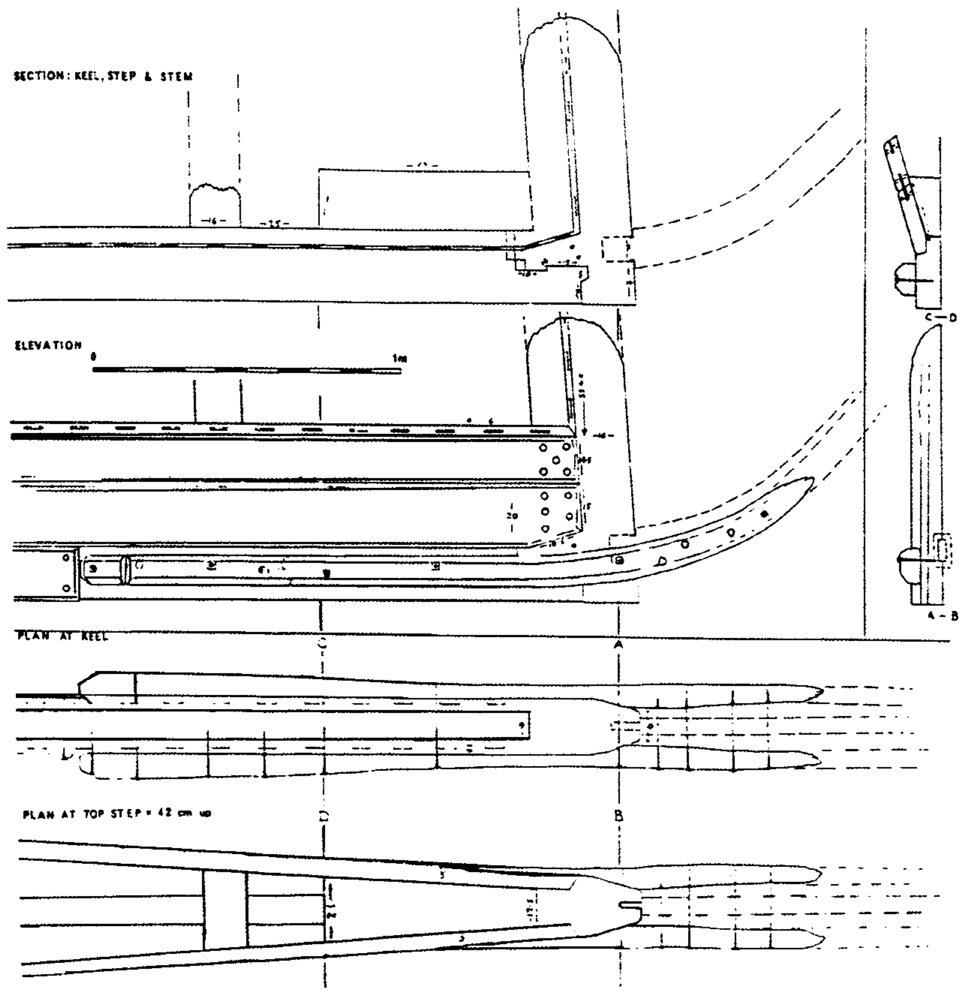


Fig. 3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C—D
A—B

Fig. 4

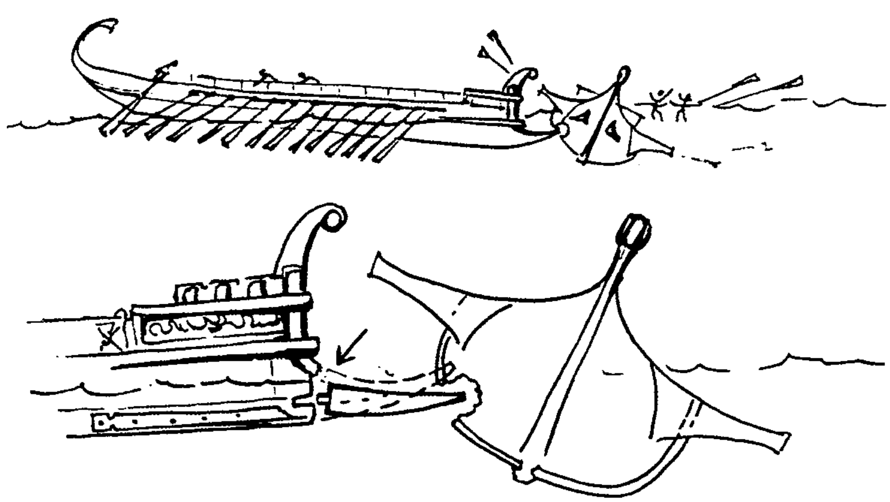

Fig. 5

ARAB-BYZANTINE STRUGGLE IN THE SEA: NAVAL TACTICS (7th-11th Centuries A.D.): THEORY AND PRACTICE

Introduction

Thalassocracy has been a major contributor to the establishment of any superpower,[1] a dictum well understood in our time in which we witnessed the spread of the American naval power from the Atlantic to the Persian Gulf. It is well known that a major factor, among many others, for the failure of Napoleon's efforts to dominate in Europe was his inability to understand the importance of a strong French navy to which testify his humiliating defeats in Abu Kir (1798) and Trafalgar (1805).

In spite of this reality, there is an example of an empire established without a navy, the Arab-Islamic. The Arabs, moving rapidly, conquered most of the Near East by the middle of the 7th century. At the time of the final conquest of Egypt in 645 there was not a single Arab ship sailing in the Mediterranean.[2] Astonishingly, in just a few years, Arab warships crossed the Eastern Mediterranean. In 649 they attacked Cyprus and a number of sea raids followed. The aggressive naval policy of the Arabs shook the Byzantines, who were taken by surprise, unprepared in front of the new enemy.

A long and painful sea struggle started in the Mediterranean, which lasted until the 11th century and this time span will become the focus of this study. It can be divided into four periods: (a) 649 – 717; (b) 717 – 824-6; (c) 824-6 – 965; (d) 965 – 11th century. It should be noted that each period had its own particular characteristics and it is a mistake to try to trace the general patterns of the naval strategy of the Arabs based solely on any of these particular periods or worse the later ones, i.e. the Mameluke, and even the irrelevant Ottoman period.[3]

The first period starting in 649 is marked more by the audacity of the Arabs rather than by their actual naval power. The Arabs understood the importance of naval power and undertook frantic efforts to construct ships and recruit crews.[4] The person who understood thoroughly the importance of naval power was the governor of Syria, Mu'awiyah, who later became a caliph (661-680 A.D.). His naval strategy closely resembles that of the Japanese admiral, Satô Tsutarô (1886-1942), who just a few years before the Second World War urged the Japanese authorities to create a strong navy, apply an aggressive policy and a preventive naval strategy in attacking the enemy.[5] Mu'awiyah, while still a governor of Syria, constantly pressed Caliph 'Umar I (634-644) to undertake an aggressive policy of naval *jihad.* A well known tradition reports that 'Umar's answer was: "Men in the sea are vulnerable like worms in the tree". Mu'awiyah's pressure brought better results with 'Umar's successor, 'Uthman (644-656), who reluctantly accepted Mu'awiyah's aggressive naval policy.

While Mu'awiyah's great efforts to organize an Arab navy were positive and absolutely necessary, his aggressive naval *jihad* ended without any long lasting conquests. In spite of the Arabs landing on Rhodes and Crete no permanent conquests were secured. Worse was Mu'awiyah's attempt to conquer Constantinople in the siege of 674-680. Mu'awiyah's siege as well as that by the Umayyad Caliph Sulayman were doomed to fail because of the Arabs' lack of proper naval preparedness.

The great advantage for the Arabs in both sieges of Constantinople was the element of surprise. Such daring actions by people who had just entered the field of navigation challenged the Byzantines. On the other hand, their courageous and well-planned defense saved them from defeat. The invention, in reality perfection, and use of a new weapon, the Greek fire, little contributed to the Byzantine success. As Clark Reynolds correctly points out, "it is a very human assumption that the dominant weapon should determine the strategy and tactics of a given period. Often this has proved to be a sound assumption. But just as often, strategic and tactical realities change, rendering the apparently dominant weapon less effective or even downright obsolete.[6]"

The Greek fire being by far less than "an atomic bomb", as it has been sometimes labeled, had a limited and a rather psychological effect on the Arabs. Actually, a crude form of Greek fire, called "naft", was used by the Arabs in their early raids. The main causes of the two failures of the Arab sieges were their lack of any realistic appreciation of the strength of the heavy fortifications of Constantinople, their unawareness of the stormy waters of the Black Sea and the great disparity which existed between the sailors and the marines. Of course, the brave determination of the Byzantines, strengthened by their religious fervor, to defend their city cannot also be denied. Byzantine iconography depicts this Christian devotion attributing the victory to the divine protection of Constantinople.

Concerning the walls of Constantinople, none of the weapons of the time and those of the following centuries could prove good enough for any serious damage. Through the Byzantine Empire and the Near East, castles as that of the Crac des Chevaliers in Syria witness their irresistible fortifications. It is only the use of gunpowder launched by Mehmet II's canons which proved destructive in 1453, a time that the capital was only a faint image of the old glorious capital and its resistance was in general minimal. It is characteristic how the Syrian admiral Ghulam Zurafa (originally Leo of Tripoli) in 904, sailing from Asia Minor, was tempted to attack Constantinople, but realizing the danger this experienced sailor just passed by and continued towards Thessaloniki.[7]

Concerning the weather conditions and the stormy waters of the Black Sea and the Aegean, the ignorance of the importance of these factors brought heavy losses to the Arab fleet. Finally, the lack of coordination and spirit of cooperation between the Christian sailors and the Moslem marines during this period is clearly manifested in the desertion of a large number of Christian sailors in the second siege (716-717) who embarked the small boats, attached to warships, and surrendered to the Byzantines.[8]

The impact of the Greek fire should be examined only within the frame of the greater inability of the Arabs at this period to use the proper means of naval warfare. One more century would be needed for them to acquire the expertise required. Their early conflicts with the Byzantines at sea did not manifest any such naval expertise. Even in their spectacular success in the famous battle known as *Dhat as-Sawari* in 655, as has been shown by the present author, the most rudimental rules of naval warfare were grossly neglected by both parties, partly because of the Byzantines' underestimation of their enemy.[9] The two fleets faced each other the whole night before their engagement without any plan. No projectiles were thrown between each other, either with arrows or stones launched from special machines. Even in the previous periods this was the typical way of starting an engagement by destroying parts of the enemy ships and eliminating some of the enemy fighters. Ibn al-Manqali reports that in such cases the helmsman was the target, an easy victim because of his conspicuous post on the poop deck and suggests ready replacements.[10]

No ram was used by any ships of either party. Since boarding practice required great skill, the Arabs found an easier solution; they managed to tie their ships to those of the enemy and thus they changed the naval warfare into land warfare.

To sum up, in the naval battle of *Dhat as-Sawari* we notice the following astonishing facts. None of the two parties took into consideration the wind or any suitable position for their fleets. The warships, being a developed form of the early, one-banked, swift dromon described in Procopius (middle of 6th c.),[11] were most probably double-banked, carrying heavily armed marines. The victorious Arabs captured no enemy ships as they did in other later naval engagements.[12] Actually, a real success of the Arabs could be achieved only with fewer losses of their own ships and marines.

Similar grave mistakes, as noticed above, were repeated by the Arabs in their two sieges of Constantinople, which were doomed to fail, mainly because of their inexperience in mobile naval warfare. The lack of mobility and maneuverability explains the Arabs' inability to cope at that time with the Greek fire as well as with all the other naval weapons of the time. A full development of the Arab naval power was reached at the turn of the ninth century. By that time the Arabs had also developed important merchant fleets, criss-crossing on the one hand, the Mediterranean from Alexandria to Spain, and on the other the Indian Ocean from the Straits of Bab al-Mandab to India and China. The interrelationship between merchant and war fleets is easily understood and was a very important factor for the development of any navy in medieval times.

The second period (717 – 824-6) of the Arab-Byzantine struggle in the Mediterranean can be characterized as a period of constant organization of both Arabs and Byzantines. The latter organized a special fleet in Constantinople and a number of thematic fleets which undertook the defense of the islands.[13]

The third period (824-6 – 965) can be considered without hesitation as that of Arab thalassocracy. Taking advantage of favoring circumstances, the Arabs conquered Crete (ca. 824-6) and started the conquest of Sicily in 826, completed in 902.[14] The conquest of Crete was achieved by a split group of the Andalusian Arabs supported by the Egyptian navy, the second by the Aghlabid Arabs of North Africa. It is at this period that the typical warship known in Byzantine sources as "dromon" and in the Arabic as "shini" is used. The combination of Byzantine and Arabic sources leads us to certain rather clear indications about the structure of the dromon-shini and its function. Unfortunately, while an increasing number of shipwrecks of merchant ships are continuously discovered in the Aegean Sea, no shipwrecks of warships dating from the period of Arab-Byzantine struggle have been found. The warship of Marsala in Sicily dates from the earlier period.[15] The merchant ships usually sink vertically and have been preserved in this position by their cargo, mainly amphorae.[16] In contrast most of the warships are either burnt, destroyed or captured.[17]

Concerning the structure of the dromon-shini of this period, the reader will find a number of useful relevant pictures in the appendix of the present article. The following two remarks can be added. Concerning the masts and sails, I believe that at least until the middle of the 10th century the Byzantine dromon had mainly one big mast at the center of the ship and one or two of the supplementary ones in front and in the rear, smaller in size. Most probably, during the naval battles – as it happened in the Greek and Roman periods – the big mast was lowered and one or two of the supplementary masts were used. R. H. Dolley's view that there were two or three big masts seems to be correct only for the later period.[18] But his remark that the forecastle was between two masts seems valid if we take into consideration that the other masts were only supplementary.

Concerning the second remark, it should be repeated here that the Byzantines deliberately concealed many elements in the military manuals for the fear of foreign intelligence. Actually revealing information to foreigners was a serious crime for which capital punishment was applied.[19] In contrast, the Arabic war manuals were never restricted with such considerations. Thus, al-Manqali offers the following practical information:[20] "The knives of the soldiers can be placed hidden in their shields, or attached to their hands or in their boots. The first is recommended for marines. Marines should also be careful to avoid putting their swords in the middle of their belt as it is the most common practice". Of course, even foot soldiers could carry the swords on their shoulders, but this was rather unusual. More interesting is Ibn al-Manqali's reference to the use of non-accepted lethal weapons. He reveals that there is a poisonous liquid which can be thrown against the eyes of an enemy marine which will immediately blind him. He further reports that such means are avoided by pious Moslems but somehow we get the impression that he indirectly approves of such means.[21]

Another factor that should be mentioned before I proceed with the concrete examination of the naval tactics is the selection of the crew members for the Arab and Byzantine warships. This is an important factor for the successful application of any naval tactics. The prevailing conception, in general, in modern times is the rough treatment of captives and/or convicts who, half-naked, moved the oars or worked in the sails under the whip of a tough master. Of course, this is the reality in later times of navigation in the

Mediterranean, but far removed from the reality which existed at the time of the Arab-Byzantine struggle (7^{th}-12^{th} c.). Even in earlier times the crews of the navies were never treated in such a way. In the Athenian navy with a few exceptions, no slaves were used and the navy people enjoyed great respect.[22] During the early Roman period the members of the crews of the fleets were mainly peregrini and a number of liberated slaves.[23] It should be mentioned here that a letter dating from the 2^{nd} c. A.D. reveals that during this century to serve in the Roman navy was considered very honorable. A certain Sembronius, writing to his son Gaion, in great grief reproaches him for not enlisting in the navy and threatens to disown him as a son if he does not do so in the future.[24]

By the tenth century in both the Byzantine and Arab navies the most skilful were enlisted in the navy. This appears clearly in the texts of Leo VI and Qudama Bn Ja'far. Qudama's text is more explicit since he repeats that even the oarsmen (*al-qadhafin*) were selected among the best.[25]

Concerning the concrete naval tactics in both manuals the main types which appear in both texts are three. However, before proceeding to these naval tactics which are suggested in the Byzantine and Arabic manuals of war, it is necessary to present the general principles that dictated the naval strategy of both Arabs and Byzantines.

A general principle applied through the ages, which I have repeatedly emphasized, was "caution before any serious naval engagement and retreating in front of superior enemy forces"[26], on account of the brittle and expensive nature of the ships. Even in contemporary times this principle is partly applied, because of – as Reynolds points out – "the biggest expense in ships, which are costly to build, arm, supply, keep up and repair."[27] Of course, in special cases when a situation is such that risky naval operations are the only way to act this principle has not been followed.

Such precaution did not mean inaction but was replaced by sudden and unexpected movements as it appears in the historical sources. A glaring example is the ruse used by the Byzantine admiral Ooryphas, who ingeniously dragged his fleet over the isthmus of Corinth and surprised and routed the Arab fleet.[28]

Both Leo VI and Ibn al-Manqali – in his work *Al-Adillatu* – describe the most common naval arrangements used in naval battles of oared ships. Syrianus (6^{th} c. A.D.) suggests – point missed in the above authors – that these dispositions of the fleet should not be applied before the engagement, but only after the enemy approaches in order to surprise him.[29]

FORMATIONS

The most common type of formation is the concave crescent formation, which appears almost identical in both the texts of Leo VI and Ibn al-Manqali's *Al-Adillatu*. Ibn al-Manqali does not report Leo VI in any of his descriptions of formation in this work- in contrast to his general practice in *Al-Ahkam*. Most probably he took into consideration the text of Leo VI along with other sources.

Concave Crescent Formation:[30]

The text of Leo VI describes it as follows (§ 50, Dain, 28):

Ποτὲ μὲν μηνοειδῶς οἷον ἡμικυκλίου τάξιν, τοὺς μὲν ἄλλους δρόμωνας ἔνθεν κἀκεῖθεν οἷον κέρατα τινα ἢ χεῖρας καὶ μάλιστα ἐν τῷ ἄκρῳ προάγοντας τοὺς ἀλκιμωτέρους καὶ μείζονας· ἐν δὲ τῷ κοίλῳ τοῦ ἡμικυκλίου οἱονεί τινα κεφαλὴν τὴν σὴν ἐνδοξότητα ὥστε πάντα περισκοπεῖν καὶ διατάττειν καὶ διοικεῖν καὶ εἴ που δεῖ βοηθείας ἐπικουρεῖν μεθ'ὧν ἂν βούλῃ ἐπὶ τούτῳ εὐκαιρούντων. Τὸ δὲ σχῆμα τὸ μηνοειδὲς γινέσθω ὥστε τοὺς ἐμπίπτοντας πολεμίους ἐντὸς ἀποκλείεσθαι τῆς κυκλώσεως.

Other times your order must have the shape of half-moon, resembling a half-circle. You will put the rest of the dromons on both sides like horns or hands, at the edges the strongest and biggest ships will be placed while at the middle of the half-circle your excellency will be placed at the head, in order to watch everything around and to give orders and administrate and to run for help wherever this is needed using the proper dromons that are available. Let the formation be half-moon, so that the enemies that attack you will be trapped in the internal part of the half-circle.

Ibn al-Manqali, *Adillatu*, p. 247.
Translation: *Another time. Let your ships be lined up next to you towards the right and left. And the commander will be in the middle (literally in the place of the heart) in order to watch everything and to supervise and to order whatever is needed to be done and whatever he watches close to him to become weak, in order to be able to offer his assistance...And we mention to you the formation of half a circle in order to encircle the enemy...*

Column and Line Abreast (ahead) Formation:

Although both the Greek and Arabic texts start with the "concave crescent formation", the fleets sail before any engagement in "column formation", one after the other, trying to keep the same distance and the same speed between them. From this "column formation" the fleet moves into the "line abreast formation". Both the Arab and Byzantine fleets use the line abreast formation described by Leo VI and Ibn al-Manqali.

Leo VI (§51, Dain, 28)
Ποτὲ δὲ παρατάξεις κατὰ μέτωπον ἐπ' εὐθείας ὥστε χρείας καλούσης ἐπιπίπτειν τοῖς πολεμοίοις κατὰ πρῴραν καὶ διὰ τοῦ πυρὸς τῶν σιφώνων ἐμπυρίζειν τὰς ἐκείνων ναῦς.

Translation: *Other times place your fleet in line abreast formation in order, when it is needed, to attack your enemy with bows and to burn their ships with the Greek fire [launched] by the siphons.*

Ibn al-Manqali (*Adillatu,* p. 247)
Translation: *Other times, let yours ships be in the line abreast formation until the occasion of attacking the enemy ships with bows appears and you will launch the Greek fire against them.*

It should be noted that in this formation the ships approach the enemy with their prows facing their own. This formation usually precedes the concave crescent formation.

Tactical Concepts or Supplementary Suggestions
Ibn al-Manqali and Leo VI present some similar tactical concepts which cannot be classified along with the formations because they are of minor importance. They are the following.

Leo VI's text (§52, Dain, 28)

Ποτὲ δὲ καὶ εἰς διαφόρους μερίζεσθαι παρατάξεις ἤτοι δύο ἢ τρεῖς κατὰ τὴν ποσότητα τῶν ὑπὸ σὲ δρομώνων. Καὶ τῆς μιᾶς παρατάξεως συμβαλούσης ἡ ἄλλη εἰσπεσεῖται κατὰ τῶν πολεμίων ἤδη ἐμπεπλεγμένων ἢ ὄπισθεν ἢ κατὰ πλευράν καὶ διὰ τῆς βοηθείας τῆς ἐπελθούσης κατ'αὐτῶν ἀπείπωσιν οἱ πολέμιοι τοῦ τόνου.

Translation: *Divide your fleet into more than one unit, i.e. in two or three series according to the number of the dromons you have under your orders. While one unit engages the enemy, the other will attack the enemy who will be involved in fighting from the rear or from the side and thus, thanks to the assistance of the second dispatched unity, the power of the enemy will be weakened.*

Ibn al-Manqali (p.248)
Translation: On another occasion divide the naval force into two parts or three according to the number of the ships you have. And while the first unit attacks the enemy and it is involved with it, the other unit attacks [the enemy] from behind or the sides.

Another Concept: Leo VI (§54, Dain, 29)

Ἄλλοτε δὲ δι'ἐλαφρῶν καὶ ταχινῶν δρομώνων συμβαλλόντων αὐτοῖς καὶ προσποιουμένων φυγεῖν, κἀκείνων ἐν τῇ διώξει κοπουμένων καὶ βιαζομένων μέν, μὴ καταλαμβανόντων δὲ τοὺς φεύγοντας, ἤ καί τινων τῆς συνεχείας ἀποτεμνομένων, ἕτεροί σου δρόμωνες ἄκοποι καὶ ἀνπεπαυμένοι κατὰ τῶν κατασκόπων ὁρμήσαντες αἱρήσουσιν αὐτούς ἤ, εἰ καὶ δυνατὰ τῶν ἐχθρῶν πλοῖα παρελθεῖν, ἰσχύσας τις τοῖς ἀσθενεστέροις ἐπιτεθῇ.

Translation: *Another time you will get engaged with the enemy with light and swift dromons which will pretend that they are retreating and while the enemy starts being tired of pursuing and will be in a hurry without catching the retreating ships or if some of the enemy ships are detached from the main part of the fleet, other dromons will attack the proceeding ships and capture them or side passing the strong ships they will attack the weak with crews who are rested and relaxed.*
Ibn al-Manqali (p. 248)
Translation: *Other times you will attack them with light ships and they will pretend retreating and when the enemy ships are dispersed seeking the enemy... they will attack them suddenly with other ships and when the enemy oarsmen are tired, you send against them the crews of the ships who have rested and if possible you side pass the strong ships [of the enemy] and you hit the weak.*

A number of other suggestions concerning naval warfare appear in the Byzantine and Arabic naval manuals. These sources emphasize the importance of having well trained and dedicated sailors and marines. They describe the warships, their equipment and the arms of the marines. It should be noted that, as has been already been mentioned in this article, the Arabic sources offer us more illuminating details. Thus, while in both Byzantine and Arabic sources the use of Greek fire launched by machines as well as the fire bombs filled with combustibles are reported, the Arabic sources offer us details about the various types of the composition of the Greek fire with designs and even a detailed description of protective fire-proof garments.[31]

The most valuable author on naval warfare, a real mine of information, is Ibn al-Manqali. In his work, *Ahkam*, he declares arrogantly that he knows the work of Leo VI and even more.[32] More important, Ibn al-Manqali is a military man and in contrast to Leo VI his information is concrete and practical. In his work *Al Adillatu ar-Rasmiyyah*, without mentioning the name of Leo VI, he reports some of his suggestions completing them with explanations and additions. Thus, not only he suggests – along with Leo VI- that the lower deck of the ship should be used for the less courageous members of the crew, but he also adds that the wounded should be placed there. Moreover, he informs us that every warship should include four medical experts specializing in the treatment of wounded and their proper dietetic nourishment.[33]

The Byzantine and the Arabic sources also report the use of naval intelligence. Both suggest that when their fleets approach the enemy land, scouting and spying ships must be sent forward. Moreover, Leo VI and Ibn al-Manqali suggest that scouting marines must be sent to the enemy land, but none of them describes how these commandos will operate. Such information appears only in the 4th century war manual, *Epitoma Rei militaris*, written by Vegetius.[34]

Conclusions, Gradual Change of the Byzantine and Arab Geopolitical Naval Thought

The Arab navy appears immediately after the main Arab land conquests in the middle of the 7th century. In the first period (649-717), the Arabs applied, in general, the naval policy of aggressiveness. They defended their coastline with a chain of fortifications equipped with an elaborate alarming communication system and simultaneously they undertook a series of constant raids against the Byzantine islands trying with their maritime "jihad" to complete their terrestrial expansion. The Byzantines taken by surprise reacted initially without any concrete and systematic plan and lost control of the Mediterranean Sea. Maritime trade between Byzantines and Arabs was reduced to a minimum.

The two suicidal attempts of the Arabs to conquer Constantinople without any proper naval preparedness, underestimating the impregnable walls of Constantinople, and the Byzantine superior naval technology in addition to the brave resistance of the Byzantines, mark the end of their futile attempts to acquire any permanent conquests during this period using their naval power.

The peak of the Arab-Byzantine struggle was reached in the 9th-11th centuries. By that time the Arabs developed important merchant fleets in both the Indian Ocean and the Mediterranean Sea. Numerous Arab freighters, taking profit of the monsoons, carried cargoes of wood, pepper, silk and other products from India, China and beyond. Ships of the various Arab states crossed the Mediterranean and experienced Arab sailors embarked on their warships. Meanwhile naval training was intensive as manifested in the Arab naval treatises, which report by far more details than those of the Byzantines including descriptions of various forms of the Greek fire and methods of defense against its use.

Simultaneously, the Byzantines systematically organized their patrolling of the sea with their thematic fleet. Their naval technology developed but little information can be found in their succinct naval treatises. In the first half of the 9th century there was a temporary retreat of the Byzantine supremacy in the Sea resulting from the strong development of the Arab navy and the interior political troubles, mainly the revolt of Thomas (821-823). By the end of the 10th century the Byzantines regained their naval supremacy in the Aegean Sea and a new start in the Arab-Byzantine naval relations. Maritime trade between the two superpowers of the time was intensified replacing the naval confrontation. Byzantine merchant ships visited the Egyptian and Syrian ports while the Arab ships sailed through the ports of Asia Minor to Constantinople. A glaring example of the change of the geopolitical conceptions of the two naval powers of the time is clearly shown in the shipwreck discovered in Serçe Liman, in present day Anatolia of Turkey. This merchant ship sailed freely around the port of Alexandria and the Syrian ports with a cargo of glass reaching the Byzantine ports in Asia Minor, where it was sunk in a storm. The ship's identity had puzzled the specialists who for a long time could not discover whether it was an Arab or Byzantine vessel.[35] Maritime trade had replaced the Arab Byzantine naval warfare.

At this time the Arabs were guided by one central government with its capital in Damascus. But they used separated naval centers, mainly in Alexandria and Damietta of Egypt, Tyr and Acre in Syria and Palestine and Tunis in North Africa. Their fleets closely cooperated keeping their independence and we occasionally notice certain frictions. Thus, a Greek inscription dating from 710 reports a complaint by the Egyptians, because some of their well trained sailors remained in North Africa at the end of a raid against the Byzantines instead of returning home.[36]

At the turn of the 9th century after a period of intense naval preparedness by both sides, we reach the peak of the Arab-Byzantine struggle. It is only at that time that the Arabs acquire complete naval preparedness based not only on special military training but also on a theoretical approach to naval warfare as their war manuals reveal. During this period, which can rightly be called "the time of Arab thalassocracy", certain external factors greatly contributed to the success of the "maritime jihad". Of course, external factors had always been important for the Arab-Byzantine naval warfare. Thus, the period of unrest following the murder of Caliph 'Uthman (656) and the rule of 'Abd al-Malik (685-705) arrested the Arabs' naval activities temporarily. On the other hand, the end of Heracleius' reign (+641) and the second rule of Emperor Justinian II (705-711) had devastating results on the effectiveness of the Byzantine navy.[37]

Nevertheless, the period of Arab thalassocracy was greatly enhanced by two important events of which the impact, especially of the first, was overwhelming. This was the revolution of Thomas (821-823). The Byzantine sources describe extensively the destructions brought by Thomas' revolt and the great upheaval in the Byzantine navy caused by him. Actually, most of the fleet sided with him and Thomas with many ships dared to attack Constantinople. Most of his ships, belonging to the thematic fleet, were destroyed by the fleet of Constantinople.[38] Thus, the Aegean Sea was left open, completely unprotected. It is this vacuum, as explicitly stated by the Byzantine sources, that enabled the Arabs to conquer Crete.[39] The exact date of the Arab attack cannot be determined, but there is no doubt that it followed the havoc brought to the Aegean by the revolt of Thomas.

Of course, in spite of this vacuum, the Arabs could not have conquered Crete without their well-equipped warships provided by the Egyptians. The Egyptians had repeatedly raided and even tried to conquer Crete without success. An Arab inscription found in Tsoutsouros of Crete (dating from the year 715 A.D.) bears witness to these attacks[40]. Moreover, even after the Arab conquest of Crete a constant flow of military supplies was sent by the Egyptians in exchange for Cretan products.

The element of hazard does also appear in the Arab conquest of Sicily although to a lesser degree. The Arabs had raided this island already from the seventh century, but they decided to conquer it only in the ninth century. Actually even at this period they hesitated, fearing the Byzantines' might. The revolt against the central government of the governor of Sicily Euphemius and his proposal to the Arabs for an alliance opened the way to the conquest of Sicily in (826-902). During the long struggle of the Aghlabids of North Africa to secure the final conquest of this island numerous small scale naval battles took place in which the Arabs demonstrated competence and naval efficiency.

The situation was overturned at the end of the tenth century when the Byzantines reconquered Crete. After a number of previous futile attempts by the Byzantines, Nicephorus Phocas organized a formidable fleet equipped with excellent weaponry and a large number of well trained soldiers. The meeting of all the units of this fleet in Phygela coming from various places of the Empire was an admirable task difficult to be accomplished even in modern times. Again, of course, the element of hazard played an important role since none of the other Islamic states came to the assistance of the Emirate of Crete, but this time naval preparedness was the main factor of success.

The eleventh century period of symbiosis dominated the maritime activities of Byzantines and Arabs. The trade relations between the two naval superpowers of the time increased greatly and the literary sources as well as the shipwrecks reveal a freedom in the movements of the Byzantine and Arab merchant ships in the ports of the Eastern Mediterranean.

By the twelfth-thirteenth centuries the rise of the maritime Western states had overturned the balance of naval power in the Mediterranean. New technology in the construction and equipment of ships appeared, warships had now multiple heavy masts with overhanging castles. The ram reappeared over the waterline as a supplementary weapon and canons loaded with gunpowder eventually replaced the previous war machines. Along with these innovations, which developed in the 14^{th} and 15^{th} centuries, an important change was to be noticed, the replacement mainly of well-chosen sailors and oarsmen by slaves. Hordes of slaves living under despicable conditions were now embarked on the warships mainly as oarsmen, changing drastically the way of naval warfare.

New naval strategies appeared, and the Arabs and Byzantines were no longer the main protagonists. The Eastern Mediterranean ceased to be the center of naval activities until the appearance of the Ottoman navy. In the Middle and Western Mediterranean, the Italian city-states and Spain emerged as the new protagonists in navigation and eventually the Atlantic Ocean opened a new chapter in maritime history.

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NOTES

1 For the dominant force of thalassocracy in the history of great nations, see Clark G. Reynolds, *History and the Sea: Essays on Maritime Strategies*, Columbia, South Carolina 1989, 4: "Real imperial powers may be considered as those great nations in history which have based their national political and economic policies and strategies chiefly on maritime activities: commercial trade, overseas possessions or dependencies, and naval forces."

2 It should be noted that the Arabs were engaged in navigation as ship owners and sailors in the Red Sea in pre-Islamic times; see M. Zemouli, "La navigation maritime chez les Arabes à travers les textes du Coran et la poésie arabe", in V. Christides, ed., *Sailing Ships of the Mediterranean Sea and the Arabian Gulf. Navigation in the Red Sea and the Indian Ocean*, vol. II, Athens 2000, 605 ff.

3 See such a generalization in Xanvier de Panhol, *L'Islam et la mer*, Paris 2000, and André Nied, "Y-a-t-il une pensée navale arabe?" in H. Couteau-Bégarie, ed., *La pensée géopolitique navale*, Paris 1995, 29ff. Nied astonishingly remarks: " 'Arabe' doit être admis comme 'non chrétien', car la pensée qui sera étudié est la manifestation des choix stratégiques des chefs barbaresques, ottomans, abbassides, mongols, safavides, yéménites et ...arabes".

4 V. Christides, "Milaha", *EI*[2] VII (1993), 42.

5 M. Peattie and D. Evans, "Satô Tatsutarô et les contradictions de la stratégie navale du Japon", in Coutau-Bégarie, op.cit., 31ff..

6 Reynolds, op. cit., 12.

7 Christides, "The Raids of the Moslems of Crete in the Aegean Sea: Piracy and Conquest", *Byzantion* 51 (1981), 76-111. For the practice of extreme caution in naval warfare, see Christides, *Byzantine Libya and the March of the Arabs towards the West of North Africa*, Bar International Series 851, Oxford 2000, 79-80.

8 Theophanes, ed. C. de Boor, *Chronographia*, I, Leipzig 1883, reprinted Hildesheim 1963,397: "νυκτὸς τοὺς τῶν κατηνῶν σανδάλους ἄραντες ἐν τῇ πόλει προσέφυγον...". The word "σάνδαλος" is a synonym of "λέμβος". Most probably these "σάνδαλοι" were either attached or embarked on the "κατῆναι", which were big ships used for transportation of goods accompanying the warships of the Arab fleet.

9 Christides, "The Naval Engagement of Dhat as-Sawari 34 A.H./A.D. 655-656. A Classical Example of Naval Warfare Incompetence", *Βυζαντινά* 13 (1985), 1331-1345.

10 Ibn al-Manqali, *Ahkam*, ed. Abd al-Raim, Cairo n.d. Raim's typewritten edition is careless. A printed edition with an English translation of the most important parts is in preparation by the present author with the collaboration of Mohammed Tarek.

11 For Procopius' reference and its interpretation, see my article "Byzantine Dromon and Arab Shini. The Development of the Average Byzantine and Arab Warships and the Problem of the Number and Functions of the Oarsmen", *Tropis* 3 (1995), 112 ff.

12 R. Rose Di Meglio, "Il commercio arabo con la Cina dalla Jahiliyya al X secolo", *Scritti in onore di L. Veccia Vaglieri*, Naples 1964, 525-53.

13 Hélène Ahrweiler, *Byzance et la mer*, Paris 1966, passim.

14 For the conquest of Crete see my book, *The Conquest of Crete by the Arabs (ca. 824). A Turning Point in the Struggle between Byzantium and Islam*, Athens 1984, supplemented with my articles, "Raid and Trade in the Eastern Mediterranean: A Treatise by Muhammad bn. 'Umar, the Faqih from Occupied Moslem Crete, and the Rhodian Sea Law, Two Parallel Texts", *Graeco-Arabica* 5 (1993), 63-102, and "Relaciones entre Creta bizantina y los Omeyas de Siria y al-Andalus", in *El esplendor de los Omeyas cordobeses*, Granada 2001. See also Ch. G. Makrypoulias, "Byzantine Expeditions against the Emirate of Crete c. 825-949", *Graeco-Arabica* 7-8 (2000), 347-362. For the conquest of Sicily see J. Lirola Delgado, "Maritime Conquests", in Ch. G. Makrypoulias, ed., *Sailing Ships of the Mediterranean Sea and the Arabian Gulf*, I, Athens 1998, 25-35.

15 For the shipwreck of Marsala, see H. Frost, "The Punic Ship Museum, Marsala. Its Presentation and some Structural Observations", *The Mariner's Mirror* 67 (1981), 65-75.

16 See for example, a description of the shipwreck of Serçe Liman found on the southern coast of Turkey, opposite Rhodes; F. H. van Doorninck, "The 11th century Byzantine Ship at Serçe Limani" An Interim Overview", in Ch. G. Makrypoulias, ed., *Sailing Ships of the Mediterranean Sea and the Arabian Gulf*, I., Athens 1998, 67-77.

17 See the remarks by P. Gille, "Les navires à rames de l'Antiquité, trières grecques et liburnes romaines", *Journal des Savants* (Jan., Mar. 1965), 64ff.

18 H. R. Dolley in his very important article "The Warships of the Later Roman Empire", *Journal of Roman Studies* 38 (1948), 52, expressed the view that "a single lateen sail would have been an impossible rig for a ship the size of a dromon." But it is quite probable that until the middle of the 10th century the warships used square sails. At the time of Anna Comnena (11th c.), the three masted warships prevailed, equipped with lateen sails. (Anna Comnena, *Alexias*, X, 8, I).

19 Of course, this is a diachronic principle, which appears in both Byzantine and Arabic sources.

20 Ibn al-Manqali, *Al-Adillatu al-Rasmiyyah fi al-Ta'bi al-Harbiyyah*, ed. M. Sh. Khatab Baghdad 1988, 249. The typical expression of the Arab authors is "yarbutunahu bi-awsatihim" when attached to the waist-belt and "taqallada" when hanging from the shoulder. For the relevant pictorial evidence see L. A. Mayer, "Saracenic Arms and Armor" in *Ars Islamica* 10 (1943), 9ff.

21 See Ibn al-Manqali, note 20 above.

22 See Pseudo-Xenophon, I, 2.

23 For the various views on this topic, see M. Reddé, *Mare Nostrum*, Rome 1986, 474 ff.

24 «Σεμ[π] ρώ [ν] ιος Γαίῳ τῷ υἱῷ ... σοι οὐκ ἐ] στρατεύσου εἰς κλάσαν, καὶ ἐποίησα δύο ἡμέρας λυπούμενος λοιπὸν οὖν θλέπε μὴ πισθῇς (sic) καὶ οὐκέτι ἔσῃ μου υἱός." J. C. Winter, "In the Service of Rome. Letters from the Michigan Collection of Papyri", *Classical Philology* 22 (1927).

25 See an analytical description of the texts of both authors in my article, "Two Parallel Naval Guides. Qudama's Document and Leo VI's *Naumachica.* A Study in Naval Preparedness",

Graeco-Arabica 1 (1982), 78ff.
26 Christides, *Byzantine Libya*, 48, 79-80, where there is the relevant bibliography.
27 Reynolds, *History and the Sea*, 5.
28 Constantine Porphyrogenitus, *De administrando imperio*, ed. G. Moravsik, trans. R. J. H. Jenkins, 2nd ed., Washington D.C. 1967.
29 *Syriani magistri naumachiae*, ed. Dain, Paris 1943, 54, §39: «Δεῖ δὲ καὶ τοῦτο τὸ σχῆμα μὴ πόρρωθεν ἄγειν, ἵνα μὴ μεταποιεῖν οἱ πολέμιοι τὰς ναῦς δύνωνται πρὸς τὸ χρησιμότερον αὐτοῖς μάχης κατεπειγούσης» See also J. Pagès, *Recherches sur la guerre navale dans l'Antiquité*, Paris 2000, 23 : "En temps de paix comme en temps de guerre, les escadres navigent en formation par colonnes ...C'est à partir de cette formation de route qu'on prend celle de combat ..."
30 For this formation see G. Fioravanzo, *A History of Naval Tactical Thought*, Annapolis 1979, 50ff., and Pagès, op. cit., 22ff.
31 Christides, "Fireproofing of War Machines, Ships and Garments", in *Sailing Ships of the Mediterranean Sea and the Arabian Gulf*, ed. Ch. G. Makrypoulias, Athens 1998, 11-18.
32 See the photo of the original front page with this statement in Christides, *The Conquest of Crete by the Arabs (ca. 824)*, 36.
33 Ibn al-Manqali, *Al-Adillatu*, 245.
34 Christides, "Military Intelligence in Arabo-Byzantine Naval Warfare", in *Byzantium at War (9th - 12th c.)*, Athens 1997, 278 ff.
35 F. Van Doorninck, op. cit., note 16.
36 P. London 1350.
37 For the importance of these events see Christides, *Byzantine Libya*, 37, 46.
38 *Ioannes Scylitzae Synopsis Historiarum*, ed. I. Thurn, Berlin – New York 1973, 84-85.
39 Christides, *The Conquest of Crete*, 86; idem, *Byzantine Libya*, 83, note 9.
40 Christides, "Relaciones entre Creta bizantina y los Omeyas de Siria y al-Andalus", 67.

ILLUSTRATIONS

Fig. 1 Moslem ships of the 14th century. MS illumination. Ram above the water.
Fig. 2 Dromon reconstructed by the team of the Oinouses Project (July 2000).
Fig. 3 Miniature dromon model made by Christos Spanoudis
Fig. 4 Machine for launching fire-arrows, made by N. Orphanoudakis. The Oinouses Project.
Fig. 5 Hand-throwing machine of Greek fire – Zarraqa, made by N. Orphanoudakis. The Oinouses Project.

APPENDIX

The Development Center of Oinoussai-Aegean Sea kindly permitted us to reprint here some pages concerning Arab-Byzantine navigation as well as the relevant pictures published in the book *Byzantine and Arab Sailing Ships*, Athens-Oinoussai 2001.

The book was published on the occasion of the exhibition of Arab-Byzantine Navigation, which took place in connection with the 8th International Congress on Graeco-Oriental and African Studies on July 5-9 2000, on the island of Oinousses. In this exhibition were presented models of Arab and Byzantine warships and merchantmen. This was the second effort by the Institute for Graeco-Oriental and African Studies to reconstruct such models. The first had been undertaken by the Kuwait Foundation for the Advancement of Science (KFAS). (See *Sailing Ships of the Mediterranean Sea and the Arabian Gulf*, volumes I and II, Athens 1998, 2000.) It was accomplished with the help of Dr. Y. Al-Hijji and financed by KFAS.

The second effort to reconstruct models of Arab and Byzantine ships was accomplished by the Institute for Graeco-Oriental and African Studies with the cooperation of the Development Center of Oinoussai-Aegean Sea. A third limited exhibition of the reconstruction of two models, i.e. a *dromon*-shini and a galea, will be presented in the 9th International Congress on Graeco-Oriental and African Studies, which will take place in Neapoli Laconias on June 26-30, 2002.

The most difficult reconstruction was that of the *dromon*, the typical average warship of the Byzantines corresponding to the Arab *shini*. Unfortunately, all the reconstructions to be found in museums are faulty. The length of an average *dromon* was 130 feet (39.62 m.) according to R. H. Dolley[1], while J. H. Pryor estimates it at 30.625 m.[2] Of course, we must remember that the ships of this period were not precision-built to standard specifications like the ships of today. The Arab equivalent of the *dromon* was the *shini*, although the term was also used for the Byzantine χελάνδιον, a word which after the 9th century was synonymous with *dromon*.

The *dromon* – *shini*, at least from the middle of the 7th century, has heavy weaponry amidships, sacrificing speed for more efficient fire powering in launching heavy stones and liquid fire. The ram- the main weapon of the Greeks and Romans – is abandoned and reappears after the 14th century above the water line as a supplementary weapon to the cannon (Fig. I). This explains why the ram is omitted in the reconstruction of the *dromon* in the Oinousses exhibition (Fig. II), although it does appear prominently in the reconstructions of dromons in certain museums, for example the War Museum of Athens. In addition to the dromon reconstructed by the team of Oinousses, a miniature dromon was made by Christos Spanoudis (Fig. III), in which the siphon was properly placed below the ψευδοπάτιον (a wooden shed).

In the Oinousses reconstruction of the dromon the wood-castle, called ξυλόκαστρον in the Greek sources and *bourdj* in the Arabic, is placed under the main mast. It was slightly raised above the bulwarks, made of beams and protected by a planked deck. Inside the wood-castle was stationed a unit of well-armed marines (στρατιωται, Ar. *djund* or *muqatila*).

The position of the wood-castle is not clearly indicated in the original Greek text of the *Naumachica* of Leo VI. Fortunately, an Arabic translation of the relevant passage leaves no doubts about the exact position of the wood-castle, stating explicitly that it was situated below the main mast (*taht*) or next to it (*ghamb*). Therefore some drawings by modern authors or reconstructions in which the wood-castle is shown hanging from the mast, cannot be accepted. Iconograhic evidence on a medallion of Doge Pietro Candiano of Venice actually corroborates the testimony of the Arabic sources.

In the Oinousses exhibition the reconstructions of two functional war machines by N. Orphanoudakis, based solely on Arabic literary and iconographic evidence, clearly demonstrate the validity of the Arabic sources, which contain more detailed information concerning naval weaponry than the Byzantine ones (Figs. IV, V).

The first is a reconstruction of a machine for launching Greek fire by hand, known as *zarraqa*, Greek χειροσίφων. The reconstruction is based on information derived from Arabic manuscripts. The second is a small-scale reconstruction of a war machine for launching fire arrows. Ibn al-Manqali (Mangli) offers the valuable information that, in addition to the warships equipped with heavy fire launching machinery, there were other smaller ones for launching fire arrows. In the course of systematic research I was fortunate enough to discover a drawing of such machinery, which was used by Orphanoudakis in his reconstruction of the machine for launching fire arrows.

NOTES

1 R. H. Dolley, "The Warships of the Later Roman Empire", *Journal of Roman Studies* 38 (1948), 48.

2 J. H. Pryor, "From Dromon to Gallea. Mediterranean Bireme Galleys A.D. 550-1300", *The Age of the Galley*, ed. J. S. Morrison, London 1995, 105.


Fig. 1

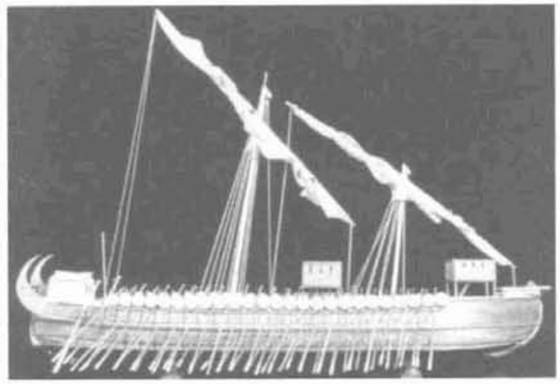
Fig. 2


Fig. 3

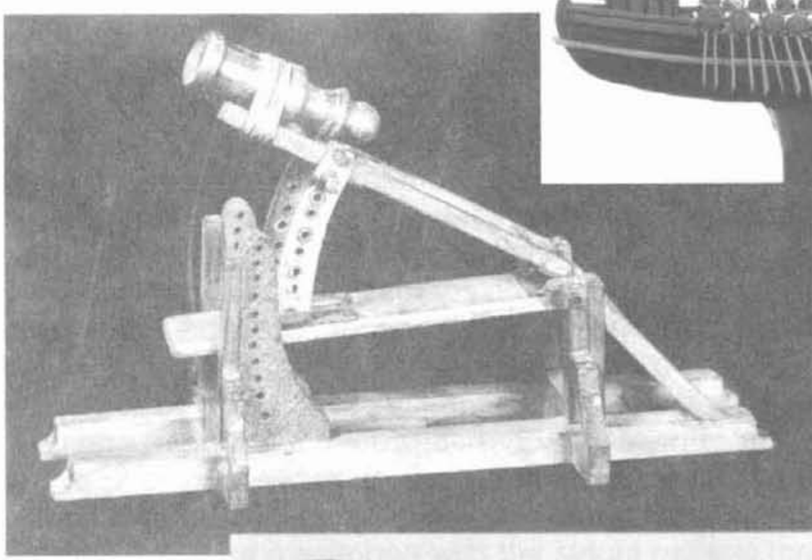
Fig. 4

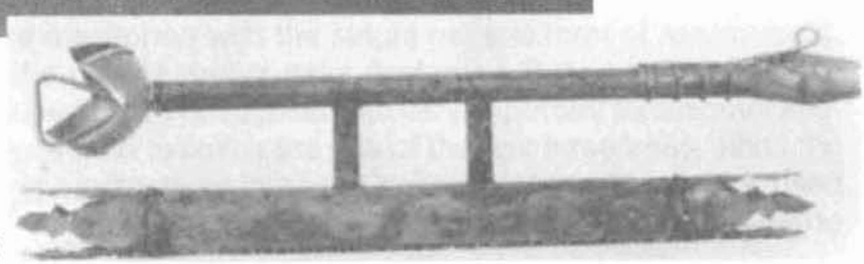
Fig. 5

GARBO TIMBER

Introduction

The purpose of this report is to highlight a special aspect in preparing timber to build hull skeletons (carved construction technique) that makes such wood particularly flexible and strong, while also saving a significant amount of materials. The use of such timber (*legnamen ad garibum*) can be considered an important technological characteristic of shipbuilding by the Genoese and by others.

Skeleton timber

From Genoese documents we know that three different types of timber were indispensable to build the skeleton, the planking and the masts of a medieval vessel. Each of the three parts was obtained from trees in a different ecological area. The skeleton was made from the deciduous oak that, in Liguria, can be found up to a height of about eight hundred to one thousand metres above sea level. Beech (*Fagus sylvatica*), a tree that prefers more humid environments and heights generally above five or six hundred metres, was used mainly for the planking. The fir (*Abies alba*), coming from environments and altitudes similar to or higher than those for the beech and from very few areas in the Genoese environs, was used for the masts and the lateen yards. The exceptional development of Ligurian shipbuilding during the middle ages is perhaps also due to the fact that in the Republic, or in its immediate surroundings, it was easy to find the raw materials (timber, iron, hemp, etc.) and the necessary technological know-how was available to be able to use such materials.

Among the oaks, three basic trees were used to make the hull skeleton that, to a certain extent, is the critical part of the vessel. In the written documentation these three trees: *Quercus pubescens*, *Quercus petraea* and *Quercus robur*, are mentioned with the single generic term of *rovere* (oak). On the contrary, the other Ligurian oaks (including *Quercus ilex*, *Quercus cerrus*, *Quercus suber*), were not considered very important for shipbuilding. In this presentation we will examine the use of the first three trees, since the others were used sporadically or in a very limited manner. The timber used for the skeleton, that almost always came from oaks, was known as garbo timber. The same trees were also used to prepare the best planking, for the bottom work.

The garbo and garbo timber

In 1807 the French government requested the local administrators of western Liguria to prepare a series of reports focusing on the marine economy, with the possible objective of implementing such an economy. A reply by the mayor of Savona was that[1]

Savona, 1807: ... *it is not possible to establish the price of the aforementioned timber that depends on the nature, shape, size and thickness of such wood, since in this area pieces are used that are naturally adapted to the construction, while in other places the timber cut from large trees is not always as strong...*

and it was specified that each piece had a price that varied because it was not the result of shaping, after cutting, of a larger trunk but made from timber that was trained naturally (*pieces adapted naturally to the construction*).

For the parts that form the frame of a medium to large-sized vessel (from the larger *lembi*, to the *saettie* and *galeoni*, up to the *barche* and *navi*) oak trunks were needed that were identified not only according to three dimensions (length, breadth and thickness) but also five (length, breadth, thickness, form and curvature). The curvature shapes the hull and can be defined with the technical term "garbo" that has at least two main meanings: in fact, the garbo method is a hull construction system based on the gradual reduction of the main garboard strake, while the garbo timber (*ad garibum*, as indicated in the documents prior to the 16th century) is the wood trained for the hull skeleton.

We can use a document that explains how the proportions of a Ligurian vessel must be correctly defined. This document is a construction contract from the year 1500 in which a shipwright promises to build a barcha with a length of 20 goe (about 15.00 m)[2]

Genoa, 14 August 1500: ... *sub illamet forma, garibo, latitudine, longitudine et altitudine prout et sicut dictus Johannes dedit eidem Jeronimo et sociis garibum magistris pro faciendo lignamina in boscho ...*

The builder must know the garbo of the various frames in advance and look for the corresponding timber. The shipwright can't venture into the forest and thus must rely on the woodcutters to find the raw material: the shipwright gives them the garbo (in this case with the meaning of *shape*) that is needed. It's more than likely that timber measurements were rather standardised: the width and the thickness of the first futtock or a second futtock for a medium-large vessel (longer than 20-25 metres) were generally squares with a length of one palm on each side (about 25 cm). Nothing says we can't assume that even the garbo (understood as the bending angle) was standardised and known to woodcutters who worked for the shipyards on the Ligurian Riviera.

Giving the garbo to trees

But the most interesting aspect is how the garbo timber was obtained. In theory, we might imagine that woodcutters wandered through the forests with the shapes provided by the shipwrights until they found trees with the proper curvature. But bent trees are few and far between and sometimes far from each other, which of course leads to the relative transport problems. Instead, it is easy to bend oak trees when they are young, i.e. *to give the garbo* to trees, monitoring their growth until they are cut and, among other things, trimming them on a regular basis.

Apart from some Venetian, English and North American handbooks from the end of the 18th - beginning of the 19th centuries, in Liguria (at Rossiglione, province of Genoa) there is a manuscript from 1754 that includes several drawings with instructions for training the trees so that they acquire the shape of the skeleton of the vessels. These are long-term forest projects: it was necessary to train very young trees, at the most three to four years of age, and wait at least fifteen to twenty years before they reached the required diameter.

Diego Moreno,[3] the first person who studied the manuscript, posed the problem concerning the age of such forest methods and provided a series of indications that, in his opinion, predated them to the late middle ages. His indications included the rules of some statutes (Albisola, 1389; Rossiglione, circa 1550; and here we also include Savona, 1404)[4] in which the term *alevare* was used expressly to refer to the oaks of some forests. But there are also much older documented information that may predate the growing practices of oaks for naval use.

Two documents from Portovenere from the 13th century are particularly important if analysed from this point of view. Some persons promised to supply timber for the skeleton of a vessel:[5]

Portovenere, 28 October 1259: *Gullielmus Podenηolus, Belleronus de Carpena et Guerinus de summo Vigo promittunt ... dare omnem corvamen sive lignamen unius legni cubitorum triginta unius, bonum et sanum, videlicet materas garibatas, in plano de parmis novem et dimidio ...*

What is particularly surprising is the use of the term *matera garibata* (madieri garibati), in other words first futtocks that had been given the garbo: but naturally or artificially? The use of the past tense should refer to an action that was already carried out, and thus artificial in my opinion. A reasonable hypothesis is that when garbo was used with reference to timber from Ligurian forests artificial bending was involved, applied to a young tree. In the Genoese area, the first mention of the term garbo known today dates back to 1248 when, for the first crusade of St. Louis IX, king of France, it is promised:[6]

Genoa, 10 January 1248: *... galeam unam ea longitudine et altitudine et de illo galibo et de omnibus ipsis ad dictam galeam pertinentibus ...*

Since this forest method produces results only from one generation to another, giving the garbo to oaks created at least two main practical problems. The first was that the conservation and use of the timber and the garbo forests could be guaranteed only by very restrictive local laws. There are various examples of rules governed by statutes. In addition to remarks in the statutes of Rossiglione, Albisola and Savona about forests that were *raised* or cultivated, a specific paragraph from 1661 about the Taggia forest states:[7]

Taggia, 8 June 1661: *... that whoever is found cutting garibo timber di calce (at the bottom) or cima (at the top) will be fined ... fifty to one hundred lire and from two to five years in prison ...*

The same sentence makes reference to two different types of garbo, one applied to the off-shoots at the base of a tree (*di calce*) and one to the tips (*di cima*). As we know from other sources, the oak trunks for naval use and construction were cut at the base, but the stump was never uprooted so that off-shoots would grow. That's because a tree grows faster from the off-shoots than from the acorn. The term *pullulare* (to make off-shoots) was already used in 1260 for trees from the Orsara forest, at what is now the border between the communities of Giusvalla (Sv) and Pareto (Al), to be used to build galleys.

The second subject of economic-social interest refers to the fact that the garbo prepared one year will be used twenty or thirty years later. Therefore, this implies major conservatism of naval construction that seems to hand down the same construction proportions and the identical bending angles for the frames from generation to generation.

The term garbo appears frequently in the 13th century Genoese notary documents, and always in relation to the skeleton of vessels and with the usual lexical ambiguity between the construction technique and the characteristic bending of the timber. The question that is raised is what meaning was used first? Is a known construction technique based on the *garbo (reduction of the main garboard strake)* or, given that naturally trained timber was the best material, did the construction technique originate from this type of timber? What came first, the technique or the material? There is no doubt that, at least in Liguria, they are very similar to each other: this is considered to be an important archaeological criteria that can be easily verified by carrying out excavations on shipwrecks.

The oak forests (10th-12th centuries)

As we already mentioned, the basic tree used to build a ship's skeleton consisted of three types of deciduous oak that were already indicated and described in the medieval and post-medieval documents with the generic term of *rovere*-oak (*ruper*, *robur*, etc.). Considering the cutting system that avoided uprooting the stump, we can also assume that the planting of oak forests, at least of those belonging to the local communities, of which a large part is still today well preserved, is probably very old. There is not much Genoese documentation relative to the naval constructions from the 10th to the first half of the 12th century, but the documents that have been preserved do mention the term *rovereto*[8] with a certain frequency. In the same documents the collective plant names always refer to cultivated trees (especially fruit trees, like chestnut forests, apple orchards, or fig trees, etc.). Therefore, the oak forest, at least at first glance, would seem to be cultivated, and thus quite different from the generic term of woods, forest or *nemus*, that is also used,

Therefore, it is likely that when the written documentation mentions an oak forest, it refers to a cultivation of trees that may also be used for naval constructions (perhaps even for the garbo). In the Ligurian tradition, there are only sporadic indications that acorns were used for food and, in any event, those mentioned came from other types of oaks.

Even if we don't know when the garbo was introduced, we can state with confidence that the timber coming from trained trees was one of the real strengths of the naval constructions because it saved money, given that very little raw material was wasted, and it guaranteed that the wood would be more flexible and stronger. Forest and construction technology interacted as far as timber for the garbo was concerned already in the middle of the medieval period, during which naval constructions were highly specialised. However, we don't know to what extent they were the result of old knowledge or revolutionary discoveries, that in any case are prior to the 13th century, at least for what concerns the written documentation available today.

The coat of arms of the Savonese family *della Rovere,* that gave the church two popes, between the end of the 15th and beginning of the 16th century (Sixtus IV and Julius II) is a curious example and an indicator of the idea that the oak tree is quite different from a wild tree. The family's shield depicts an oak whose branches are bent in a rather unusual way, but that does not seem to be very different from the *garbo di cima* described in the previously mentioned seventeenth-century document. It almost appears as if the oaks known by the Ligurians are those that were *garbate* to make the skeleton of the vessels. Presently, the practice of *giving the garbo* is still known only by a very few people.

Conclusions

The timber for naval use came from different ecological areas, and often far away, and required different forest technologies. In the territory of the Republic of Genoa, the right situation had arisen, that is similar to only very few other Mediterranean areas, in which all possible variations of such requirements existed together within a radius of a few dozen kilometres.

In addition, there were old and well-documented contacts between specialised labour on the coast and those who worked in the forests for the supplies with the greatest added value. There were different professions that were used to interacting and maintaining relations within what was already a modern context that resembled more of an industry than the image of medieval handicrafts that we might normally imagine.

Since there were techniques such as *giving the garbo* to the oaks, we must assume that there were real forest cultivation systems and a continuous search for and protection of the raw materials for naval use. This strengthens the idea that the naval constructions, as well as the private ones described in this report, were part of an integrated economic system, with a precise division of labour, that involved a large number of people.

Since the middle of the medieval period shipwrights were not the only ones who built vessels. There was also a large group of artisans and each had a specific task: from raw material suppliers, transporters and storage men, to the actual builders. A shipyard can be already be considered an industry in the modern sense of the word.

One of the most difficult things is how to recognise artificially trained wood in a wreck. In my opinion artificially trained wood have less knots than naturally trained wood because people, every year, cut new shoots in trained trees. But it is necessary to have more informations about this argument.

In addition to all the previous observations, it is felt that the garbo given to the oaks made it possible to supply the best material available during the middle ages and to use a technology that, beyond the construction techniques, was truly excellent and one of the discriminating factors between the most important historical naval traditions (that had created an economic and technological integration with the forest activities for centuries) and those that began to emerge.

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* Acknowledgements: to Richard Barker and Brad Lowen, for trained woods in United Kingdom and U.S.A.; to Mario Marzari, for trained wood in Venice; to Gaudenzio Paola, for botanical information but, naturally, incidental mistakes are all mine; to Francesco Murialdo for the Della Rovere coat of arms; to Pierino Falco, for practical information about giving the garbo. In another article, different and complementary to this one (F. Ciciliot, «Il legname da garbo, secoli XIII-XVIII», *Navis*, 1, Venezia 1999, 77-86), more documents about garbo timber are presented. Translation by Terrence Agneessens.

NOTES

1 Cerisola 1968: 124.
2 Gatti 1975: 49.
3 Moreno 1982.
4 Archivio di Stato di Savona (ASS), *Statuti del 1404*.
5 Falco Pistarino 1955: 61.
6 Belgrano 1859: 32.
7 Martini 1955: 50.
8 Pavoni 1997: *passim*.

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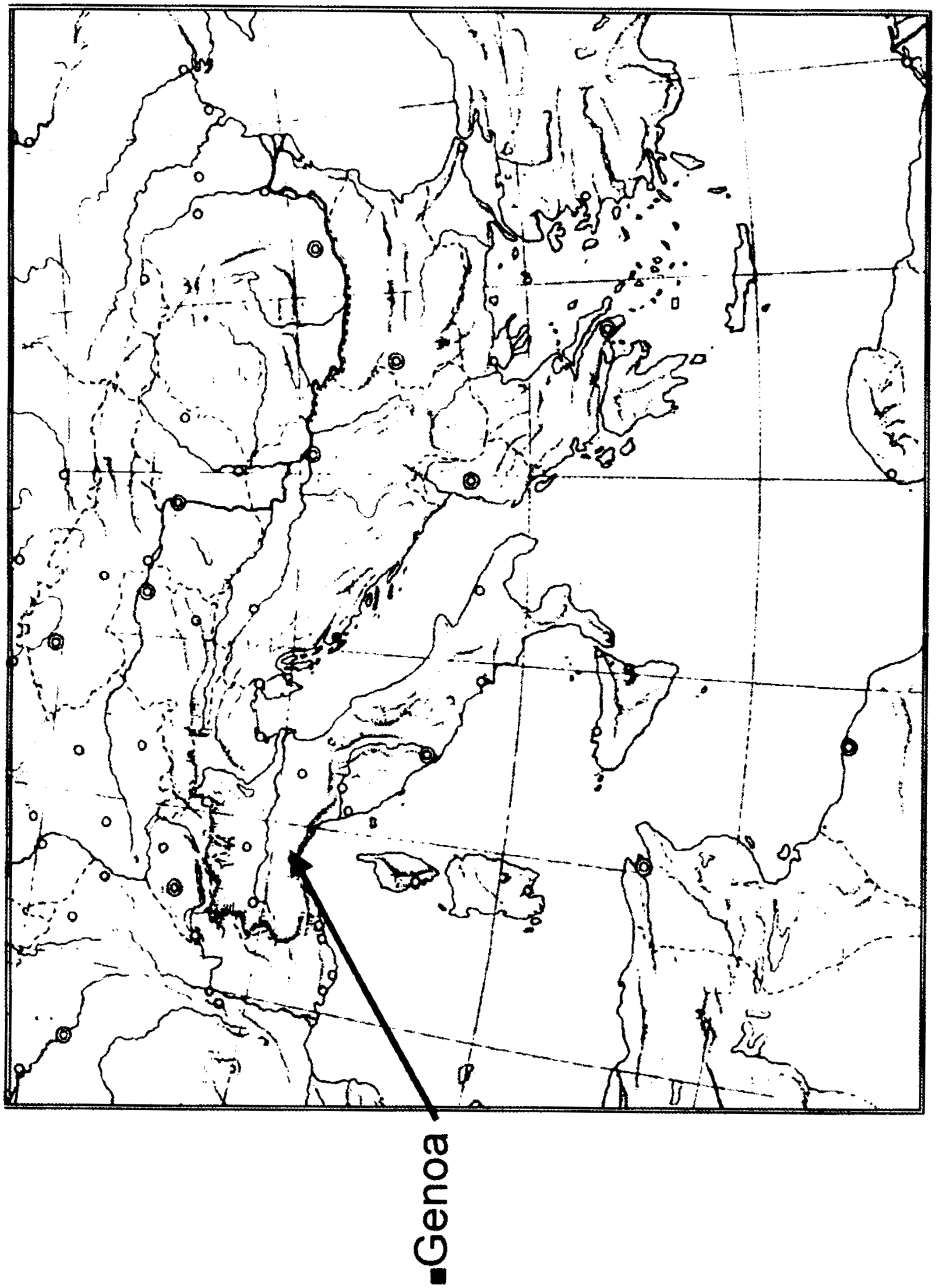
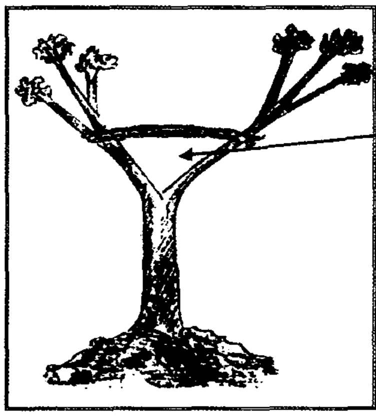


Fig. 1

Rossiglione handbook, 1754



Rami forzati per farli dilatare
Branches that are trained to be enlarged (for a forcazzo)

Fig. 2

- *Roveri intorte, con un peso appiccicatole o con corda o con vimini*
- Oak trained by a weight

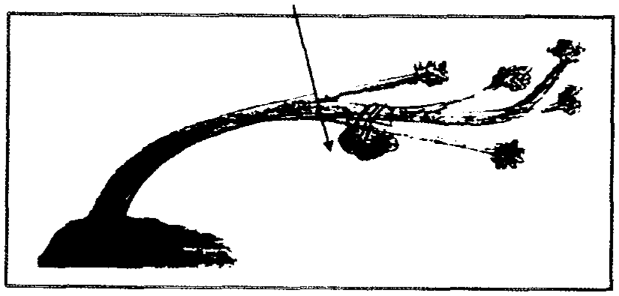


Fig. 3

- *Roveri incrocichiate assieme per farle venir curve*
- Two crossed oaks

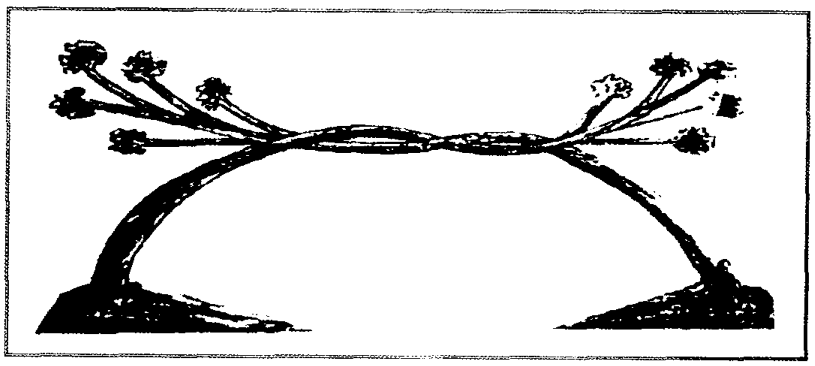
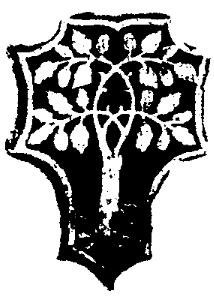


Fig. 4

The Della Rovere coat of arms:the Savonese family that gave to the church two popes in the XV-XVI Centuries (Sixtus IV and Julius II)



The family name comes from the oak which is also depicted on their coat of arms. The branches of the tree are trained and seems to be a garbo tree

Fig. 5

ON WORKING THE PIRAEUS SHIPSHEDS

A proposal to reconstruct an ancient *trieres* Zea shipshed has given some urgency to resolving questions about the operation of these sheds and their slipways. The purpose of this paper is to add to what has already been written about them so that the reconstructed shed may accord as far as possible with the mechanics of manipulating *triereis* in and out of the water.

It is understood that the proposed reconstruction of a shipshed is intended to house *Olympias,* the reconstruction of a *trieres,* which is based on evidence mainly from that same period as the sheds. A shed and the ship together would make a particularly fitting monument to the sea power of ancient Athens because there can be little doubt that the shipsheds were as necessary to sustaining that power as the ships themselves; it was essential not only to keep unsheathed hulls of warships out of the water as far as possible to keep them clean and free of *teredo*, but also to protect the ships from sun and rain to extend their lives. The cost of the sheds, though high, must have been considered to be economic in maintaining a fleet of warships.

Our knowledge of these sheds comes mainly from the hurried rescue excavation carried out in 1885 by Dragatsis[1] and whose findings were drawn by Dörpfeld. In the short time at their disposal those excavators did remarkably well but there are gaps in their evidence which have raised a number of questions which remain with us in the absence of excavations of shipsheds in Zea since 1885.

Though not without her shortcomings, *Olympias* has proved herself by trial to be as seaworthy as her proportions allow and has given good indications of being very close to the original. Blackman[2] has already considered some questions about the sheds and slipways: the number of men needed to haul ships up the slips; the friction between keel and groundways and lubrication; coatings for bottom planking; the use of timber on stone slips; the length of the slips and the operations carried out on ships in the sheds. It is therefore appropriate now to consider in more detail how such a ship could have been manipulated in a Zea shed.

The essential operational questions are:

1. As *triereis* would have been unstable when supported on their keels out

of the water, how were they supported laterally in the sheds?
2. At what point did *triereis* become stable as they entered the water from the slip?
3. How far below the water level must the slips have extended?
4. How could the ships have been hauled up and down the slips?

The writer[3] has reviewed the hazards of launching ships and some of those affecting *triereis* in particular. In this paper, further work by the writer on the mechanics of launching (and equally, of hauling up) *Olympias* on a reconstructed slipway is reported. This work, by hydrostatic and structural calculation is corroberated by 1/25 scale model experiments, has first re-examined the lateral support of the ship while being moved on the slip and some details of moving the ship, then the point during launch or hauling up when the bow lifts from the slip, then the point at which the ship is neutrally stable and finally where the after end of the keel would leave the bottom of the slip as the ship floats free.

Lateral support in the shed

To keep the ship upright when out of the water, the hull shape of a *trieres* makes some form of lateral support essential. It could be provided by a sliding cradle under the hull, as has been suggested, or by sliding supports on each side, or by the pillars of the shed. Support is needed until enough of the ship is in the water to give her at least neutral stability. The support must also allow the ship to hinge about the after end of the flat keel (called the after cut-up, or ACU) as the bow lifts; it must therefore extend aft in the ship as far as the ACU.

The length of a *trieres* would call for a cradle (or the extent of two cradles) to be at least 15m long to provide sufficient vertical support longitudinally. There is no mention of such things in the literature which, if they existed, is strange because they would have been large and important pieces of equipment. While it is likely that *triereis* were floated on to and off wheeled trolleys functioning like cradles at each end of the Corinth *diolkos*, the extra height and length of underwater slip needed, the depth of water and the rocky bottom of the Piraeus harbours make the use of such vehicles there most improbable, and handling a cradle, even if contrived to float at a suitable waterline, under a hull while afloat would be cumbersome manoeuvre for a ship as long as a *trieres*. A cradle would have to have timbers passing under the keel raising the necessary height of the roof of the shed. It would also add substantially to the mass to be hauled up and down the slip. Support of *triereis* by cradles is not therefore an attractive hypothesis even though it is the normal method employed today with generally shorter ships on usually open slips.

The writer had previously advocated the use of sliding supports on each side of the ship, placed at the ACU. This paper advances the proposition that *triereis* were supported laterally while being moved on the slips by the pillars themselves.

Stone pillars of the dimensions given by Dragatsis with lateral connection at the roof which they support can each withstand horizontal forces at the level of the main rail of *Olympias* up to safe lower limits of 1 tonne in the case of the roof ridge pillars 7.3 m high and of 0.7 tonne in the case of the shorter roof valley pillars 5.5 m high. These limits neglect the stabilising effect of any thrust in them from the weight of roof bearing upon them (being a timber structure, the roof could bear unequally upon its supporting pillars, particularly upon the ridge pillars). These limiting loads are those needed to cause uncemented joints between drums nearest to the ship's rail to open and form a hinge. The lateral force required from the roof structure is in both cases only 0.2 tonne. Friction between pillar drums would be sufficient to prevent sliding except possibly in the case of any short and so light drums under the capital which may have to be pinned to ensure against sliding under the lateral roof force.

The total lateral force needed to hold up *Olympias* on the slip varies with the clearance between her outrigger rail and the pillars. If the clearance were 10 cm, a quite practicable amount, the total force would be 0.7 tonne (Fig. 1), a force which the eight tall pillars or the 12 short pillars next to the parallel length of the outrigger could most safely provide, even if owing to lack of alignment or ship deformation only a few of them are actually in contact with the ship. The pillars would probably have had softwood rubbing pads set into them at the level of the outrigger rail and in the case of *Olympias* the pads on the pillars should protrude from the stone by about 25 cm. When the ship was secured in the housed position, she would probably have been wedged upright on shores, leaving the whole of the bottom clear for access for repairs, scraping, rubbing down, caulking and recoating, all of which operations would have been important for her good future performance. All things considered, and given the known existence and details of the stone pillars, their use to support the ship when being launched or slipped seems simplest and most likely.

Moving the ship on the slip

The hauling teams on each side of the ship, 70 men in each, pulling on each side of a rope in pairs could provide the required pull of 7.5 tonnes in heaves to haul the ship up the slip. Secure footholds would however have been essential and this demands with some certainty that the 2.5 m wide rocky-bottomed spaces between the masonry slips were boarded over firmly and provided with cross-battens to form footholds, as proposed in Fig. 2. If unobstructed, there would be just enough space for such teams to work. They would mostly stay in the same place, each man at his foothold, coming forward on the rope after each heave. The hauling force would be about 4 to 5 tonnes to start the ship up the slip and haul her until, at the point called bow lift when launching, the flat keel settles on the slip. During further travel up the slip the hauling force will rise to about 7.5 tonnes when the hull is clear of the water and the whole mass of the ship is supported on the greased groundway. At the housed position the hauling force needed would be increased, owing to the unavoidable obliquity of the pull from the ram to leading blocks, placed to give a fair lead for the teams (and which could have been secured to pillars), by 12% to 8.4 tonnes, or 60 kg f. per man.

The force needed to move the ship down the slip with the same coefficient of friction would be only 2.5 tonnes, which could be provided by 50 men. A small party on a check rope round a bollard at the head of the slip to control any motion between heaves would be needed in both cases, but particularly during the later stages of launching when the force needed to move the ship will become small.

The proposed timberwork and the timber groundway presume some fixings into the stone slips. No such fixings were reported by Dragatsis, whose report[1] understandably contains few details of that kind. It is however very difficult to believe that no timber was used in connection with the slips, and if it was it must have been secured to the stonework somehow.

Bow lift

In considering launching (or, in reverse, hauling up), the longitudinal equilibrium of the ship as she enters (or leaves) the water is determined by her mass, position of her longitudinal centre of gravity, buoyancy, the longitudinal position of the centre of buoyancy (LCB), and the longitudinal position of the After Cut-Up of the keel, the ACU. In *Olympias* when the bow starts to lift to the increasing buoyancy, she hinges at the ACU which is at 16 Station (Fig. 2); the hinge point then moves aft a little as she rolls on the upcurving after keel. The bow will lift off the groundway when the moment of the ship's mass about 16 Station is equal to the moment of the buoyancy about the same point. The 1/25 scale model experiment (Fig. 3), described in the Annex, corroborated previous hydrostatic calculations[4] that bow lift occurs when 16 Station is 6.5 m from the point where the groundway's sliding surface enters the water (GEW). The position of bow lift will of course be sensitive to the actual mass of the ship when launched.

The upthrust acting at the hinge point when the bow lifts will be about 15 tonnes, a concentrated force which could cause lubrication to break down and the ship to stick on the ways. Lubrication in that region of the groundway is therefore particularly important and it may be advisable for the groundway to be of softwood to spread the length crushed and so reduce the pressure on the lubricant to a value under which it will remain effective. The well-rounded curve of the keel at the ACU is helpful for that purpose. Greasing that part of the groundway before a launch would be possible because it lies under the ram when the ship is in the housed position. The lower 11 m of the groundway need to be able to withstand the moving concentrated load which diminishes to something less than 10 tonnes at the bottom end of the groundway.

The sagging bending moment on the hull is at its maximum during launch at bow lift. Owing to the ACU being so far from the stern, this bending moment is fortunately only about 22 tonne m, whereas if the ACU were further aft it would be greater. This is a point of importance from the point of view of the working and consequent leakage of the hull in service.

The point of neutral stability

The ship will continue to need lateral support as she travels down the slip until she has acquired, through buoyancy, neutral stability at least. If she is supported by pillars, these must therefore extend far enough down the slip to support the after end of the outriggers until she can stand up by herself. This may determine whether Dragatsis (or was it Dörpfeld?) was right in surmising that there were 13 ridge pillars though only 12 were actually excavated (on one slip only) and although at its lower end only the 12th ridge pillar is level in plan with a valley pillar on the other side of the slip. Like the point of bowlift, the point of neutral stability will move on the slip with the height of the mean water level and also with the tide. The mean water level at Piraeus in the fourth-century BC is not known but it is believed to have been 0.4 m above the level in AD 1885. The tidal range is now between 10 and 28 cm. Hydrostatic calculation gives the ship neutral stability when supported at the ACU when the draft at ACU is 0.48 m, while the model indicated that point to be when the draft is 0.57 m. The upthrust on ACU in that condition is about 10.5 tonnes. The point of neutral stability naturally varies according to where the ground support is applied to the ship, and experiments with the model showed how it moves along the rising after keel as the depth of immersion of the pivoting point varies (Fig. 4). The results from the model have there been converted into metres in the ship. The positions of the ship along the slip at those drafts naturally depend upon the slope of the slip underwater and this does not seem to have been measured. If the slope were to continue underwater at 1 in 10 (and it was reported by Dragatsis, in somewhat vague terms, that the slips continued some way into the water), those positions would be 4.8 and 5.7 m from where the groundway entered the water (GEW), but if the slope were to increase below water the sloping after keel might cause the ship never to touch any underwater part of the slipway. No underwater slip would then be necessary, contrary to Dragatsis' observation that the slips continued into the water and Dörpfeld's indication, in his plan only, of such extensions by dotted lines. If he had extended the slips in his profile, even if conjecturally, he would have had to give them some particular slope, simply to draw any line at all below the water. That he did not draw anything indicates that he did not know what the slope was.

The dry length of the slips and ancient sea level

At this stage of this investigation we meet the different sea levels shown by Dörpfeld in his drawings. In his profile the stone slip meets the waterlevel at the axis of the 13th ridge pillar, 42.52 m from the back wall of the shed, whereas in his plan the line showing the water's edge wanders rather casually and unconvincingly across the whole array of slips. It crosses the top end of a firmly drawn piece of the portside edge of the slip[1] at 36.1m from the back wall, and near ridge pillar No.11. The difference of 6 m or so between those distances could be reconciled if the water's edge in plan referred to a level 0.6 m lower than the surface of the slip, but as the rocky bottom between the slips shown in section in the profile is irregular, the waterline shown in the plan is either meaningless or the mean dry length of the slips is only 36.1 m long, 0.7 m less than the length of *Olympias.*

Certainly the slips and sheds would have been no longer than they had to be, but could *Olympias* be housed in such a short shed? It is unlikely that the stern would have been drawn up so far as to touch the back wall; even a 2 m separation, to give a reasonable passage for men and materials across the top of the slips from one to another, would require her ram to extend 2.7 m over the water and imply a barely sufficient length of shed to accommodate the hauling teams about 35 men long when the ship is nearing the fully housed position. The backs of the leading men in those teams could not be nearer to the tip of the ram when housed than 6m, assuming ropes looped round the ram and spread aft through leading blocks on tails secured to pillars No. 10. Pairs of men could probably not be spaced closer than 0.9 m along the ropes, so the backs of the end pair of men would be at least 6 + (35x0.9) = 6 + 32 = 38 m, which would only just fit in. Protection of the vital ram structure from rain and sun would by normal rules call for the roof to have an angle of elevation from the base of the tip of the ram of 45 at least. By that minimum criterion, the roof would be 2 m too short if it ends at ridge pillar No. 12. A dry length of 36.1 m should therefore be rejected. It is therefore assumed that the mean dry length of the slipway when it was built was 42.1 m. If further evidence arises to correct that level, detailed dimensions in what follows will have to be corrected also.

The end of the groundway relative to water level and Pillar No.13

The whole matter of the controlled entry of the ship into, and her exit from, the water has to be considered and it is much affected by the long rise in the keel leading to the overhanging stern. That long rise aft slopes at about 10 to the keel amidships, little more than the slope of the slip to the horizon. If the timber groundway ended at ridge pillar No.13 and it was 0.25 m deep (or high), a likely figure, the floating ship would touch at about the same time both the end of the groundway and the stone slip if the slip continued underwater at its slope above water for a length of 6 m. The top edge of the end of such a groundway would be 0.23 m below the assumed fourth-century BC water level. In being launched, the ship becomes neutrally stable when 17 Station is just past ridge pillar No. 13 (Fig. 2) and is supported on the end of the groundway there with an upthrust of about 5 tonnes. At 17 Station the breadth across the outriggers is the full breadth of the ship, so the pillars would at that point of the ship's travel would cease to be needed as lateral support and so there would be no need for any additional pillar No.14; the required supporting force would have been decreasing from 0.7 tonne (for a pillar-to-ship clearance of 0.1 m each side) at an accelerating rate as the ship entered the water to zero at the point of neutral stability (Fig. 5).

Bringing a trieres in to the slip

We have thus far discussed and arrived at some critical features of the shed and slip needed for launching and hauling a *trieres* up the slip which conform to the available archaeological evidence. There is also the need to be able, as a practised routine, to bring the ship afloat stern first to the slip before hauling her up the slip. Harry Tzalas has usefully considered the important matter of manoeuvring *triereis* in Zea harbour[5] and how they may have been lined up to enter sheds. Ships would then have to be guided more exactly on to the groundways. One has to allow for side winds blowing the ship off-centre to some extent and it must be expected that there were guides in some form to funnel the stern with accuracy, as hauling began, on to the centreline of the slip and so on to the groundway.

Once again it is found that the shape of the stern of a *trieres* helps slipping, and in this case enabling alignment to occur. As soon as the ship has been hauled, floating, far enough for the after end of the outrigger, which is strongly supported by the *threnus* beam across the hull, to be past the first pillar of the shed, No.13 (Fig. 2) the ship can be allowed to rub if necesary against the pillar to bring the ship nearer the centreline of the slip as she is pulled aft. The next guide could be at the end of the groundway in the form of stout timbers sloping up from each side of the groundway at about 30 to a height of 0.5 m (or 1 cubit) above the stone slip. These would catch the sloping keel of the ship, which would be increasingly constrained, as the ship is hauled in, to slide down whichever timber it was rubbing upon, towards the middle until the keel landed on the end of the groundway itself 0.23 m below the water (when at its assumed mean level). At that point the stern would be held by mooring lines, possibly secured to some pillars or bollards, and some bow lines would be rigged and heaved upon as necessary to align the ship more accurately for hauling up the slip.

To prepare for hauling, two 40 mm diameter ropes each two ship-lengths long with bights at one end could be looped over the ram and led back up the slip on each side through leading blocks as already described. It is proposed that hauling ropes were secured to the ram so that it should be near hauling height and be attached to the ship as far forward as possible to reduce its obliquity near the end of the haul up the slip. The hauling ropes could have been discarded *hypozomata*; the diameter of 40 mm is more than is necessary as regards strength but it would give a good hand-grip for the haulers.

The slips underwater

Dragatsis reported in 1885 that the slips extended some distance underwater but did not take any measurements, and none have been made since. With the proposed ending and depth of immersion of the timber groundway, the ship would scarcely touch any stone slipway further underwater, which raises the question 'Why did they extend underwater?', or doubt must be cast either upon on the groundway arrangement proposed here, or upon Dragatsis' evidence. The slips may not actually have gone underwater so far as Dragatsis indicates because they would by optical refraction between water and air have appeared to be longer than they actually were; for instance, an underwater length of 6m would look as if it were about 10 m long to someone standing on the slip near the water's edge. Would an apparent 10 m have been described as 'some distance'?
Another point arises from the necessity for all the underwater part of the groundway, about 4 m, and its supporting and fixing sleepers to be portable and rigged in place only when needed for use; otherwise they would be quickly consumed by *teredo* and that was unlikely to have been tolerated by the ancients. It should also be borne in mind that it is necessary to restrain the keel in contact with the slip from sliding away from the middle line while

the ship is being supported laterally by horizontal forces. It is therefore necessary for the keel to be on (and in) a laterally confining groundway from a point below the water and it is desirable that that point be as near the waterline as possible. To provide handling space for rigging the necessarily heavy timbers and ballasting and locking them in place, the slip should extend say 3 m beyond the end of the groundway. A 3 m length underwater might look like 4 m but would that be recorded as some distance? Practical alternative proposals on this point to achieve better accordance with Dragatsis, even though his wording is vague, would be most welcome.

Conclusions

This discussion about working the Piraeus sheds and slipways to house *triereis* leads to the following particulars for a practicable reconstruction which would accord with the findings of Dragatsis and Dörpfeld:

1. the shed should have 13 roof ridge pillars on one side and 20 roof valley pillars on the other;
2. the sliding surface of the timber groundway should enter the mean water level 1.7 m beyond the axis of the 13th ridge pillar, that is, 44.2 m from the inside face of the back wall of the shed;
3. underwater parts of the groundway and supporting timbers should be portable to avoid attack by *teredo*;
4. the bottom end of the groundway should have vee-timbers to guide the rising after keel on to the centre of the groundway when slipping a *trieres*;
5. the bottom 12 m of the groundway should be capable of carrying a concentrated load of 15 tonnes at the top of that length, diminishing to 10 tonnes at the end of the groundway;
6. the space on either side of the stone slip would be boarded over and firmly secured to transmit a hauling force of 4 tonnes on each side, and have cross-battens to provide firm footholds for hauling teams of 35 pairs of men;
7. hauling ropes could be discarded *hypozomata*;
8. pillars should have greased softwood rubbing blocks set into them at the height of the main outrigger rails of the *trieres*, and equidistant horizontally from the middle line of the groundway 0.10 m more than half the overall breadth of the ship, the blocks on the two seaward-end pillars being rounded to receive the stern-end of the rails and to extend over the range of their heights when the ship is afloat at all states of the tide;

9. the underside of the roof structure at the middle line of the groundway throughout its length must be clear of the *aphlaston* of the ship.

ACKNOWLEDGEMENTS
The writer is indebted to David Blackman for his great knowledge of ancient Mediterranean shipsheds, and to Norman Gundry for permission to use his ship model for the experiments described at Annex.

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ANNEX

Experiments with 1/25th scale model of *Olympias*

The object was to find:

1. the immersions of points of support from the ground, bearing on various positions on the after keel, at which the ship was neutrally stable;
2. the height above water of the ACU when the bow lifts from a 1 in 10 slipway;
3. the upthrusts at the ACU at various points of travel while pivoting about ACU.

The model, made in 1983 to demonstrate the appearance of the reconstructed *trieres*, was shaped to an earlier proposed hull form of which that of *Olympias* is a not very different development, except that the keel in *Olympias* is deeper by 0.2 metre (8 mm in the model). Its main dimensions and displacement volume are close to those of *Olympias* on 1/25th scale. It was therefore thought that some hydrostatic experiments could provide some useful indications about some critical stages of launching and slipping *Olympias* to corroborate previous hydrostatic calculations[4] and also to explore conditions for neutral stability.

The experiments were made with the rig shown in Fig. 3, where the model was in a trough containing adjustable levels of water and a pivot point (attached to a brick on the bottom of the trough) to engage with the keel as desired. The model was heavier than its scaled displacement, so, by means of a calculated weight and a lever suspended over the model, a constant upward force was applied to the model at a calculated point, to make the effective mass and effective position of the model's centre of gravity correct for the scale of the model. The displacement was also corrected to allow for the use of fresh water in the trough for floating the model. The upthrusts at ACU were measured by applying an vertical upward force above the ACU by means of weights in a balance set on a stool over the trough. To obtain approximate measures of the thrust of the ship on pillars, vertical battens were placed on either side of the model in the plane of the pivot and the correct distance apart to represent pillars with rubbing pads. Measurements of the model's draft were taken fore and aft.

To simulate the ship's travel down the slip without moving the ship in the trough, the model was placed with its ACU (16 Station) on the pivot and its forward keel supported at the slope of the slip. Water was added to the trough in stages and the height of waterline relative to pivot, drafts, upthrust at ACU, and weight on one outrigger needed to cause the model to roll from one 'pillar' to the other, measured at each stage.

The results are shown in Fig. 5, where the upthrust at ACU and the force on pillars are plotted against ship travel. The model bow lifted at the same travel as previously calculated, after allowing for the shallower keel of the model. The measured upthrusts at ACU were about 8% higher than calculated (at bow lift only) but followed a reasonable curve to zero at the point where the model floated free. Measurements of force on pillars were more difficult because as it diminished to zero as the ship moved to the upright position, the starting value was thus not easy to identify; readings were plainly too low, but though the measurements are unreliable, the manner of their variation with travel is clear. The force on pillars varies by calculation with clearance on each side of the ship between pillar and outrigger as shown in Fig. 1.

To find where ship stability becomes neutral as the position of support from the groundway is moved along the after keel and the immersion of the support to give neutral stability is found, the pivot was moved under the ship, its longitudinal position noted, and then the water level adjusted until the model appeared neutrally stable when upright. The points and their immersions so found are shown in Fig. 4. These points are laborious to calculate with any accuracy so the model determination is useful; immersion of ACU at neutral stability was calculated to be 0.48 m while the model indicated (full scale equivalent) 0.57 m. These points are critical to the position of the ship where support from the seaward-end pillars becomes necessary.

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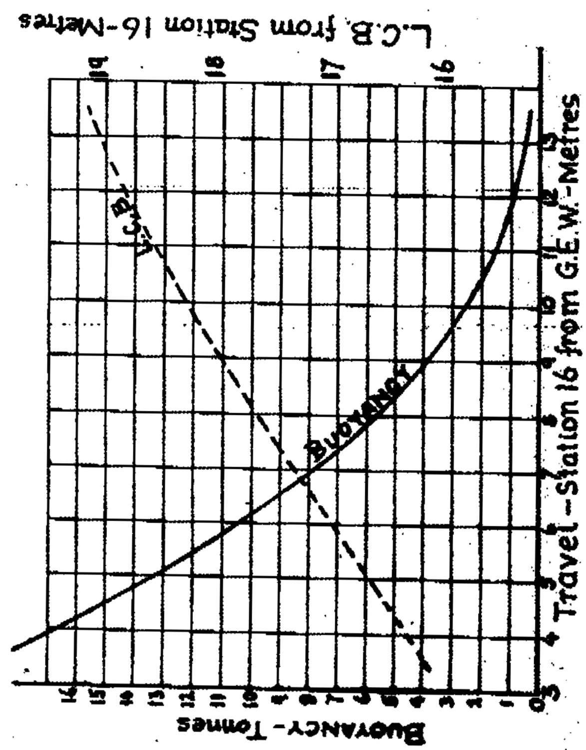
ILLUSTRATIONS



ig. 1 Ship travel v Buoyancy and Longitudinal centre of buoyancy

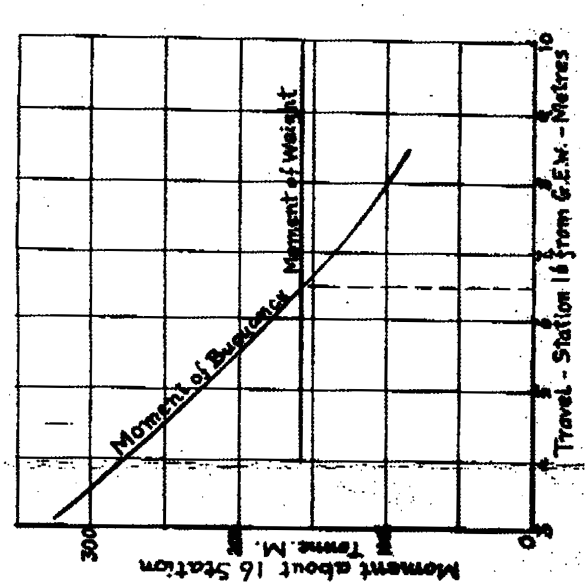


Fig. 2 Moments of mass and of buoyancy about Station 16 v. Ship's travel

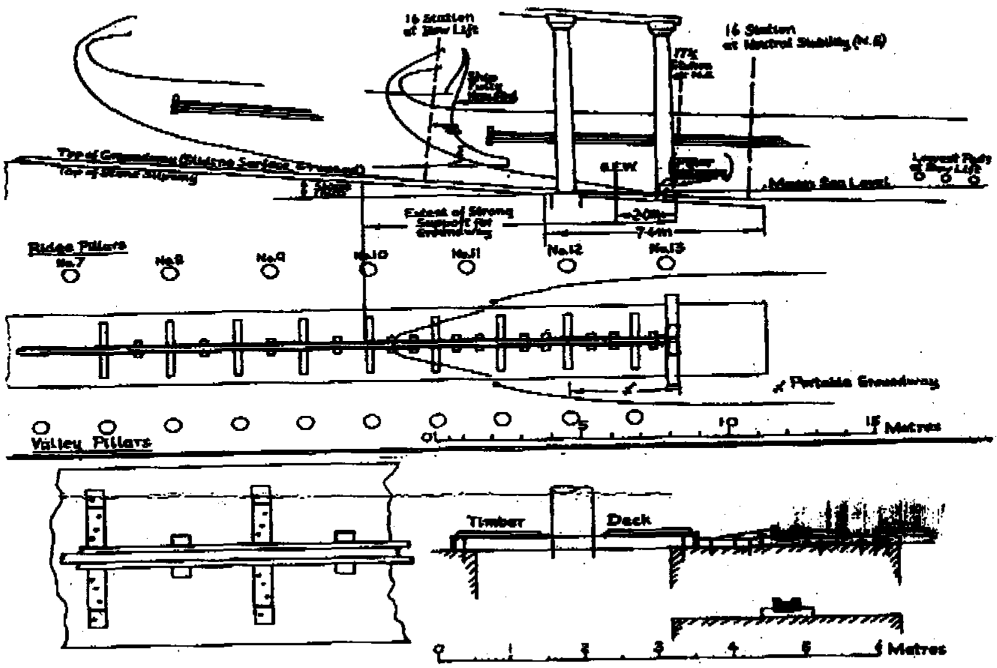


Fig. 3 Slipway, groundway, shipshed and position of ship at bow lift and at neutral stability

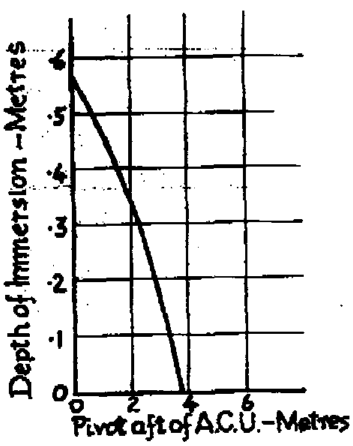


Fig. 4 Pivot points of neutral stability along after keel and their immersion

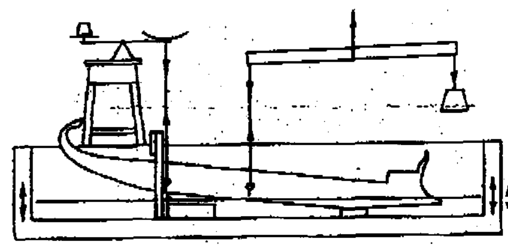


Fig. 5 Experimental Rig

NEW FINDS FROM PHTHIOTIS

The title of this paper is misleading since the artefacts presented are not at all new. They were simply unknown findings from the past which did not draw the attention of the archaeologists, and they are simply new for the science.

Reorganizing the store-rooms of the Archaeological Museum of Lamia we discovered two forgotten antiquities which I think would be interesting for the specialists engaged with ancient maritime activities to be aware of.

They both come from Phthiotis but their exact finding conditions are unknown. The only information we could obtain from the old catalogues is the place of their provenance.

The first artefact is an anchor like item.[1] (Fig. 1). From its form it could be thought to be a loom-weight. It is made of well fired clay, it is triangular with rounded corners and on top has a fairly wide hole, showing that the artefact was hung by a thick string or rope. It measures 225 centimetres in height and it weighs 1.700 grms.

On one side a male name in genitive is twice scratched after it had been fired. One of the inscriptions is worn out, while the other is very clear. The fact shows to my opinion that it was worn out because of continuous use and it became necessary to repeat it. The name is ΔΑΦΝΑΙΟΥ and the genitive implies that he was its owner.

The artefact as said above has a usual form of anchors as we know them from many places of the East Mediterranean[2]. It also looks like a loom-weight. However it could not serve as an anchor because it is light for such a use, nor could it be a loom-weight being too heavy for this purpose. On the other hand if it had been used as a loom-weight the name on it should be female, since we know that weaving was a task of women.

Taking into consideration the shape, the weight and the provenance I propose to call it a fishing-weight. The place it comes from is Xenias, 30 klms northwest of Lamia. Xenias today is a very fertile plateau but in antiquity it was a lake, 5 meters deep with marshly coasts, rich in fish according to ancient literary sources[3]. Its shape and weight can be traced among the fishing-tackles so far known[4]. Since however this weight has been found at the area of a lake, it is probable that it served for fishing in sweet waters.

The second antiquity presented is a miniature black-figured amphoriskos (Fig. 2) said to be found in Lamia.[5] It can be dated to the archaic period, more precisely to the end of the sixth century on the base of parallel examples.[6] Apart from the fact that it is the first and only so far known black-figured vase found in Lamia, its shape is unusual for the period. It has for the moment no meaning to be engaged with the shape since it goes beyond the scope of this meeting.

On the belly zone between the handles, on either side, two scenes of the myth of the killing of the Minotaur by Theseus are depicted. On one side Theseus is ready to slaughter the Minotaur in the presence of the goddess Athena, protectress of the hero. The building on the right end of the scene obviously suggests the Labyrinth. On the other side a ship is represented sailing to the left as the sail and the position of the rowers, facing opposite the prow, show (Fig. 3-4). The scene describes the trip of Theseus to Crete.

The surface of the vase has been damaged but the main characteristics of the myth are visible.

The ship is both sail and oar propulsed. The rowers are sitting on deck a little deeper from the rail on banks in the hull. The ship obviously has no deck.[7] The person astern should be the steering man while the one near the prow must be the captain.

Unusual and rare but not unknown in ship iconography and in the archaic period itself is the existence of two balustrades on both ends of the vessel.[8] The ship has a ram and an upright high stem, characteristics found on war-ships. But our ship has another feature that to my knowledge has not till now been observed on ships of every kind. The stern does not curve upwards and inwards, as it does usually but it is concave forming a small ram-like protrusion.[9]

Above the balustrade astern a curving inwards device is depicted which otherwise could be seen as the end of a curving stern. This curving part ends to something like a flowing drapery or rather to a pattern like a bunch of leaves. Similar rendering of the upper end of sterns can be seen on some of the ships of the period and above all on the ship of Theseus from the well known François-vase on which the same myth is represented.

The above described antiquities' contribution to our knowledge of maritime activities is not revolutionary as the Kynos' ships were but they add two more small and of course not fatal pieces to the puzzle of ancient nautical history, and that was the purpose to join the 7th International Symposium on Ship Construction in Antiquity and present this paper, apart from the author's desire to meet colleagues again.

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NOTES

1. The artefact has been registered in the catalogue of Lamia's Archaeological Museum with the number AE 145. It measures 0,225 m in height, 0,075 - 0,205 m in width and 0,025 m in thickness.
2. Honor Frost, The Kition Anchors, KITION V, 307, fig. 9, No 5174 & 312, fig. 12, No 2517. Honor Frost, The stone-anchors of Ugarit, UGARITICA VI, Table I, No 22. C.F.A. Schaeffer, Remarques sur les ancres en pierre d'Ugarit, UGARITICA VII, 372, Fig. 1 & 373, fig. 5.
3. Stephanus of Byzantium, Ξυνία. Apollodorus of Rodos, I, 68. R.E. IX, A2, 2177.
4. Honor Frost, Fishing Tackle: Three limestone weights, in KITION-BAMBOULA III, 169-173.
5. The vase has been registered in Lamia's Archaeological Museum catalogue.
6. For example the Attic dinos in Louvre Museum No C11248 (Lucien Basch, Le Musée Imaginaire de la Marine Antique, Athènes 1987, 208, fig. 430).
7. The ship coincides with the Classe A according to the classification of Basch (Basch, loc. cit. 206-211).
8. See note 3.
9. Perhaps a stern-ram as Prof. Olaf Hoeckmann suggests (Hoeckmann in this volume).
10. Basch, loc. cit. 204-205, fig. 425.

FIGURES

Fig. 1. An anchor-like item from Xenias (fishing weight?)
Fig. 2. Amphoriskos.
Fig. 3. Detail of the ship's representation.
Fig. 4. Plan of the representation.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

FURTHER FINDS FROM KYNOS

Kynos tends to become a phenomenon for an archaeological site because it is the only place that furnished us with so many samples of ancient ships of the Late Bronze Age period.

To prove it one needs only to think that between the Vth Symposium in Nafplion (1993) and the one in Lamia (1996), that is in a period of three years, seven more examples of ships, either models or vase-paintings, have been found in Kynos[1].

Under the reserve of a more elaborate publication of the whole relevant material from Kynos, in the limited space of a paper, apart from presenting the pieces, only a few comments about the most interesting elements of them will be made by the author.

The first find to be presented is a part of a clay model of a flat-bottomed boat (Fig. 1-3). The preserved piece belongs to the amidship part, the bow and stern missing. Flat bottom models are not unknown during the Bronze Age[2]. The example of Kynos shows that the flat bottom of a model does not necessarily imply that it represents a craft without keel, since the keel as well as the ribs or beams on the inner side of the hull are all indicated by red coloured stripes. On the outside of the hull along the port side and the starboard side two wide parallel red stripes suggest perhaps the planks or other structural detail or they are merely decorative.

Two holes on both sides near the flat bottom were not intended for suspension. Such holes are rare on models and when they occured, as for example on the well known model from Maroni-Cyprus, are near the gunwale; they are small and numerous and are interpreted as suspension holes[3]. But this is not the case of the Kynos' model.

The Kynos model has only two holes, one aft and one fore, and to my opinion were used to fasten wheels with the help of wooden or metal bars. That is, the model was a toy (Fig.4)[4]. From ancient literary sources[5] we learn that children used to play with ship models. The proposed identification of the model as a toy is also supported by the presence of a clay wheel found near the model . By accepting this function for the above discussed model, Kynos has proven a source of surprises since, according to the examples known so far, nowhere else has been found a toy of this form dated at the LH IIIC period.

The next piece, not impressive but still didactic as far as ship construction is concerned, is also part of a clay model of the ship, which can be identified as the dead wood knee of a stem post or of a sternpost (Fig. 5-6).

Such devices we find in ancient models both astern and at stem implying that they worked either as cutwaters[6] or as protectors of the hull when crafts were beached ashore stern to or stem to[7]. Both ways of beaching have been ascertained[8].

Since usually by coloured stripes or lines the ancient craftsmen rendered structural parts of the ships I think that it is not impossible if we interprete the dark brown stripe along the edge as a metal sheathing. Sheathing parts of the hull with metal, especially lead, is a practice known from the traditional ship-building in the Aegean and it is also given by the ancient literary sources[9]. A metal band along the outer side of the keel and of the angle of the post would protect the wood when the ship was hauled up ashore.

The third piece is a sherd from the lip of a crater (Fig. 7). A helmsman, holding a steering-oar with a loop at its end, suggests that here the aft part of a sailing ship is represented. The end of the sail-yard can be seen above the head of the helmsman. The piece is presented for statistical reason since it increases the number of the vases with ship representations.

The next new find from Kynos is a very small sherd, from a pictorial crater also, on which one can distinguish a caricature of a warrior with the same attitude and armature as on the other already known representations from Kynos itself (Fig. 8)[10].

The warrior looks as if he is standing not on a deck but somewhere in the hull, as the rail or bullwark behind him suggests. In other words, against what it is ascertained until now by the other examples from Kynos[11] this ship should be undecked, the type of craft that Thucydides called «άφρακτον»[12] or perhaps the type that Homer describes as hollow «κοίλαι» or «γλαφυραί»[13].

The above conclusion is supported by the next sherd from Kynos again.

On this sherd (Fig. 9) the aft part of a rowing-ship is represented, of a very low hull indicated only by a thick black stripe. The vertical lines rising above the gunwale should be considered as thole-pins against which the oars were worked. There is no indication of a deck, nor of a rail or a bulwark.

Representations of ships with thole-pins rising free from the hull are not unknown in the iconography either of the Bronze Age[14] or of the Geometric period[15] and the fact gave birth to the theories that the ships described by Homer as hollow were undecked, something that Thucydides also supported by writing that the ships which sailed to Troy were undecked «άφρακτα»[16].

Now based on the examples known so far from Kynos we can support that both types of war-ships were in use during the Late Bronze Age, decked and undecked.

The thick stripe extending from the hull downwards should imply a steering oar. Similar rendering of steering oars can be found among the representations of ships of the period[17].

Another ambiguous ship due to her partial preservation shows an angular low hull, a rather high stem or stern and many oars (Fig.10). We obviously have here an oar-propelled galley, again a war ship.

Above and parallel to its gunwale a thick line or rather a stripe is pictured, the reserved space between being filled with a continuous wavy line, or semicircular lines, like festoons. To my opinion this band implies a bullwark, in other words a longitudinal plank or screen for the protection of the rowers behind[18]. According, then, to this interpretation the thick horizontal stripe on top of the festoons should be the deck. However, comparing it with the other examples known so far from Kynos[19] this interpretation creates an anomaly since on those the bullwark under deck is pictured at a certain distance from the gunwale and not immediately above it.

The idea that every semi-circle perhaps represents the back of a rower on the basis of the famous Thera ship where the backs of the paddling crew form a similar wavy line[20] cannot be taken into consideration since only four such semi-circles are represented against eight oars. Thera's ships, however, give us a good example of a decorated bullwark placed immediately upon the gunwale[21].

At a distance above the bullwark another construction is pictured with vertical lines framed underneath by an horizontal band. It is not possible to know how the top of this construction was. It is sure, however, that it begins from the stem-or stern-post. None of the details of the ship pictured is decisive to conclude whether the preserved part is a stem or a stern. The above-described construction could be a platform protected by a palissade, called by the ancient writers «ἴκριον».[22] Such constructions existed both fore and aft on ancient ships[23], either of the Mycenaean period[24] or of the Geometric one[25]. Closer observation however shows that this construction is rather long compared with other similar ones pictured on ships of the above mentioned periods. The evidence so far available from the iconography of ships can not permit us to say whether this part of the ship is a second bullwark, this one under deck.

Another problematic device on this ship is the crescent-like small protrusion drawn at the angle where the post joins the keel. Undoubtedly it is not a ram. It is perhaps a kind of extension of the keel[26]. Several forms of protrusions at the bow or at the stern, none of these similar to the discussed example of Kynos, have been attested on many Bronze Age ships.[27] All of them, no matter how long they are or what they look like, are interpreted as devices useful to stand the shock of beaching ashore or of a head sea[28], being also helpful to pull the ship ashore and fasten her by a rope[29]. Since then beaching ashore stern to was the most usual way[30] this protrusion could imply that the preserved part of the ship represents the aft. Nevertheless beaching bow first was not unknown in ancient times especially at speed when attacking coastal settlements or enemy[31] so that it is not impossible to support that we are dealing with the fore part of the ship.

The questions put forth by this example will remain unanswered until hopefully the good Lord of Kynos reveals to us the joining sherd or sherds with the ship's missing part. The writer of this contribution, however, on the account of the direction of the oars is for the stern being represented on this sherd[32].

Ships in antiquity did not serve only purposes of war. So Kynos, apart from the numerous war-ships it provided us, offered us the example of a small sailing boat, part of which is pictured on a sherd, again from the lip of a Mycenaean pictorial krater (Fig.11).

Preserved are the mast, a backstay and a forestay and one of the boat extremities which rises well above the gunwale or the deck, if there was one. The standing figure between mast and stay by facing to this end perhaps suggests that we are dealing with a stern[33]. It has no decoration and it looks like an upwards and outwards turning sternpost.

Between stern and mast the distance is obviously small to accomodate more persons than the one standing on deck holding an oar rather than a steering oar. Sail and yard are not pictured and that means that the boat is moving somewhere in a port, the person on deck trying to manoeuvre the boat to beach her or to tie her. Similar actions are still familiar until today to the sea-men of the Aegean area and of Kynos itself. So the craft pictured here is perhaps a fishing-boat or a «kaiki» like the one on Skyros' stirrup-jar, which is also interpreted the same way and presents enough similarities with this find from Kynos as far as the stays are concerned[34].

Fishing as an occupation of the inhabitants of Kynos is attested by other finds as well, such as fishing hooks, lead weights for the nets, fish-bones, shells. Fishing played an important role for people of the settlements lying ashore all over the Aegean coasts until today and it is more than obvious that the suitable craft for this activity would have been used.

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NOTES

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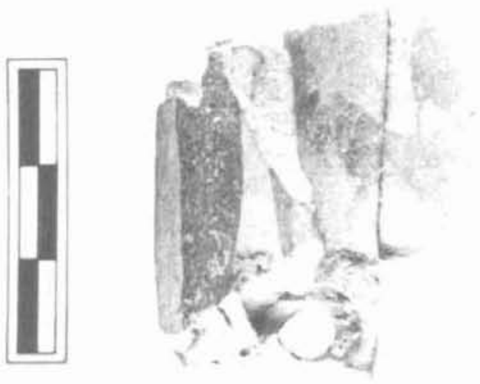
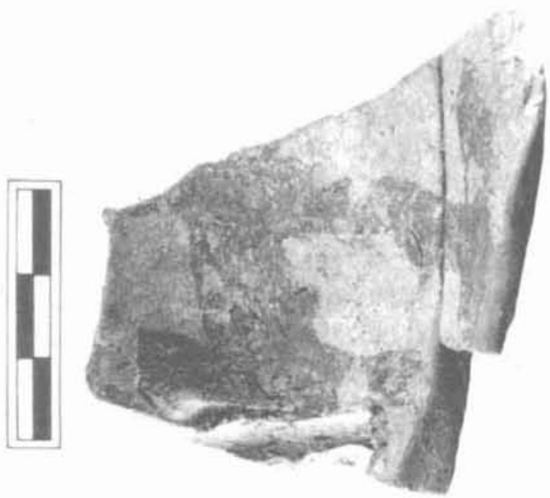


Fig. 1


Fig. 2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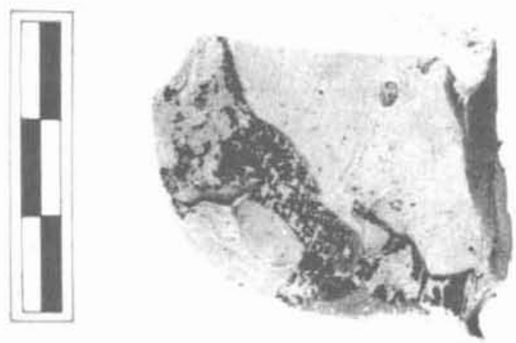
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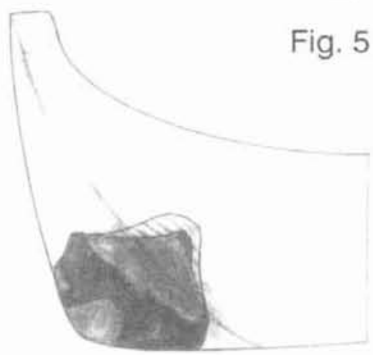
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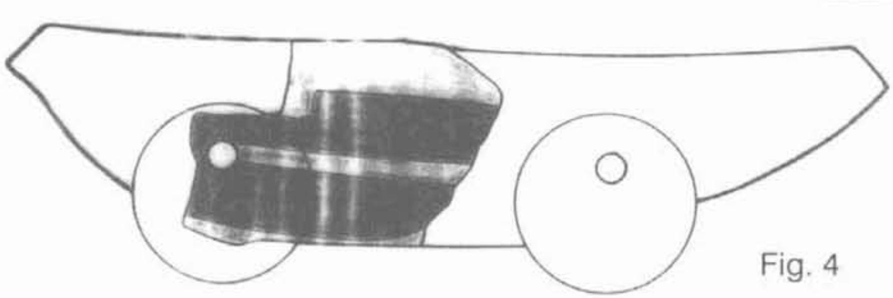
Fig. 4

Fig. 7

Fig. 8

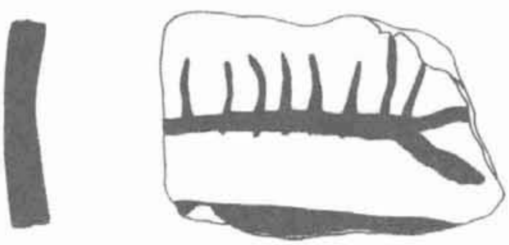

Fig. 9

Fig. 11

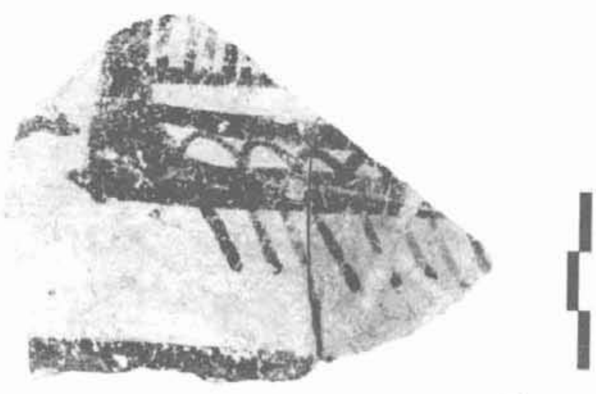

Fig. 10

MARITIME SPACE AND NIGHT-TIME SAILING IN THE ANCIENT EASTERN MEDITERRANEAN

Introduction

A number of studies of late have been devoted to establishing the navigational parameters of ancient maritime activity in the Eastern Mediterranean.[1] They endeavor to expand our knowledge of ancient trade routes and colonial activity by explaining the environmental constraints under which these mariners operated.[2] Although these studies are major contributions to the way in which we view the ancient maritime environment, some of the conclusions reached by such approaches attribute to the ancient mariner the same state of navigation knowledge that was presumed more than fifty years ago, such as that expressed by A. Thomazi in 1947: "Ancient peoples were mediocre sailors who were so afraid of the sea that they took every possible opportunity to travel by land. They would never sail at night unless they absolutely had to. As a general rule, as soon as the sun went down they returned to the closest shore, beached their ships, and would not set out again until the next morning; thus they had no experience in plying the open seas."[3] Although Thomazi's view is perhaps an extreme one to the student of ancient seafaring today, its tenor is still echoed in many nautically related histories and archaeologies.[4]

The present study takes its cue from S. McGrail's seminal paper, "Navigational Techniques in Homer's Odyssey," published in the *Tropis* series.[5] McGrail deduced a set of non-instrument, wayfinding techniques used by the ancient Greeks through a detailed look at Homer's *Odyssey*. He demonstrated that ancient Mediterranean mariners were cognizant of the spatial relationships of distant lands and had developed navigational techniques to reach their destinations safely.[6] Not only were they capable of sailing the open seas and at night, but they did so *deliberately* – a view at total odds with Thomazi's. Here I expand on McGrail's study to address the question of visibility at sea, and thus its effect on how we define 'open sea' navigation in the Mediterranean. Deserving exploration also are the various techniques of celestial navigation employed by ancient mariners.

The Mediterranean: ***How 'open' is the open-sea?***

The Phoenicians of the eighth and seventh centuries BC, in their effort to secure markets and metal sources and to establish colonies, forged a network of sea-lanes which crisscrossed the Mediterranean from east to west. To be sure, Classical sources cite them as being the inventors of open-sea navigation, a stance further reinforced by the discovery of two eighth-century BC Phoenician shipwrecks in the open sea 48 km off Ashkelon, Israel.[7] Given their reputation, the notion that they sailed from one end of the Mediterranean to the other without losing sight of land still persists. M. Aubet, in her book *The Phoenicians and the West*, claims that "in favourable weather conditions, with very few exceptions, the coast or the mainland is visible from any point in the Mediterranean. From a map of theoretical visibility, taking in all the coasts of the Mediterranean, it is clear that there are very few parts of the sea from which at least a mountain or a high coastal range cannot be seen. This is especially true along the whole northern coastline of the Mediterranean and along the African coast in the west."[8] Aubet computed the height of each major mountain or mountain range and the curvature of the earth to arrive at a range of 'theoretical visibility' (known in nautical parlance as 'geographic range') during "favourable weather".[9] Thus, because of the high elevations of mountains along the northern Mediterranean littoral, Aubet's map displays only a narrow corridor of open sea (= land not visible) between Crete and North Africa; also, all the islands of the Aegean archipelago lie within sight of one another; and Cyprus is visible from the mainland coasts to the north and east.

Geographic range, however, is only half the equation. To determine the *actual* range of visibility, meteorological conditions must be taken into account. Figures obtained from U.S. Naval Weather Service publications are revealing, for they indicate that sea-haze is a constant limiting factor in determining visibility in the summer in the Eastern Mediterranean.[10] The haze, for the most part, is natural – the product of three factors: predominant winds, dust, and static pressure. From May to September (the ancient sailing season) predominant winds, such as the *etesians* in the Aegean and the *khamsin* in Egypt, blow with enough force to inject a considerable amount of dust and sand into the atmosphere. This dust is held down at the lowest stratum of the atmosphere – the one where ships do their business – by a moderate high-pressure system with isobars remaining relatively unchanged throughout summer. Roving weather fronts are rare during summer, and therefore there is little air circulation.

Table 1 indicates frequency (expressed as a percentage) of varying visibilities in 12 regions of the Eastern Mediterranean observed from May 1 to September 30, 1854-1969. The regions are divided as follows: North Aegean (Region 24), South Aegean (25), Crete (26), Benghazi (27), Rhodes (28), Central Levantine Basin (29), Alexandria (30), North Cyprus (31), South Cyprus (32), Nile Delta (33), Beirut (34), and Port Said (35). Visibility in these regions is computed in nautical miles (nm) and is split into three categories: visibility more than 2 but less than 5 nm; more than 5 but less than 10 nm; and 10 nm or more.

According to Table 1, the sky of every region of the Eastern Mediterranean is affected by diminished visibility.[11] The average occurrence of 10 + nm visibility in the Mediterranean during the sailing season is 74.2%, otherwise expressed as three days out of four. In the Aegean (areas 24, 25, 26), however, visibility does not match the rest of the Mediterranean: here there is only a 54.35% occurrence of 10 + nm visibility. This means that land of any elevation which lies 10 nm distant *cannot be sighted one day out of two* during the summer. Furthermore, visibility around Rhodes (28) and Beirut (34) falls below the Mediterranean average, perhaps owing to local phenomena. The rest of the Eastern Mediterranean, in contrast to the high relief/moderate visibility of the Aegean, experiences excellent visibility all summer. But because of the very low relief of their shores and adjacent hinterlands, especially in eastern Libya, Egypt, and along stretches of the Levantine littoral, the coast comes into view only six to eight nm out, thereby offsetting the advantages gained by clear skies. How open, then, is the 'open sea'? And what areas should be considered as such? That there are large expanses of blue water in the Mediterranean, *contra* Aubet, is clear in Figure 1, which is a chart of visibility adjusted for meteorological factors. The results are interesting.

It would appear at first glance that navigation in the Aegean was rather simple; islands and headlands are copious and lofty, distances are not inordinately long. Indeed it is generally considered the perfect laboratory for early seafaring with its numerous 'stepping stones'. However, a century of weather data indicates that even this relatively small archipelago, due to restricted visibility, houses large areas of sea within which land is out of sight for significant periods, especially in the central and southern Aegean, the crossroads of ancient trade routes. Navigation between islands and coasts often placed ships in waters devoid of landmarks, even in cases of relatively short crossings, such as between the mainland and Rhodes, or between Lesbos and Euboea.[12] Consequently, as a general rule, the complexity of local navigation practices emulated that of interregional, open-sea navigation practices, such as those exercised on longer passages between Crete and North Africa or between Egypt and Cyprus (see below). Thus we should consider as 'open sea' much of the Eastern Mediterranean, including significant areas of the Aegean.

Overnight voyages: The literary evidence

Voyages were not necessarily planned to maintain in sight coastal or insular landmarks, and open sea voyages sometimes involved passages requiring more than a day to complete, whether intended or unintended. Fortunately, there is a body of literature which contains such direct references, and in sufficient quantity to dispel any doubt that many passages intentionally involved several days of nonstop sailing. Odysseus, for example, understood that the Nile lay quite a distance south of the Aegean, for he states to his loyal swineherd Eumaeus: 'Setting out from broad Crete on the seventh day, we began to sail easily with the North Wind blowing strong and steady, as if we were sailing downstream. Therefore no harm came to my ships, but we sat unscathed and free from sickness, and the wind and helmsmen kept the ships on course. On the fifth day (*πεμπταίοι*) we came to fair-flowing Aegyptus' (*Od* 14.252-258).[13] In Thucydides' *Peloponnesian War* we read that Kythera, an island in the south-west Aegean, was a 'landing place for the merchant ships from Egypt and Libya' (Thuc. 4.53.2). This passage, if made directly from Libya, is at least 200 nm in length, assuming there was no stop at Crete; if there was, then the voyage would measure 150 nm. At one point in the same war, two Spartan triremes arrived in Sicily from Libya, a voyage of '*only* two days and a night' (Thuc. 7.50.1). The Augustan writer Strabo states that 'the voyage from Samonium (a cape in north-east Crete) to Egypt takes four days and four nights' (*τεττάρων ἡμερῶν*); and the voyage from Cyrenae in North Africa to Criumetopon in south-central Crete is 'two days and two nights' (*δυεῖν ἡμερῶν καὶ νυκτῶν πλοῦς*) (Strab.10.4.5). We read of an extended voyage in Lucian's *Navigium* (6.7), in which he describes a ship's troubles on its way from Egypt to Rome with a large cargo of grain: 'The captain said that after they left Pharos (Egypt) under a weak wind, they sighted Acamas in seven days. Then as it blew against them from the west, they were carried abeam as far as Sidon. From there they encountered a strong storm and came through Aulon to Chelidonenses on the tenth day.'[14] Acamas is a mountain and cape in south-west Cyprus, a distance of over 250 nm from Pharos, and one well out of view of the Levantine coast.

In addition to these specific mentions of multi-day voyaging in antiquity, there are even more specific mentions in Classical Period texts of sailing at night. In one case, Herodotus has the Greek fleet await the arrival of the Persian fleet, 'and then, after midnight had passed (*μετέπειτα νύκτα μέσην*), put to sea to meet the ships that were sailing round Euboea' (Hdt. 8.9). In another, Xenophon tells us that 'the *Paralos* (state ship of Athens) arrived in Athens *at night* (νυκτός)' with a report of the disaster at Aegospotami in 405 BC (*Hell.* 2.2.3). Strabo explicitly states that the 'Sidonians...are philosophers with regard to astronomy and arithmetic, having begun with practical calculations and with night-time voyages (νυκτι-πλοΐας); each a concern to the merchant and ship-owner' (Strab. 16.2.24). These three sources, in addition to Thucydides, Lucian, Arrian, and Heliodorus, among others, mention night-time sailing with remarkable frequency, practiced either for tactical reasons, or to catch early-morning or late-evening breezes, or simply because the voyage required three or four or more days to complete.[15]

Navigation stars and evidence of wayfinding techniques

The next obvious question concerns the type of reference system employed when sailing at night in an age without instruments: How did ancient mariners maintain a course in the absence of landmarks?

To begin exploring several possible answers to this question, I take a passage from the *Argonautica*, the epic poem of Jason and his crew by Apollonius Rhodius in the third century BC. When Jason began the trek back to Thessaly from Libya, it required two days to sail the 300 nm of open sea to Karpathos, whence they proceeded to eastern Crete, presumably a well-known landmark.[16] 'After spending a night there, they drew water and embarked, intending first to proceed under oars beyond the height of Salmone (Cape Sidero). Then, immediately, while running over the depths of the Cretan Sea, night began to frighten them, the night they call the Shroud (*κατουλάδα*); on that fatal night neither stars nor sparkling moon was visible; but black chaos had descended from heaven, or some other inmost darkness had arisen from the depths of the earth' (Ap. Rhod. *Argon.* 4.1692-1698).

Eventually they reached Anaphe – Thera's neighbor to the east, a crossing of only some 60 nm. It is important to emphasize here that this distance is only a fraction of the distance from Libya to Karpathos. What was the difference between that large stretch of open sea and this relatively short passage? It must have been the fact that the sun had set on the Cretan Sea when the sky was thick with clouds. Thus it would seem that the so-called 'Shroud' was not necessarily unique to the Cretan Sea, but is instead a phenomenon applied to any situation involving open-sea navigation under cloudy skies, a rarity during Mediterranean summers. The upshot is that without any stars to steer by, the Argonauts were totally without reference.[17] We might conclude from this passage, therefore, that stars and other celestial phenomena were used as points of reference for these night-time crossings. Again, literature reinforces this view.

Of all ancient texts, one short passage in Homer's *Odyssey* (5.270-277) lists nearly all the navigation stars and constellations employed in antiquity. Upon building his raft, Odysseus set sail and 'watched the *Pleiades* and late-setting *Bootes*, and the Bear, which is also called the Wain; it circles where it is and keeps an eye on Orion. It alone has no part in the baths of Ocean. The beautiful goddess Calypso advised him to keep this one on his left as he sailed over the sea.' The Bear is the constellation most-often mentioned in nautical contexts and goes by many names: In Greek, it translates as *Arktos* and *Helice* (or the Helix), and sometimes *Axis*; in Latin it is known as *Ursa Major* (used in this paper); and in English it is called the Wain or Big Dipper, both groups of which are asterisms of the constellation.[18] The *Pleiades* are a deep-sky cluster consisting of exactly one hundred stars within the constellation *Taurus*; it is famous for its seven stars which were known as the 'seven sisters' in mythology, although in truth there are only six visible. *Bootes*, known also as *Arctophylax* and the Plow, has as its brightest star *Arcturus*. And *Orion* is one of the most prominent constellations in the Mediterranean night sky; its several high-magnitude stars make it simple to locate. Approximately five hundred years after the Homeric poems were compiled, Apollonius tells us in the *Argonautica* that 'on the sea sailors from their ships looked to *Helice* and the stars of *Orion*' (3.744-746). While he may have been following Homer's epic tradition, his audience was expected to understand the existence, if not the usage, of these essential navigation stars.

Of all these constellations, only *Ursa Major* and *Ursa Minor* were circumpolar (Fig. 2). Homer, who, like Apollonius, mentions only the larger of the two bears, says that it 'alone has no part in the baths of Ocean,' meaning that the constellation somersaults all night long around the celestial north pole, never touching the horizon. Owing to precession, the north celestial pole in antiquity was not occupied by *Polaris* as it is today, but by *Kochab*, the brightest star in *Ursa Minor*.[19] By at least the Classical Period a distinction between Greek and Phoenician sailors and their preferred constellations began. According to the third-century BC writer Aratus, 'In order to steer their ships, the Achaeans on the sea take their mark by Helice (*Ursa Major*), whereas the Phoenicians cross the sea trusting in the other

(*Ursa Minor* or *Cynosura*). But *Helice*, appearing clear at earliest night, is easily recognized; but the other is small, yet better for sailors; for all of her stars wheel in a smaller orbit; by her, then, the Sidonians sail their ships' (Arat. *Phaen.* 37-44)

Ovid (d. AD 17), too, who may have read Aratus' poetry and therefore may have borrowed his impressions, perpetuates this distinction between Achaean (Greek) and Sidonian (Phoenician) sailors: 'You two beasts, great and small, one the leader of Grecian, the other of Sidonian ships' (*Tr.* 4.3.1-7). So too does Silius Italicus, who wrote his epic poem *Punica* only a few years after Ovid's death: 'By observing the stars do we navigate across these valleys, for daylight confuses the path; and over the vast fields does *Cynosura* (*Ursa Minor*), that constellation most faithful to Sidonian sailors, lead the traveler who sees himself always in the middle of the plain' (*Pun.* 3.662-665); and later in the same epic, the Punic navigator Bato is described as having 'great skill to contend with the fierce sea and outsail storm winds; nor could *Cynosura*, no matter how obscured its course, escape his faithful watch' (*Pun.* 14.453-464).[20]

The constellation *Orion* also has a long history in ancient Greek literature, being first mentioned in Homer, but also in Hesiod's *Works and Days*.[21] Its different rising and setting episodes (e.g. heliacal rising, cosmical setting), along with *Arcturus* and the *Pleiades*, seem to have been used primarily as an indicator or benchmark of agricultural activity or as harbingers of the sailing season's beginning and ending.[22] By the third century BC, Aratus, like his contemporary Apollonius, describes *Orion* as a time-keeping reference, but also adds to it the function of navigation star. He remarks that the 'sailor on the open sea can mark the first bend of the River (*Eridanus*) rising from the deep, as he watches for *Orion* himself to see if he might give him any hint of the measure of the night or of his voyage' (*Phaen.* 728).

Exactly what is meant by 'the measure...of his voyage'? To be sure, concepts of direction were far more different in antiquity, with perceptions based on lateral views as opposed to plan views based on the maps and charts of today. However, since these stars were easily recognized and employed often, it would have been obvious to the mariner that as one traveled north, or toward the North Wind (*Boreas*), *Ursa Major* ascends higher and higher in the sky, and vice versa as one travels south; this constellation, for instance, rotates well above the horizon in Black Sea latitudes, while just south of Crete it dips its feet just slightly below it. And perhaps the Phoenicians realized early on, from constant observation and widespread voyaging, that *Ursa Minor* was a more-accurate indicator of the north celestial hub than its larger sibling. In any event, the correlation in antiquity between a star's altitude and one's geographic position, as first suggested by McGrail, is reinforced by congruent passages in Pliny and Arrian:[23] Pliny relates how the envoys from India 'marveled at the new sky, the Great Bear and the *Pleiades*, and they told us that in their own region...*Canopus*, a large and luminous star, shines on them at night' (*NH* 6.24.87). And Arrian, in his description of Nearchus' voyage to the Persian Gulf, has Alexander the Great's admiral state that 'some of the stars they had seen in the sky up to this point were completely hidden, while others appeared low down towards the horizon; and those which had never set before were now seen both setting and immediately rising again' (*Ind.* 25.4-8).

Perhaps the most obvious reference to this method of position reckoning, however, comes from Lucan's *Civil War*, in which a helmsman tells Pompey how he intends to navigate to Syria:

'the never-setting pole star (*Axis*), which does not sink beneath the waves, brightest of the twin Bears, guides the ships. When I see this one culminate and *Ursa Minor* stand above the lofty yards, then we are facing the Bosporus and the Black Sea that curves the shores of Scythia. Whenever *Arctophylax* (*Bootes*) descends from the mast-top and *Cynosura* (*Ursa Minor*) sinks nearer to the horizon, the ship is proceeding toward the ports of Syria. After that comes *Canopus*, a star content to wander about the southern sky, fearing the North. If you keep it on the left [as you sail] past Pharos, your ship will touch Syrtis in mid-sea (*in medio aequore*)' (*Bel. Civ.* 8.174-184).

These passages, then, make it obvious that the northern (and sometimes southern) circumpolar stars were used as a means for determining a.) orientation and b.) crude geographic position. The ability to gauge relative position north or south of some reference point is, of itself, significant. But aside from obtaining a rough estimate of a star's altitude on the mast-top, as in Lucan's description above, the limitations of such a technique lay in the fact that there were no known instruments capable of measuring correctly the altitude of stars. Nor does there appear to have been a means of demarcating an east-west position, a problem that plagued mariners until after Columbus' day. Thus, only to a certain extent could they derive their position by such techniques according to a 'mental chart' of relative geographic position: a night-time arrival in the neighborhood may have been attainable, but finding the correct address was an altogether different matter.[24] For this a specialized knowledge of local geography was required.

A third wayfinding technique, however, that of star-path steering, deserves exploration. Ethnological studies have shown that the Polynesians developed a navigational system encompassing both an intimate knowledge of weather and a considerable familiarity with stars and their rising and setting azimuths.[25] Thus equipped, they regularly sailed without compass between 50 and 200 nm at a time. They knew the direction of their destination by following a series of star-risings or settings, memorized in sequence, along a particular bearing, or 'star path.' Destinations did not necessarily lie directly along this path, and sometimes stars abeam were employed when those forward were obscured by cloud; only the most convenient and well-known stars were used. Winds and currents also affected their course, and to compensate, they steered by keeping the star-path on either bow; the navigator, much like Lucan's helmsman above, simply used parts of the rigging to keep himself in alignment with the stars associated with his destination.[26]

For example, in Figure 4, a Polynesian ship is steering north by northwest, keeping the Great Bear in line with the Main Brace to starboard and *Capella* in the shrouds. Over the course of the evening, *Capella* will rise too high to be useful and the navigator will switch to another star which rises on the same or similar bearing. Evidence exists that indirectly supports the theory that ancient Mediterranean mariners understood and employed a similar system of star-path steering.

Of the constellations we have encountered so far in ancient texts, the majority lies in the north: *Ursa Major, Ursa Minor* and *Bootes*. *Orion* and the *Pleiades*, however, are different: because their rising and setting azimuths in Mediterranean latitudes lie at due east and west respectfully, their zenith altitudes change imperceptibly with changes in latitude. Therefore when Aratus says that 'he watches for *Orion* himself to see if he might give him any hint of the measure of the night or of his voyage' (*Phaen.* 728), he meant that *Orion*'s stars, being so prominent in the night sky, were used to steer by, especially when they were close to the horizon. By keeping the northern stars on his left, Odysseus was steering eastward toward *Orion*, the object of *Ursa*'s gaze, and the *Pleiades*.[27] And indeed these constellations fit the model of a Polynesian 'star path.' For along an approximate bearing of 090° (due east) rose a series of high-magnitude stars, one after the other, throughout the night during the months of summer (Fig. 4a-c):[28]

1. *Altair* in *Aquila* (mag. 0.76)
2. *Deneb* in *Cygnus* (mag. 1.25)

3. *Alpheratz* in *Pegasus* (mag. 2.07)
4. ***Pleiades*** (mag. 1.2) (cluster of 100 stars)
5. *Aldebaran* in *Taurus* (mag. 0.87)
6. *Betelgeuse* in ***Orion*** (mag. 0.45)
7. *Procyon* in *Canis Minor* (mag. 0.40)
8. *Regulus* in *Leo* (mag. 1.36)
9. *Alphard* in *Hydra* (mag. 1.99)

For *Orion* and the others to be used effectively as guides on this 'star path,' however, required not only a knowledge of their rising and setting bearing, but also a realization that they rise obliquely to the horizon; within two hours of *Orion*'s rising, for instance, it ascends 30 degrees and shifts 30 degrees south of east. Thus, in order for the navigator to steer a true easterly course, he would have been forced to transfer his reference from star to star along that path once they reached a certain altitude. (The Polynesian practice was to shift to another star once it rose approximately 15° above the horizon, although east-west constellations, such as those listed above, could be used much longer.) And while these stars served to indicate due east, they also denoted west by their reverse (or 'back') bearing, much as landmarks were certainly used upon departure. Thus were all four quarters of the sky represented, sufficient enough for the mariner to steer more oblique courses by maintaining a star's position in relation to the ship's rigging, as in Figure 4 above.

Conclusions

A detailed study of empirical weather data has shown there to be more areas of 'open sea' in the Eastern Mediterranean than previously acknowledged. To be sure, an estimation of visibility is fruitless without taking into account meteorological information. And therefore the presumption that ancient mariners could sail anywhere in the Mediterranean with land continually in sight is erroneous, even in the case of the Aegean.

In the absence of reliable winds in open seas, ancient mariners required a reference system by which to maintain course. Well-known winds and the sun's position fulfilled this role during the day. And at night, stars and celestial phenomena, once their movements became understood and predictable, served to guide the mariner. Ancient sources drop useful tidbits here and there attesting to such practices: We know, for example, that Greeks, Phoenicians, and Romans correlated the altitude of the pole star with geographic position north or south of some reference point. We know equally well that ancient mariners steered by the stars, whether keeping them ahead or abeam or on points in between. That they steered by 'paths' of star risings and settings remains speculation, although this line of inquiry may lead to more discoveries in ancient sources. Above all, we can firmly reject any notion that ancient peoples were "mediocre sailors" who "had no experience in plying the open seas" and "would never sail at night unless they absolutely had to."

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NOTES

* This paper is derived from research compiled for my M.A. thesis on the development of navigation in the ancient eastern Mediterranean (Texas A&M University). I would like to thank Shelley Wachsmann for his comments and critiques on the original. I am deeply indebted to William Murray, who commented on and greatly improved the final version. Abbreviations are taken from Liddel, Scott and Jones [9], *A Greek-English Lexicon* and the *Oxford Classical Dictionary*.

1. Georgiou 1993: 353-364; Broodbank 1993: 315-331; 1989: 319-337; Lambrou-Phillipson 1991: 11-20; Broodbank/Strasser 1991: 233-245; Altman 1988: 231-237.
2. See Murray 1987 and 1995.
3. As cited in Rougé 1975: 12, n. 4 (A. Thomazi, *Histoire de la navigation*, "Que sais-je," 43 [1947], 23).
3. See most recently A. B. Knapp 1997: 155; Negbi 1996: 614; this is also the undertone of Hirschfeld 1996:
610-611 and to a lesser extent Aubet 1987: 133-166. We read in the *Oxford Companion to Ships & the Sea* 1976: "So far as it is possible to reconstruct the distant past, all the earliest navigation was purely coastal, ships relying entirely on visual contact with the shore. For several thousands of years after man first ventured to sail on the sea there were no aids to his navigation; no compass or other navigational instruments, no chart or map, no means of measuring distance at sea. The ships of this earliest period crept around the coasts, and if they were blown out to sea by storms, or hidden from the sight of the shore by fog, they were lost until again they sighted the coast." Similarly, Johnstone (1980: 81) speaks for the whole of prehistory when he states that "the usual practice was to beach the ship at night. This is confirmed by the absence of any means of cooking aboard the fourth century BC

Kyrenia merchant ship excavated from the seabed off Cyprus."
4. McGrail 1996: 311-320.
5. Wachsmann (1998: 295-301) explores navigational knowledge and techniques utilized during the Bronze Age.
6. See "Search for Phoenician Shipwrecks," in *Biblical Archaeology Review* 25.5 (1999: 16).
7. Aubet 1987: 142. The idea that mariners could see long distances because one peak was visible from atop another – despite the premise that the ship is at *sea level* – is the theme in McCaslin 1980: 106 and throughout Semple 1931.
8. Aubet's map is taken from Schüle 1968. For these numbers to make sense, we need to know first that the higher the elevation of the observer or the observed, the more distant the visibility, according to a mathematical formula. At the top of a ship's mast, say about 7 meters, the horizon lies 5.6 nm away. If the observer's height is doubled to 14 meters, then the horizon retreats to 7.9 nm, and so on. It follows, then, that if the observed object, such as an island or a mountain, has any elevation, it can be seen from further away *if visibility is unlimited*. Aubet, like Semple (*supra* n.3) fifty years earlier, uses this convenient formula to compute her map of theoretical visibility, but makes the mistake of excluding meteorological factors. McGrail qualifies his mention of theoretical visibility by adding 'in good weather' (McGrail 1987: 278 and table 14.1); so too does Agouridis (1997: 16-17). For tables computing distance to the horizon and geographic range, see Bowditch 1981: Tables 8 and 40.
9. Georgiou (1993: 361-362) discusses visibility in the Aegean during summer months.
10. The numbers of observations varied among these regions from approximately 200 to 2,000 during May over a 115 year period, 1854-1969. The resultant numbers agree well with my own personal experience acquired at sea in the Aegean 1995-1999. I found that haze often limited visibility to two or three nautical miles for a week at a time. The averages taken from *Synoptic* Table 11 were derived as follows: each observation was broken down by hour (0000 & 0300; 0600 & 0900; 1200 & 1500; 1800 & 2100) and divided into six stages of visibility. These lower three stages – <1/2 nm, 1/2<1 nm, and 1<2 nm – I discarded because of their rare frequencies, which rarely amount to 0.3 %. Next, I averaged each region's daily percentage for each of the three visibility categories and placed these figure on Table 1. Variations in visibility can sometimes be seen over the course of a day, but these hour-to-hour variations are minute by comparison with those that occur day to day.
11. For example, Menelaus deliberated whether to cross the open Aegean or take the coastal route (Homer, *Od.* 3:165-175).
12. Though Homer has a propensity for exaggeration–witness the 17 days (*ἑπτὰ δὲ καὶ δέκα*) he spent sailing to the land of the Phaeacians (*Od.* 5.278)–five days is a realistic time-frame for an Aegean-to-Egypt voyage, especially with a predominant north-west wind.
13. *Chelidonenses* is modern day Cape Gelidonya on the Mediterranean coast of Turkey. A Late Bronze Age shipwreck excavated here in the 1960s foreshadows Lucian's comment (see Bass 1967: 14-16). A voyage from Cyprus to eastern Egypt *maris vasti transverso* is recorded in Lucan 8.460-466.
14. See also Hdt. 8.6-9; Thuc. 1.48, 3.49, 3.81, 3.91, 4.31, 4.42, 4.53, 4.120, 6.65, 7.50, 8.41, 8.101, 8.102; Xen. *Hell.* 1.1.11, 1.1.13-16, 1.6.24-29; 2.1.32-2.3; Dem. 50.20, 56.30; Xen. *Oec.* 21.3; Diod. 13.39.1; Strab.10.5; Luc., *Nav.* 8-9, *Peregrinus* 43, *Toxaris* 19; Arr., *Ind.* 23.4, 25.4-8, 27.1, 29.1, 38.6; Hel. *Aeth.* 5.
15. This assumes an average speed of 6.25 knots over 48 hours, which is doubtful given the presence of a headwind the entire way. Cf. *Od.* 5.278.
16. LSJ9 s.v. κατουλάς refers to a fragment [433] of Sophocles that also uses the term with the noun νύξ. An episode similar to that experienced by the Argonauts is described in Ovid's *Tr.* 1.2.22B36.
17. The term 'asterism' denotes a group of stars within the larger constellation, distinguished

primarily by their brighter luminosities.

18. Precession is a shift over time in the position of stars relative to the viewer and is caused by a very slow wobble in earth's rotation, much like a child's top begins to wobble as it slows its spinning. It occurs because earth's center of gravity does not coincide with its center of rotation, the equator – due mostly to the gravitational bulge at earth's midriff, but also because earth is tilted 23.5 degrees from the ecliptic. As a result, the north celestial pole, as a celestial coordinate, describes a circle in the north sky approximately every 26,000 years resulting in a uniform shift in the position of the constellations as viewed from earth. Every so often a star wanders into or near the position of the north celestial pole as viewed from earth: in antiquity, *Kochab* (*β Ursae Minoris*) was the brightest star fitting this description; even so, it was still a significant distance away spinning in a tight circle 7° away. Today *Polaris* (*α Ursae Minoris*) fulfills this role.
19. See also Manilius, *Astro.* 1.294-302 and Diogenes Laertius, *Thal.* 1.23. Diogenes credits Thales with the discovery of *Ursa Minor* and a work on nautical astronomy, now lost.
20. Hesiod, *Op.* 598, 609, 615, and 619.
21. See Dicks 1970: 13, 34-38 and references there.
22. See also Strab. 10.2.12; Ovid, *Tr.* 3.10.9-14; and Nonnus, *Dion.* 40.284-291.
23. For the concept of a 'mental chart' in navigation, see McGrail 1987: 277.
24. Lewis 1972: 82f. The term 'azimuth' is used to describe the horizontal direction of a celestial object, and is measured clockwise from (in this case) 000° (true north) through 360°.
25. Lewis 1972: 94-97; I believe that comparisons between ancient Polynesian navigation systems and those employed in the ancient Mediterranean are relevant and productive. For while it is true that the Polynesians could sail hundreds, if not thousands, of miles over open ocean and hit their mark consistently, their inter-island voyaging was normally confined to their respective archipelagos where islands are regularly spaced between 50 and 200 nm apart (see Lewis 1972: 4-6, 85-94).
26. The *Pleiades* and *Hyades* were located either within or very near the constellations of Taurus; their rising and setting were objects of mention in ancient texts. See for example Alciphron, *Letters of Fishermen* 10 and Callimachus, *Epig.* 20.
27. In addition to this convenient alignment, there are others that correspond to known sea routes in antiquity – namely those between Egypt and Cyprus, which would require using circumpolar stars (forward and reverse bearings), and between Crete and North Africa using constellations on the ecliptic (although *cf.* Lucan 8.172-176).
28. Lewis 1972: 97-98.

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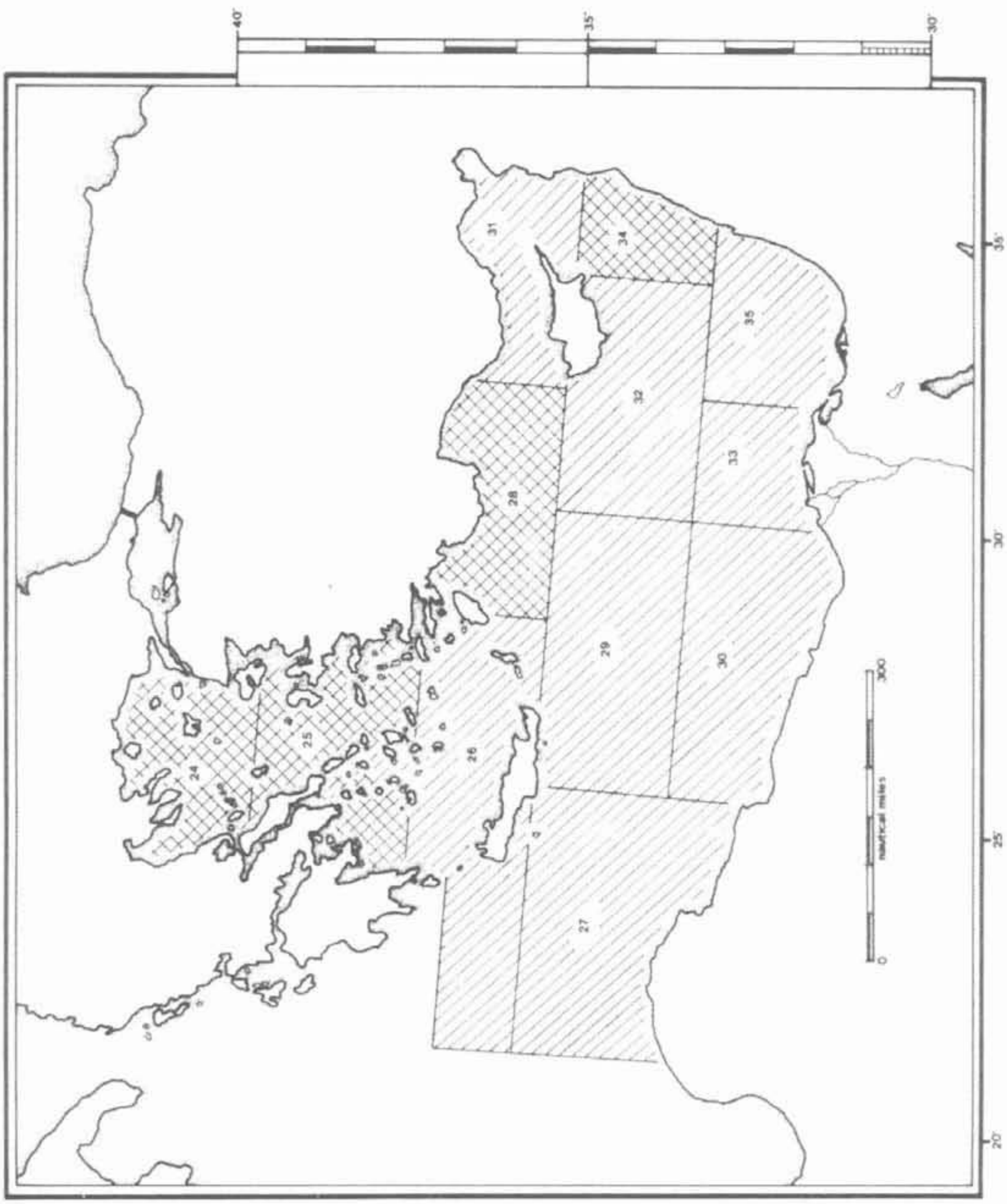
ILLUSTRATIONS

Fig. 1



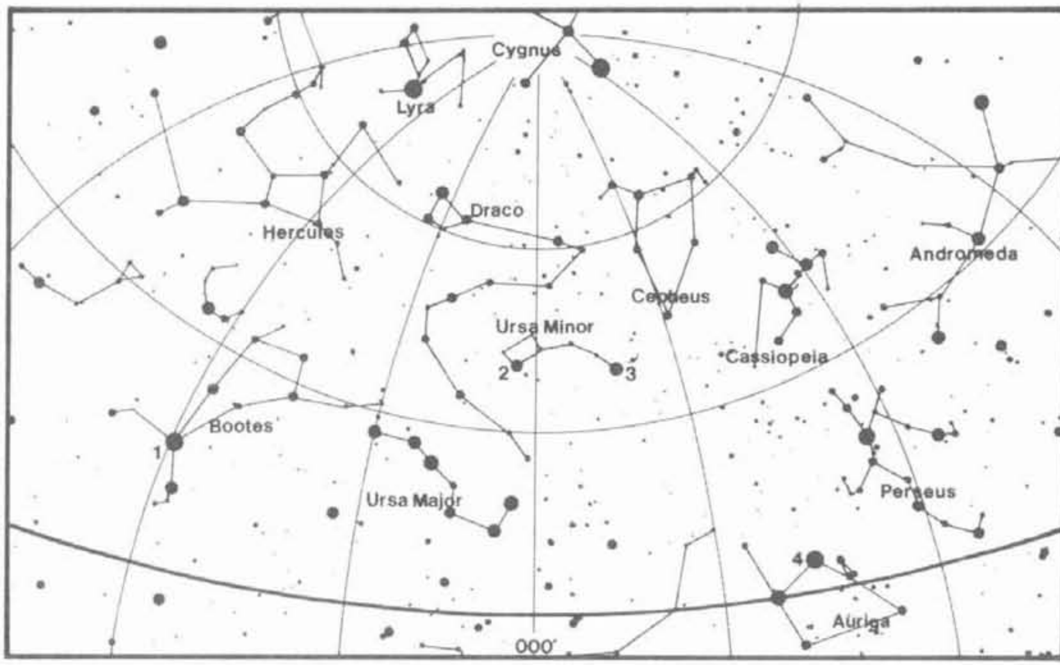

Cygnus
Lyra
Draco
Hercules
Andromeda
Cepheus
Ursa Minor
Cassiopeia
2
3
Bootes
1
Perseus
Ursa Major
4
Auriga
000'

Fig. 2

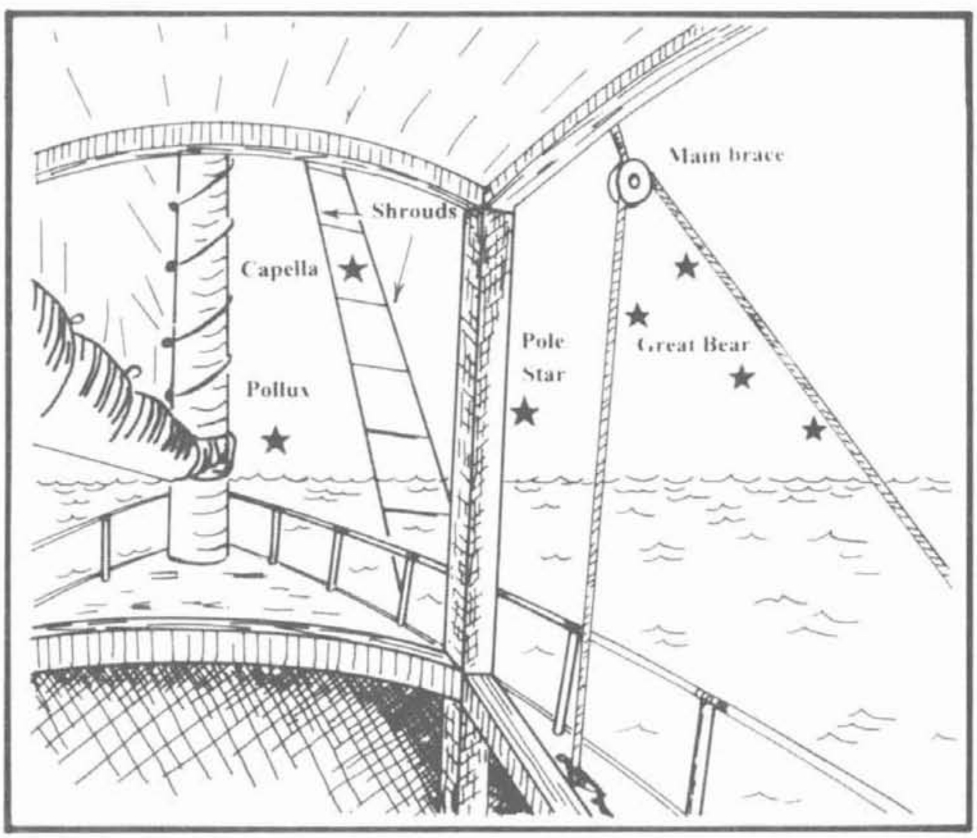

Main brace
Shrouds
Capella
Pole
Star
Great Bear
Pollux

Fig. 3

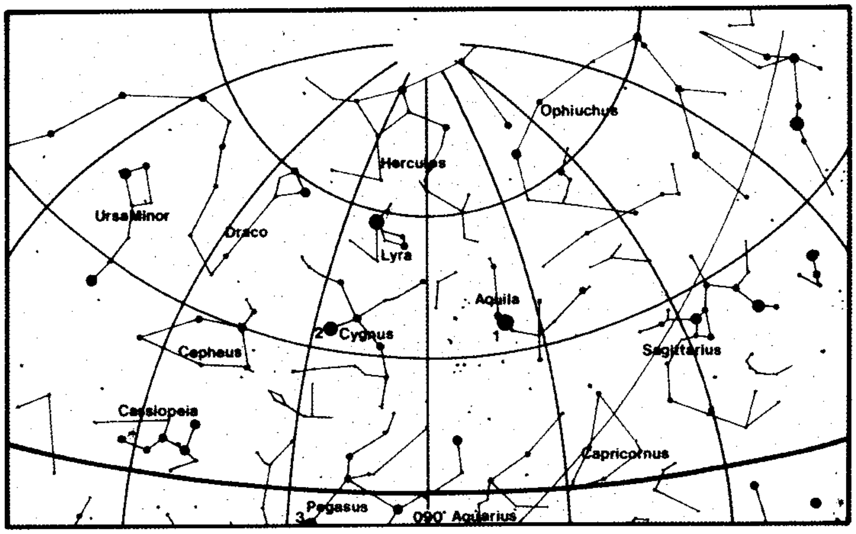


Fig. 4a

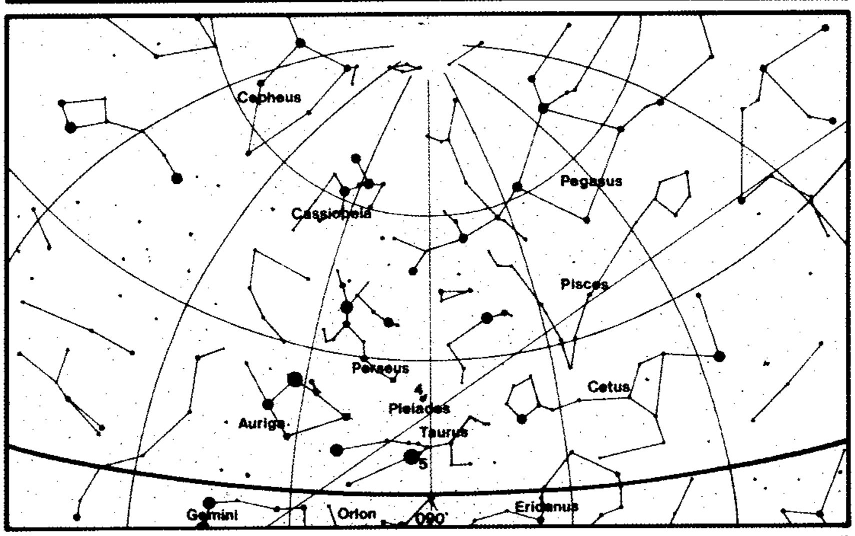


Fig. 4b

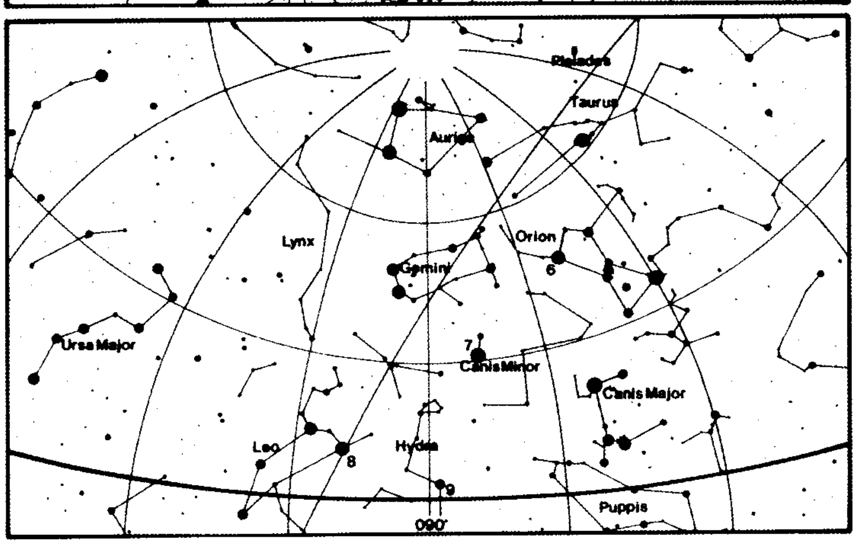


Fig. 4c

Table 1

Percentage frequency of visibility (nautical miles) in Mediterranean regions from May 1 to September 30, 1854–1969.

Area	Region	2 < 5	5 < 10	10 +	2 < 5	5 < 10	10 +
North Aegean Sea	24	2.26	46.8	49.4	Avg = 2.56	Avg = 42.0	Avg = 54.35
South Aegean Sea	25	3.86	52.78	42.2			
Crete	26	1.58	26.42	71.48			
Benghazi	27	0.98	12.84	85.96	Avg = 0.9	Avg = 17.92	Avg = 80.84
Rhodes	28	0.82	31.0	67.76			
Central Lev. Basin	29	0.94	12.88	85.78			
Alexandria	30	0.68	8.12	90.94			
North Cyprus	31	0.54	17.82	81.3			
South Cyprus	32	1.0	21.04	77.64			
Nile Delta	33	0.68	9.2	89.7			
Beirut	34	1.44	35.64	62.72			
Port Said	35	1.02	12.72	85.74			
Averages	**all**	**1.31**	**23.9**	**74.2**			

SITTING ON THOLES, OFFERING ANCHORS: SOME CHALLENGES OF INTERPRETATION IN ANCIENT EGYPTIAN NAUTICAL ICONOGRAPHY

Pharaonic Egypt provides some of the most explicit iconographic evidence we have from the ancient world regarding the construction and use of watercraft. The scenes are detailed and lively, peopled by sailors and passengers and stevedores; men pull the oars, direct the helm, raise the yard. In the end, of course, these images are not boats. They are material reflection of what the artist thought of a boat and its crew and its cargo, filtered through the haze of artistic convention, the constraints of the medium, and the artist's own skill and effort and intent. Therefore, iconographic evidence cannot be taken at face value but must rather be examined critically, keeping foremost in mind not only the subject at hand but also the art. Two examples – one long a subject of debate, the other not – will illustrate some of the challenges confronting those attempting to reconstruct watercraft on the basis of iconography.

Several Middle-Kingdom tomb paintings feature craft provided with a single rudder mounted at the stern and typically, but not always, fitted with a mast (fig. 1). One of these boats appears in Theban Tomb 60 (fig. 1.A), which belonged to an official named Antefoker and dates to the reign of Senwosret I (1971-1926 BCE). When Norman Davies and Alan Gardiner published the tomb in 1920, they described the action of the crew as follows: "The men stand . . . [and] seem . . . to be pushing the oars against a bent thole pin, like a gondolier; but this would give the wrong direction to this craft. They are really *pulling*, but the pins have been placed on the wrong side of the oars."[1]

Although Davies and Gardiner anticipated that the loom of an oar would be rigged aft of its tholepin, oars rigged forward of tholepins are found in the ethnographic record.[2] Closer examination of fig. 1.A does, nevertheless, reveal discrepancy of a different sort: the artist inconsistently overlapped hook-shaped objects and legs, which is especially noticeable when comparing the two rowers marked by arrows in fig. 1.A. Visually inaccurate relationships between objects is common in Egyptian art. For example, the boat in fig. 1.A is towing a funerary barge, the stern of which appears in fig. 2. On the barge, the artist has impossibly interwoven one steering oar among stanchions and stern, an "error" not unique to this scene.[3] Another typical artistic lapse, demonstrated by every figure here with the exception of fig. 7.A, is the absence of oar loops or grommets.

Other apparent discrepancies result not from artistic oversight or carelessness but rather from the conventions with which the Egyptian artist worked. These were based essentially on the concept of objects, not their appearance; that is to say, the artist made no attempt to recreate the illusion of three dimensions in two and instead drew things as he knew them to be rather than as he saw them to be. Of these conventions, which are many and complex,[4] only one is critical here.

Fig. 3 illustrates two representations of the head of Osiris, the Egyptian funerary god *par excellence*. The crown consists of a conical helmet. Two feathers, which in the statuette (fig. 3.A) flank the helmet, in the relief (fig. 3.B) appear to be mounted at front and back. The horns, which emerge straight from the sides, in the relief are shown curving to front and back. It is in this way that the Egyptian artist could render an object or element of an object that would, in three dimensions, be perpendicular to the viewing plane.[5]

Gardiner and Davies relied upon this fundamental convention when they interpreted the objects as tholes. Fifty years later Bjorn Landström advanced their interpretation one step further and reconstructed the objects as outriggers to facilitate the use of oars aboard a shallow boat (fig. 4).[6] More recently Dilwyn Jones has followed suit.[7]

The Egyptians facilitated the use of rowers aboard such watercraft by another means. In fig. 1 the rowers are standing, but in other scenes we see rowers working seated (fig. 5). Sometimes they rise to make the catch and sit back again through the drive to finish the stroke.[8] Ordinarily this is done from thwarts, but where necessary raised rowers' benches appear in scenes (fig. 5)[9] and models (fig. 6).

Some of these benches are, when seen end-on, hook-shaped (fig. 6.B-E) and bear a remarkable resemblance to the objects in fig. 1.A. However, are they in fact the same objects? After all, Egyptian drawing conventions would require that an artist depict tholepins in exactly the manner that we see in fig. 1. Therefore, despite knowing that there are indeed seats of this shape as evidenced by the models in fig. 6, and that the scenes in fig. 5 are representations of them, more evidence is needed to decisively conclude that the objects in fig. 1 are not tholepins.

That necessary piece of evidence appears in fig. 1 itself. With the exception of fig. 1.B, which is ambiguous, there is never a hook-shaped object aft of, namely, in front of, the rower nearest the stern. Without exception, there is always a hook-shaped object forward of, that is, at the rear of, the rower nearest the bow. The association is clearly not between the objects and the oars but rather between the objects and the rears of the rowers.

These objects are not, therefore, tholepins that curve outboard. They are, instead, broad benches whose seats curve back, like those in fig. 6. Two major factors misled Davies and Gardiner and the researchers who have followed them:

The absence of oar loops. This left open the possibility that they might not be in their usual place along the sheerstrake but instead at the ends of the hook-shaped objects.

The apparent association between the hook-shaped objects and the oars. This association, however, as evidenced by the association between the objects and the rowers' legs, is ambiguous and *inconsistent*.

We must, therefore, remove tholes from our repertoire of reconstructions of pharaonic Egyptian watercraft.

Unlike Middle-Kingdom tholes, the triangular objects with rounded tops found at the bows of boats in many Old-Kingdom tomb scenes (fig. 7) have long inspired contention. Ernest Assman unwittingly began the debate in 1913 by proposing that the Egyptians made offerings of conical loaves of bread (and wine) at the arrival and departure of vessels.[10] Fifty years later, when Honor Frost noted that stone anchors found in the Eastern Mediterranean, including Egypt (fig. 8), are essentially triangular when seen *en face*, researchers began to identify at least some of these objects as anchors.[11]

Unequivocal examples of bread loaves of this shape abound (fig. 9). They appear, for example, in baking scenes (fig. 9.A), with their bell-shaped molds (*bedja*) (fig. 9.B)[12] and on stands before the deceased[13] or in rows of offerings[14] (fig. 9.B).

Unequivocal examples of anchors are considerably less common. Generally accepted as anchors are the object at the bow of one of the ships from the temple of King Unas (fig. 10) and that from the similar – but contested – scene from the temple of King Sahure. The confusion regarding the latter arose because in the line drawing of the scene published by Ludwig Borchardt the hole does not appear,[15] a point R. L. Bowen, Jr.[16] immediately raised after Frost published her drawing with the hole.[17] Substantiating Frost's claims,[18] a photograph published more than twenty years later by Lucien Basch[19] confirms that the hole does indeed exist.

The identity of the objects at the bows of other boats remain to this day the subject of considerable controversy.

The arguments from both sides are long and complex, encompassing the practicality of anchors in Nile mud[20] and ultimately extending to the question of whether or not the ancient Egyptians ever went to sea.[21] These two questions are beyond the scope of the current paper, so it will not be necessary to comment upon them here. The two major points and counterpoints at issue here are:

The pro-bread group contends that the Egyptians offered bread of this shape by itself in non-nautical contexts; the objects on the boats are examples of this practice in a nautical context.[22]
The pro-anchor group contends that bread alone is not attested to as an offering and that the evidence used to support the use of bread in association with the arrival and departure of vessels comes from non-Egyptian sources.[23]

The pro-bread group contends that there are no hawser holes on any of these objects[24] except for the examples from the funerary temples of Unas and Sahure.
The pro-anchor group contends that the lack of hawser holes is unimportant, the result of artistic oversight or ignorance.[25]

The first point and counterpoint are based on the function of the objects, focusing on the use of unambiguous loaves of bread in offering scenes and how bread is treated in that context. As such, they are secondary and will be examined (here only briefly) after forma' considerations.

The most troubling formal point for the identification of these objects as anchors is the lack of a hawser hole. However, as the "tholepins" have served to demonstrate, the omission of a detail is not the strongest basis for an argument. More useful would be another positively indicative (or contraindicative) detail.

Leaving aside images and turning to the actual objects, what distinguishes a loaf of bread from a stone anchor? Aside from the hawser hole and of course the material used in their creation, the actual shape of the objects. Anchors are flat-sided, bread is conical. Unfortunately, in Egyptian two-dimensional representations a flat-faced object cannot be told from a round-sided one, even as an object curving backwards cannot be told from one curving towards the viewer. Once again we must look for another clue.

Even the finest bas relief was intended, ultimately, to be painted, which would provide texture and other such detail that the carving itself does not suggest.[26] All too often the painted surface no longer survives, making it imperative to remember that often what one is viewing is not the complete and finished work. The loss of the intended surface has caused difficulties, for example, with regards to the interpretation of the ships of the Sea Peoples at Medinet Habu, with human bodies strangely woven in and out of portions of the hulls.[27]

Fortunately, many tombs do retain at least some of their original, painted surfaces. Among them is the tomb of Kaiemankh at Giza (Dynasty VI), the burial chamber of which is decorated in painted plaster (not relief) and which has among its scenes two sailing boats with the objects in question positioned at the bows. The register below the boats depicts ducks, geese, and pigeons. Below this is a variety of offerings, including five conical loaves of bread, which, to balance the composition, the artist placed atop their baking molds. In the photograph published by Junker,[28] one can see that the artist painted each loaf yellow, "browned" at the top (as if from baking) by means of vertical brush strokes in the same reddish-brown paint used to outline it. This detail is confined neither to this scene nor to this tomb.[29]

He did exactly the same to the objects at the bows of the boats (fig. 11).[30]

This presents us with two possible interpretations. Either:

> Egyptian artists committed two simultaneous errors: one is the omission of the hawser hole from virtually every representation of an anchor;[31] the other is that the artist of Kaiemankh's tomb either painted anchors in exactly the way he painted loaves of bread (i.e., without hawser hole and with brown top)[32] or he (erroneously?) painted loaves of bread in place of anchors.

or:

> the Egyptian artists deliberately painted loaves of bread aboard these boats.

The first interpretation, that the objects are anchors, requires the acceptance of a remarkable number of omissions of detail and at least one case of transference or misidentification by the artist.

The second interpretation, that the objects without holes are loaves of bread, raises only the question of why these are at the bows, which is not a trivial issue. It calls for further examination, but for now[33] only a brief restatement and slight expansion of what others have proposed is offered: the boats in these scenes are not engaged in ordinary journeys. Accompanying texts indicate that these vessels are going to the "West", namely, the netherworld,[34] which was also known as the Field of Offerings[35], which were symbolized by bread,[36] which appears as a single, uncut conical loaf placed alone on a reed mat in the hieroglyphic sign *hetep* ("altar", Gardiner sign list R 4)[37] and as a single, uncut conical loaf held alone in hand in the hieroglyphic sign *imi* ("give", Gardiner sign list D 37 and D 38).[38]

However, regardless of the precise reason why these objects appear at the bows of the boats, regardless of whether or not the Egyptians ever used stone anchors in the Nile or ever went to sea, the fact remains that what the Egyptian artist painted are loaves of bread.

Egyptian forms of representation, although conceptual, can be misleading, for it was the Egyptians' concepts, not our own, that we see in two dimensions on the walls. Very easily artistic convention, carelessness, unfamiliar cultural practices, as well as state of preservation, can put us astray from seemingly straightforward issues. We must continually question interpretations, even our own, in the face of evidence both new and old. This is the only way to reach beyond the art to grasp, however loosely, the physical reality that surrounded the artist and influenced his work.

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NOTES

1. Davies/Gardiner 1920: 20 n. 1; emphasis in the original.
2. «In the Mediterranean today boats are always rowed with the oars forward of the thole» (Coates 1993: 49).
3. E.g., (Old Kingdom) Blackman/Apted 1953: pl. XLIII; (New Kingdom) Davies 1927: pl. XXVI; Weeks 1998: unnumbered color plate.
4. For an in-depth and overall examination of these conventions, see Schäfer 1986.
5. Cf. Schäfer 1986: 107, 116.
6. Landström 1970: 84, 85 figs. 255-257, 87 fig. 265.
7. Jones 1995: 48, pl. VI. Jarrett-Bell (1930: 11-12) likewise thought these objects to be tholes.
8. Boreux 1925: 319-24, Jarrett-Bell 1930.
9. Boats of this type also appear in the tomb of Khnumhotep at Beni Hasan (Newberry 1893-94.1: pl. XXIX). For another scene from the tomb of Amenemhat (besides that here, fig. 1.B), see Newberry 1893-94.1: pl. XVI.
10. Borchardt 1913: 149-50.
11. Frost (1963: 9) first cited the depiction on the Causeway of Sahure. Tombs later explicitly identified as having depictions of anchors include those of: Akhethotep (Frost 1964; Nibbi 1975: 38; Nibbi 1984: 254-255 fig. 3); Ti (Nibbi 1975: 38; Nibbi 1984: 253 fig. 2; Nibbi 1997 46 fig. 6); and Kaiemankh (Nibbi 1975: 38).
12. E.g.: Épron/Daumas/Goyon 1939: pl. LXVI (tomb of Ti; also B×rta 1995: 24 fig. 3; Nibbi 1997: 46 fig. 7; Basch 1994: 223 fig. 5); Morgensen 1921: 38 fig. 36 (tomb of Kaemremt; also Basch 1994: 223 fig. 6).
13. E.g.: Nibbi 1997:54 fig. 13a (tomb of Shepsi); Harpur 1987: 400 plan 57 (tomb of Rakhaefankh); Harpur 1987: 398 plan 48 (tomb of Kainefer); Harpur 1987: 415 plan 89 (tomb of Itti); Basch 1994: 223 fig. 4 (stela of Nes-henu).
14. Junker 1929-55.4: pl. XVI (tomb of Kaiemankh); Harpur 1987: 461 fig. 30 (tomb of Hetepka), 470 fig. 58 (tomb of Nefer), 530 fig. 188 (tomb of Pahenwikai).
15. Borchardt 1913: pl. 12.
16. Bowen 1963.
17. Frost 1963:4 fig. 1.
18. Frost replied that this figure had been drawn from a photograph «in the archives of the Science Museum» (Frost 1964: 242).
19. Basch 1985: 454 fig. 1.
20. Frost (1979: 146) and Basch (1985: 457) question the practicality; Nibbi (1984: 260-61;

1997: 43-45) upholds it. Earlier (Nibbi 1975: 39-40) she suggests that the nautical application of these stones could have been for purposes other than mooring.

21. For a summary of arguments and bibliography for the view that the Egyptians did *not* go to sea, see Nibbi 1997. References to Egyptian seafaring abound, but for a recent overview see Wachsmann 1998: 9-38.
22. Basch 1994: 222-23.
23. Nibbi 1975: 39, Nibbi 1997: 45-49.
24. Frost (1964: 242) reported «pin-head» sized holes in the reliefs from the tomb of Akhethotep at the Louvre, but Basch's reexamination of the scenes, and additionally those of Ti and Mereruka, revealed no such holes (Basch 1985: 459-60; Basch 1994: 221-22). In later publications, Frost acknowledges that similar objects, from another tomb, are «more likely to be one of the loaves of bread that are sometimes confused with anchors» (Frost 1979: 146).
25. Nibbi 1975: 38, Bakr/Nibbi 1991: 8 n. 24.
26. Baines 1986: 9.
27. For examination of this difficult scene, and solution to the anomalies presented by its current condition, see Wachsmann 1981, Wachsmann 1982, Wachsmann 1998: 163-75, 317-19.
28. Junker 1929-55.4: pl. VII.
29. For another scene in the tomb of Kaiemankh with bread so painted, see the black-and-white photographs in Junker 1929-55.4: pl. XVII. For color photographs of bread so painted in the tomb of Irukaptah at Giza, see Siliotti 1997: 134-35 figs. B, C, E, F.
30. Cf. Junker's photograph of these boats (1929-55.4: pl. VII), in which one can clearly see that both objects are painted in this manner. In his own painting of the rightmost of these boats, Landström (1970: 40 fig. 104) omitted this detail.
31. If this is to be considered a convention, the *inclusion* of the hawser holes in the representations of the Sahure and Unas ships is noteworthy.
32. There is nothing about anchors themselves that would have inspired the artist to paint such a detail.
33. The author plans to explore this and other issues raised in the bread-or-anchor debate in greater detail in another paper.
34. Harpur 1987: 83.
35. Lesko 1991: 119-20; B×rta 1995: 30-31.
36. Wilkinson 1992: 162-163, 206-207.
37. Gardiner 1957: 501. The bread in R 4 takes on several forms, most being beveled at the base, but some, as those seen in Junker 1929-55.3: 167 fig. 29 and Junker 1929-55.5: 69 fig. 16, are not.
38. Gardiner 1957: 454.

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FIGURES

Fig. 1 Boats. A: Tomb of Antefoker, Theban Tomb 60, Dynasty XII (Senwosret I, 1971-1926 BCE). From Davies/Gardiner 1920: pl. XVIII. B: Tomb of Amenemhat, Beni Hasan. Dynasty XII (Senwosret I, 1971-1926 BCE). From Newberry 1893-94.1: pl. XIV. C: Tomb of Sehetipibre, Karnak. Dynasty XII. Dynasty XII (Senwosret I, 1971-1926 BCE). After Vandier 1969.1: 915 fig. 344, 1.

Fig. 2 Stern of a funerary barge. Theban Tomb 60 (Antefoker), Dynasty XII (Senwosret I, 1971-1926 BCE). From Davies/Gardiner 1920: pl. XVII.

Fig. 3 Osiris. A: Bronze statuette. Third Intermediate Period (1070-712 BCE). After D'Auria/Lacovara/Roehrig 1992: 239 no. 198. B: Relief, temple of Seti I, Abydos. Dynasty XIX (Seti I, 1306-1290 BCE). From Erman 1894: 226.

Fig. 4 Reconstruction of the boat in fig. 1.A by Bjorn Landström. After Landström 1970: 85 fig. 257.

Fig. 5 Boats with rowers' benches. A: Tomb of Djehutihotep, El Bersheh. Dynasty XII (Senwosret III, 1878-1841). From Newberry n.d.1: pl. XVIII. B: Tomb of Sarenput I, Elephantine. Dynasty XII (1991-1783 BCE). After Vandier 1969.1: 913 fig. 342.

Fig. 6 Wooden model rowers seated on benches. Middle Kingdom (2040-1640 BCE). A: From Reisner 1913: 69 fig. 256. B: From Reisner 1913: 12 fig. 50. C: From Reisner 1913: 47 fig. 165. D: From Reisner 1913: 33 fig. 129. E: After Glanville, 1972: 40 fig. 39c.

Fig. 7 Boats with triangular object at the bow. A: Tomb of Ti, Saqqara. Dynasty V (Izezi - Unas, 2388-2323 BCE). After Épron/Daumas/Goyon/Montet 1939: pl. XLIX. B: Tomb of Kaemremt, Saqqara. Dynasty V (2465-2323 BCE). From Morgensen 1921: 18, fig. 11.

Fig. 8 Stone anchor from Wadi Gawasis. Dynasty XII (Senwosret I, 1971-1926 BCE). After Wachsmann 1998: 261 fig. 12.11.

Fig. 9 Conical loaves of bread. A: Bakers. Tomb of Ti, Saqqara. Dynasty V (Izezi - Unas, 2388-2323 BCE). After B×rta 1995: 24 fig. 3. B: Pottery mold (*bedja*) for baking conical loaves of bread. Dynasty V (2465-2323 BCE). After B×rta 1995: 22 fig. 1a. C: Offerings. Tomb of Hetepka, Saqqara. Dynasty V - VI (Unas - Teti, 2356-2291 BCE). After Harpur 1987: 461 fig. 30.

Fig. 10 Bow of boat. Causeway of Unas, Saqqara. Dynasty V (Unas, 2356-2323 BCE). After Wachsmann 1998: 14 fig. 2.5.

Fig. 11 Bow of boat. Tomb of Kaiemankh, Giza. Dynasty VI (2323-2150 BCE). After Junker 1929-43.4: pl. IV.

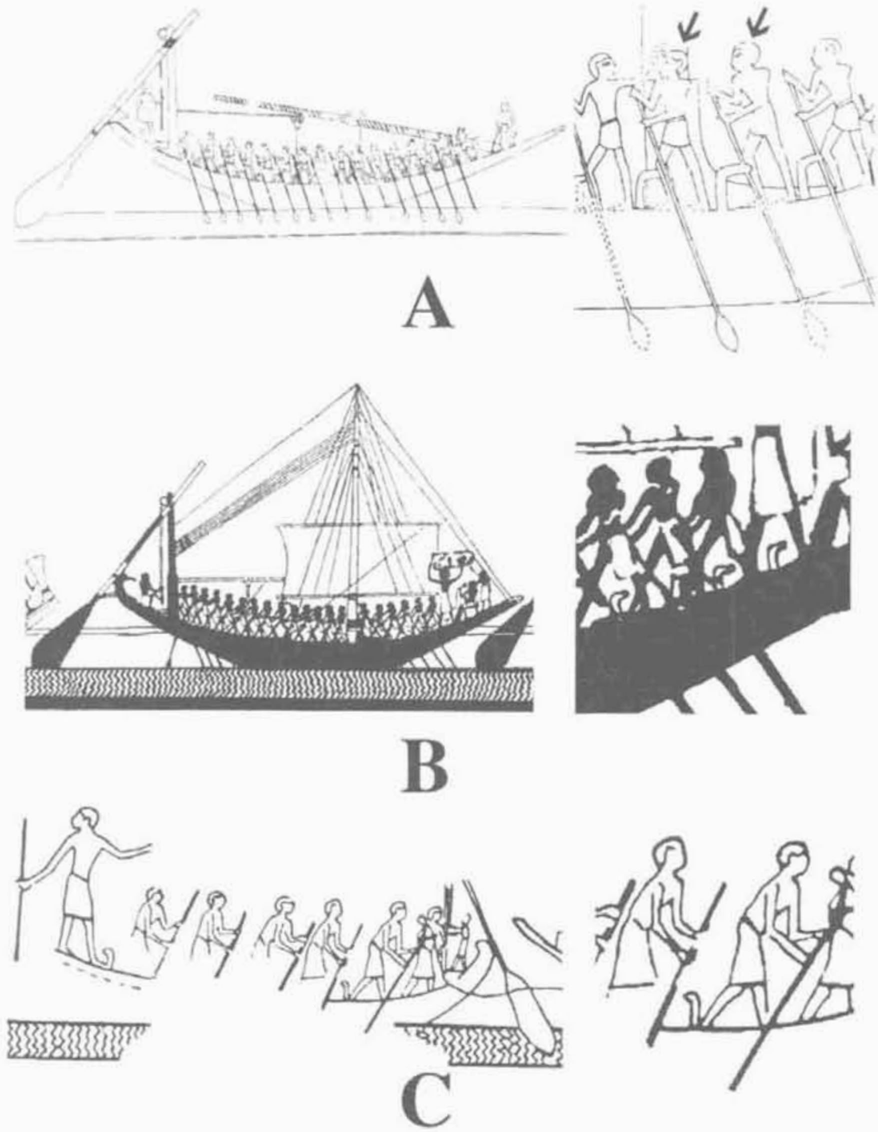

Fig. 1

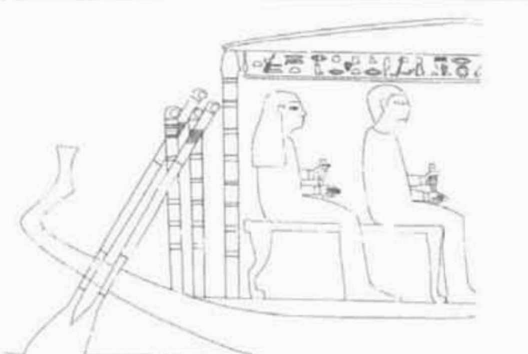

Fig. 2

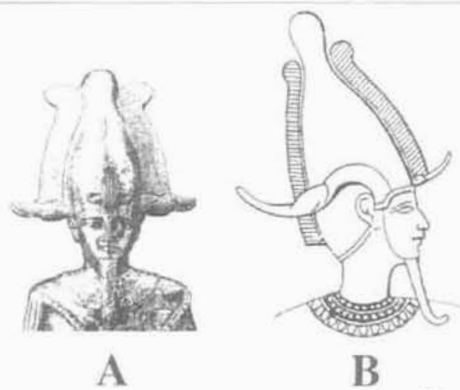

Fig. 3

Fig. 4

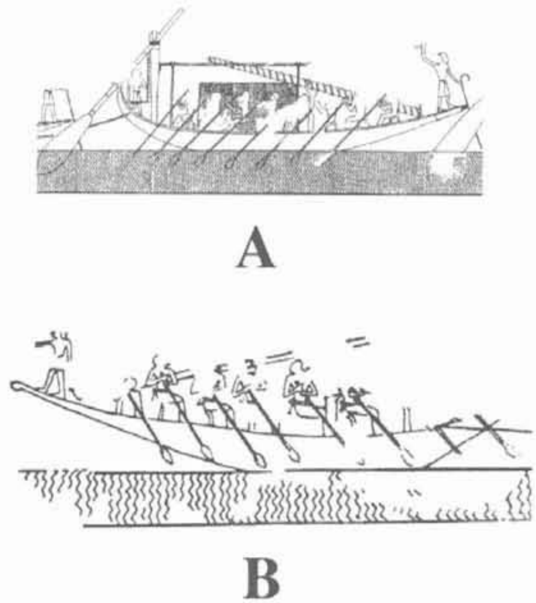

Fig. 5

Fig. 6

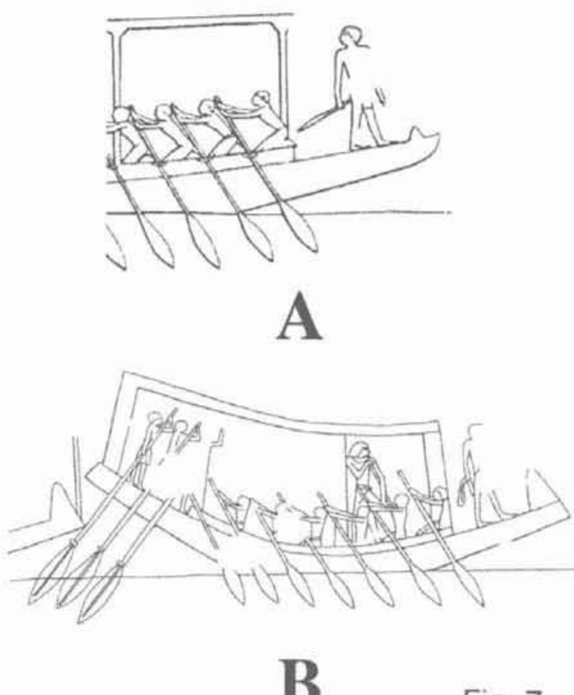

Fig. 7

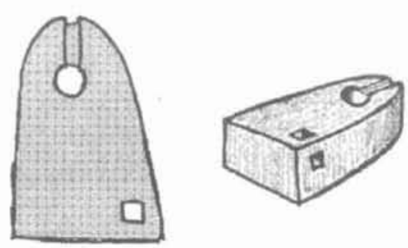

Fig. 8

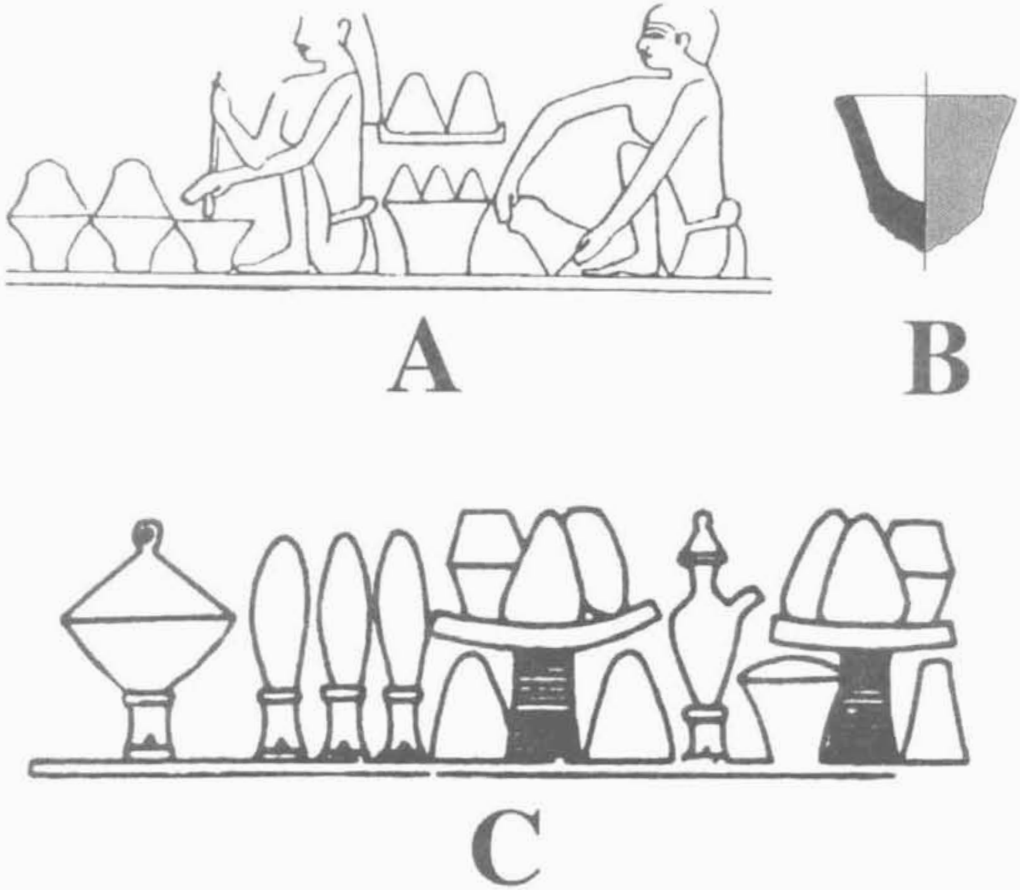

Fig. 9

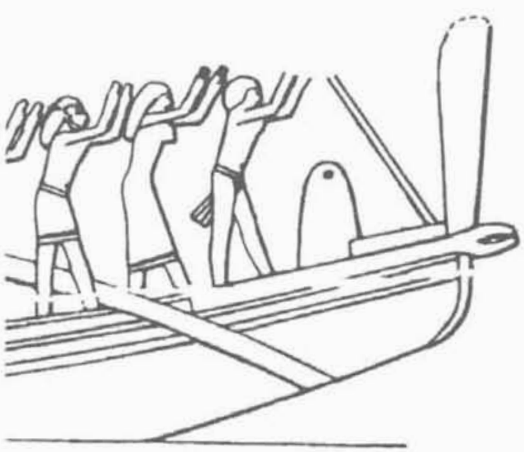

Fig. 10

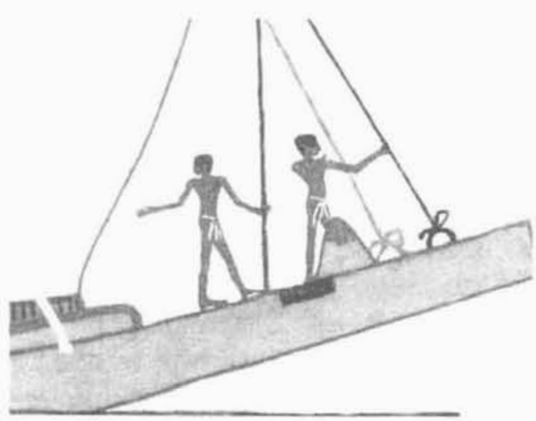

Fig. 11

LES FOUILLES SOUS-MARINES DU CNRS A ALEXANDRIE (EGYPTE)
I- LE SITE MONUMENTAL DE QAITBAY

Les fouilles du Centre d'Etudes Alexandrines du Centre National de la Recherche Scientifique (CNRS) à Alexandrie ont commencé il y a une dizaine d'années. Les premières recherches ont porté sur des chantiers terrestres. Il s'agissait d'opérations de sauvetage urbain, là où les promoteurs détruisaient des immeubles vétustes pour y ériger des tours modernes. Depuis 1992, nous avons procédé à une vingtaine de fouilles d'urgence aussi bien dans l'habitat de la ville antique que dans les nécropoles[1].

Les fouilles sous-marines ont commencé en automne 1994 et nous en sommes donc actuellement à la huitième campagne (fig. 1)[2]. Chaque campagne de fouilles comptant entre 4 et 6 mois de fouilles par an, si nous mettons tous ces mois de fouilles bout à bout, nous totalisons l'équivalent de plus de quatre années de fouilles à ce jour. Les équipes varient d'une année sur l'autre, en fonction de nos objectifs et de nos moyens financiers. En moyenne, les équipes comptent une quinzaine d'archéologues plongeurs, mais durant certaines campagnes, notamment en 1995, ce chiffre a plus que doublé. Ce sont donc maintenant plusieurs dizaines de milliers d'heures de travail sous l'eau qui ont été réalisées jusqn'à 'présent[3]. Cependant, comme on le verra à ce jour, les recherches sont loin d'être terminées.

En réalité, nous menons de façon concomitante plusieurs fouilles sous-marines de nature différente. La concession attribuée à notre équipe se situe à l'extérieur du port oriental d'Alexandrie, depuis l'extrémité nord du cap Lochias à l'est (la moderne pointe du Silsileh) jusqu'à l'ouest du fort Qaitbay. Au pied du fort Qaitbay, nous fouillons un site monumental composé de plus de 3.000 blocs d'architecture et de sculpture, tandis que dans les zones situées plus loin au large, nous avons trouvé toute une série d'épaves de bateaux grecs et romains (sur la fig. 1, voir les indications 'QB1' à 'QB4'). Dans les pages qui suivent, je vais essayer de faire un point rapide sur le seul site monumental qui gît par 6 à 8 mètres de profondeur sur le flanc oriental du fort de Qaitbay. Nous réserverons à la prochaine réunion du groupe de notre ami Harry Tzalas l'occasion de faire le point sur la fouille des épaves grecques et romaines.

Le site monumental au pied du fort Qaitbay

Les circonstances de la fouille

Le site monumental immergé au pied du fort de Qaitbay était déjà connu par les voyageurs des siècles passés et avait fait l'objet d'une exploration par le pionnier de l'archéologie sous-marine égyptienne, Kamal Abou el-Saadate, au début des années 1960 ; puis ce fut Honor Frost, qui exécuta une mission d'expertise pour l'UNESCO en 1968 et publia la première étude sur le sujet, avec toute une documentation graphique[4].

En septembre 1994, les Autorités Égyptiennes m'ont demandé d'intervenir, alors que 180 blocs de béton moderne étaient jetés sur le site antique. Nous avons alors découvert à notre tour cette zone immense qui s'étend par 6 à 8 mètres de profondeur sur une superficie de 1,25 hectare.

L'aspect du site

Le site est composé de plus de 3.000 pièces d'architecture antique. Le chiffre ne peut être précisé, car chaque nouvelle campagne apporte un grand nombre de blocs nouveaux, que ce soit parce que nous les découvrons peu à peu en déplaçant les couches supérieures au moyen de ballons gonflés à l'air comprimé, mettant ainsi au jour les couches inférieures, soit parce que nous enlevons les blocs de béton moderne : la dernière opération de ce type a été effectuée en janvier 2001, permettant d'enlever 145 blocs de béton moderne de 20 tonnes chacun qui encombraient encore le site antique (fig. 2).

La carte que nous avons pu constituer comprend à ce jour 2.635 blocs : ils sont topographiés et, pour la plupart, dessinés et photographiés. On mesure l'ampleur du travail qui reste à fournir.

Les méthodes utilisées : la topographie sous-marine par onde acoustique

Les archéologues qui procèdent aux fouilles de sauvetage sont soucieux d'économiser leur temps en recourant aux techniques nouvelles qui améliorent leur efficacité. Ce souci est encore plus présent lors des fouilles sous-marines, même si l'apparition d'une nouvelle technologie peut susciter des engouements sans lendemain. Cette curiosité nous a poussés à expérimenter des méthodes de relevés topographiques par station totale Leica visant une bouée que les plongeurs plaçaient le mieux possible, au moyen d'un lourd lestage, au-dessus d'un point immergé ou en plaçant un GPS sur le pointeur de la même bouée. L'utilisation d'un GPS différentiel nous donnait une précision théorique de l'ordre du centimètre, mais la houle fréquente dans ces eaux, sauf par le vent du sud malheureusement trop rare à Alexandrie (de l'ordre de 30 à 40 jours par an), entraînait des erreurs récurrentes qui nous ont ramenés vers la méthode traditionnelle de la triangulation. Cette opération (dont l'invention revient aux géomètres alexandrins de l'époque de Ptolémée II !) présente toutefois l'obstacle de la lenteur. Une solution semble avoir été trouvée au cours de l'année 2001 avec l'achat, grâce à un mécénat spécifique[5], d'un nouvel outil, l'Aquamètre (**fig. 3**). Développé par la société PLSM, cet appareil immergé permet des mesures acoustiques. Sous l'eau, il mesure la vitesse/distance entre un pointeur et une base fixe dont l'on connaît la position en 3D, donnant les nouvelles positions du pointeur mobile. Les données enregistrées sur disquette aboutissent à une cartographie automatique d'une précision centimétrique lorsque le pointeur se trouve dans un rayon d'une dizaine de mètres de la base. Plusieurs pointeurs (16 au maximum, avec une mesure à la seconde pour chacun) peuvent être utilisés en même temps. L'utilisation de ce nouvel outil pendant les campagnes de printemps et surtout d'automne 2001 autorise à mettre quelque espoir dans la fiabilité et la rapidité de ce nouvel outil qui sera peut-être d'un usage courant et banal pour les archéologues sous-marins d'ici quelques années.

La subsidence

Plusieurs indices montrent que le site se trouvait hors d'eau dans l'Antiquité. Ainsi des débitages ont dû avoir lieu sur place, comme l'indiquent les cavités creusées par les coins des carriers voire les déchets de débitage que l'on retrouve sous plusieurs blocs. D'autre part, les scellements métalliques encore en place montrent qu'un certain nombre de pièces d'architecture appartiennent à des monuments qui se dressaient à cet endroit dans l'Antiquité.

L'enfoncement remarquable du site – de l'ordre de 6 à 8 mètres – que constatent les archéologues est expliqué par les géomorphologues par une subsidence particulièrement importante dans la région. Alexandrie est affectée par le jeu des plaques tectoniques avec l'enfoncement de la plaque africaine sous l'Europe et la région égéo-anatolienne, au niveau de la Crète et de ses environs. Par contrecoup de cette activité sismique, Alexandrie s'est enfoncée d'une manière que révèlent une vingtaine de carottages effectués dans la baie : il s'agirait d'un phénomène, non pas progressif, mais violent, dont l'un des épisodes les plus importants a eu lieu à la fin du VIème siècle après J.-C.[6]

Les monuments pharaoniques

D'autres pièces du site sous-marin sont remarquables, par leur forme autant que par leur chronologie : il s'agit d'une trentaine de sphinx, de 5 obélisques, d'une demi-douzaine de colonnes papyriformes. Ces blocs sont en granite d'Assouan, en quartzite, en calcite, en grauwacke et la plupart portent des inscriptions en langue égyptienne : ces hiéroglyphes ont été déchiffrés directement sous l'eau par des égyptologues-plongeurs de l'Institut français d'archéologie orientale (IFAO-Le Caire) et du Conseil Suprême des Antiquités (SCA), inaugurant ainsi une nouvelle spécialité que Champollion n'aurait pas imaginée, l'égyptologie sous-marine ! Ces spécialistes nous apprennent que ces pièces portent les noms de pharaons fort éloignés dans le temps, depuis Sésostris III (XIIème dynastie, XIXème siècle avant J.-C.) jusqu'à Psammétique II (XXVIème dynastie, VIème siècle avant J.-C.) (fig. 4-5). Ces mêmes inscriptions nous enseignent que ces offrandes proviennent du vénérable sanctuaire du soleil à Héliopolis (au nord du Caire moderne). Détruit par un violent incendie, il servait, comme nous l'apprend le géographe grec Strabon (vers 25 avant J.-C.), de carrière aux Ptolémées puis aux Romains qui y prélevaient ici un sphinx, là un obélisque pour décorer leur nouvelle capitale. Ainsi, ces consécrations pharaoniques ont abouti à Alexandrie, pour servir dans la maçonnerie des nouvelles constructions (comme le montrent des sphinx équarris du site sous-marin, dont on reconnaît parfois avec mal la forme originelle) ou au décor de la cité, ornant des places publiques ou la façade des temples, comme l'Arsinoeion ou le Césaréum, selon les descriptions de Pline l'Ancien[7]. La présence de ces pierres 'errantes', emprunts à un sanctuaire pharaonique, ne changent en rien l'histoire de la cité fondée par Alexandrie le Grand en janvier 331 avant J.-C. Elles sont tout au plus une indication sur le décor pharaonisant de certains quartiers de la capitale.

Les statues colossales

Parmi les blocs remarquables se distinguent des statues colossales en granite d'Assouan (**fig. 6**)[8]. Aux six bases en pyramide tronquée qui se trouvent sous l'eau correspondent les fragments de six statues. Plusieurs de ces fragments statuaires ont été retrouvés durant la dernière campagne (telle la main à gauche de la fig. 6), après l'enlèvement des blocs de béton moderne en janvier 2001. Il s'agit de trois statues masculines et trois féminines : trois Ptolémées en pharaon, trois reines en Isis, trois couples royaux représentés par des effigies de grande taille, plus de 13 m pour le couple le plus grand, une dizaine pour les deux autres couples. L'identification de ces Ptolémées est en cours. Ils ont été retrouvés pour ainsi dire *in situ*, en contrebas de leurs bases, regroupés par paires et ils devaient être érigés au pied du Phare d'Alexandrie.

Monuments in situ et monuments rapportés

L'étude patiente des monuments *in situ* permet aussi de distinguer ceux qui ont été apportés d'autres endroits de la ville. Il s'agit principalement de fûts de colonnes qui ont servi de renforcement du site, sujet à de fréquents tremblements de terre[9] ou à des tsunamis, des raz de marée, comme celui qui a frappé Alexandrie le 21 juillet 365 après J.-C.[10] . Un savant de Bagdad, Abdel Latif, visita Alexandrie en 1200-1200 et, selon ses mots, « J'ai vu aussi sur les bords de la mer, du côté où elle avoisine les murailles de la ville, plus de quatre cents colonnes brisées en deux ou trois parties » ...etc.

A cette première indication sur la présence de pièces en place sur le site s'ajoute un constat sur les blocs d'architecture : ainsi des dizaines de scellements ont été retrouvés et sont en cours d'étude[11]. Ces agrafes métalliques en fer ou en bronze enrobées dans du plomb maintenaient des blocs deux à deux, de mêmes que les goujons verticaux. Le fait que des blocs aient conservé en place leurs scellements, que l'on trouve des associations de plusieurs blocs par l'emplacement des cavités de scellement (position, écartement, taille), indique que ces blocs se trouvaient en place et n'ont pas été apportés d'ailleurs.

Une porte monumentale a pu être reconstituée par Isabelle Hairy, architecte plongeuse en charge de l'étude architecturale du site, et elle présentera ses résultats au cours de la prochaine réunion de *Tropis*. Elle a pu reconstituer jambages, linteaux voire dalles d'une porte monumentale de 13 mètres de hauteur, avec des blocs dont le poids dépasse les 70 tonnes. Cette porte, dont on ne peut encore préciser la relation spatiale avec les statues colossales voisines, appartient à un monument important. Rappelons le seul témoignage d'Ibn Iyyas, chroniqueur du règne du sultan mamelouk Qaitbay : il indique par deux fois dans son texte que le sultan se rendit du Caire à Alexandrie en 1477 « pour bâtir une forteresse sur les ruines de l'ancien Phare ». L'un des buts des campagnes futures sera de continuer ces anastyloses virtuelles, surtout dans la zone située juste au contrebas du fort Qaitbay et de distinguer les éléments qui pourraient appartenir au monument qui s'élevait à cet endroit durant la période antique.

L'avenir du site sous-marin

A l'heure actuelle, nous avons mis à terre une quarantaine de blocs d'architecture et de sculpture (**fig. 7**). Ces objets ont séjourné sous l'eau pendant plusieurs siècles et ils doivent recevoir un traitement adéquat dès leur mise en contact avec l'air. Un processus de désalinisation a été mis en place et ces sphinx, ces statues et ces obélisques ornent maintenant le musée en plein air du site archéologique de Kôm el-Dick. Cependant, le grand nombre de blocs immergés a conduit à une réflexion sur l'avenir du site sous-marin. Il a paru d'emblée qu'il serait difficile, en temps comme en moyens financiers, d'étendre ces mises à terre des pièces architecturales à l'ensemble du site et qu'une autre solution devait être trouvée : le CSA a donc décidé la mise en valeur d'un parc archéologique sous-marin. A part des exceptions justifiées par un raccord avec un fragment déjà mis à terre, aucun bloc n'est désormais prélevé sur le site immergé. Les visiteurs sont acceptés, avec location d'équipements de plongée à travers des clubs privés de la ville, pour des promenades sous contrôle des autorités archéologiques. A l'avenir sont aussi prévus des bateaux à fond transparent qui permettront au non plongeurs de découvrir ce site saisissant, facilement visible par beau temps puisqu'il gît à faible profondeur, 6 à 8 mètres au maximum.

Pour obtenir des nouvelles régulièrement mises à jour sur le développement des fouilles sous-marines sur le site de Qaitbay, on peut se reporter au site web <www.cea.com.eg>

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1 Je renverrai à la bibliographie sur les fouilles terrestres qui est donnée chaque année dans les rapports publiés dans le *Bulletin de Correspondance Hellénique* (= *BCH*) : voir en dernier lieu le *BCH* 124 (2000), p. 548-570 et plus particulièrement p. 570.
2 Voir la bibliographie citée à la fin de cet article.
3 Les données exactes seront détaillées dans le volume en cours de publication *Pharos 1* (J.-Y. Empereur éd.), *Études alexandrines* 9, IFAO, Le Caire, à paraître en 2002 (désormais cité *Pharos 1*).
4 H. Frost, «The Pharos Site, Alexandria, Egypt», *IJNA* 4 (1975), p.126-130.
5 Don de la société France Telecom R&D en mai 2001.
6 Cf. l'étude de Chr. Morhange et J.-Ph. Goiran dans *Pharos 1* et *BCH* 123 (1998), p. 560-566.
7 Pline l'Ancien, *Histoire naturelle*, livre 36, § 67.
8 Cf. J.-P. Corteggiani, « La mèche de Ptolémée », *Historia thématique*, 69, janvier-février 2001, p. 18-19.
9 On trouvera une liste des tremblements de terre dans J.-Y. Empereur, *Le Phare d'Alexandrie*, collection Gallimard/Découvertes n°352, 1998, p. 106-107 et Moustafa Anouar Taher, 'Les séismes à Alexandrie et la destruction du Phare', *Alexandrie médiévale 1*, *Études alexandrines* 3, 1998, p. 51-56.
10 Cf. F. Jacques et B. Bousquet, 'Le raz de marée du 21 juillet 365 . Du cataclysme local à la catastrophe cosmique', *MEFRA* 96 (1984), p. 423-461.
11 Cf. l'étude de M. El Amouri dans *Pharos 1*.

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Volume : J.-Y. EMPEREUR, *Le phare d'Alexandrie*, Paris, Découvertes Gallimard, 1998.

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LEGENDE DES ILLUSTRATIONS

Fig. 1 : Carte d'Alexandrie, avec indication du fort Qaitbay et des épaves en cours de fouille. Carte N. Martin, archives CEA.

Fig. 2 : Enlèvement des blocs de béton qui avaient été placés sur le site sous-marin en 1993. Cliché A. Pelle, archives CEA.

Fig. 3 : Mesure topographique au moyen de l'Aquamètre, appareil de mesure acoustique sous-marin. Le pointeur à lecture directe est placé sur le bloc à topographie. Cliché A. Pelle, archives CEA.

Fig. 4 : Une base de l'un des deux obélisques du pharaon Séti Ier. Le pharaon fait une offrande aux divinités d'Héliopolis. Quartzite. Remonté à la surface en 1995, ce bloc est exposé au musée de plein air de Kôm el-Dick.

Fig. 5 : Moulage sous-marin de l'autre base d'obélisque du pharaon Séti Ier. Ce bloc est resté dans le site sous-marin. Cliché A. Pelle, archives CEA.

Fig. 6 : Statue colossale d'un Ptolémée en pharaon. Granite d'Assouan. Hauteur 10,05 m. Dessin St. Rousseau, archives CEA.

Fig. 7 : Levage d'un sphinx de Ramsès II. Cliché J.-P. Corteggiani, archives CEA.

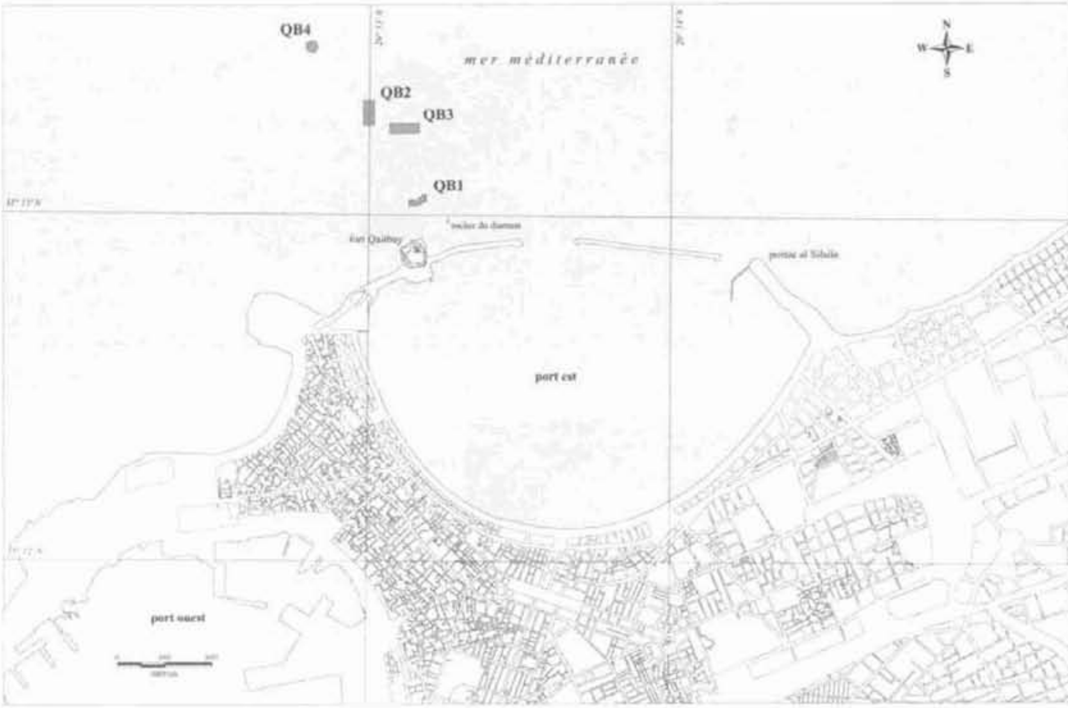

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

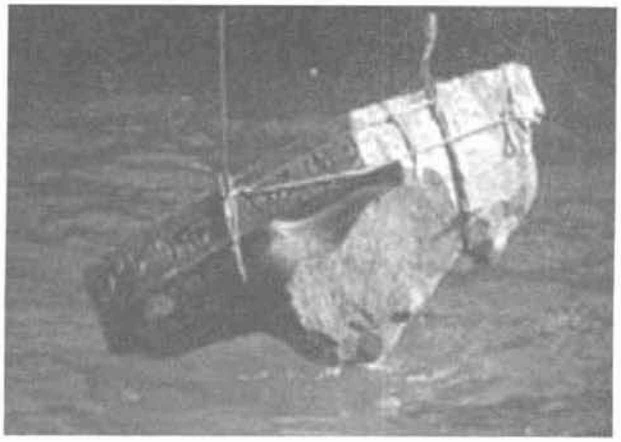

Fig. 7

Main droite
de la statue colossale.
Découverte en novembre 2001,
site de Qaitbay.

Fig. 6

LES DIEUX OLYMPIENS ET LA MER:
LE CAS DE LA MESSENIE ET DE LA LACONIE

Cette communication a pour objet d'exposer dans ses grandes lignes – en l'attente d'une publication exhaustive – les conclusions d'une thèse de doctorat[1] portant sur la religion des marins grecs, vaste thème abordé par Dietrich Wachsmuth[2] il y a plus de trente ans mais peu développé depuis. Nous avons limité notre recherche aux dieux olympiens honorés dans le monde grec dans un contexte maritime. En effet, celles-ci – bien plus que les figures marines telles les Néréides ou Triton qui se manifestent plutôt comme des figures folkloriques – reçoivent de véritables manifestations de culte de la part des gens de mer. L'espace géographique concerné comprend les mer de la Méditerranée – pour reprendre la formule de F. Braudel[3] : « Non pas une mer, mais une succession de mers » –, le Pont-Euxin et les autres eaux fréquentées au gré des périples coloniaux ou commerciaux. Toutes les sources ont été sollicitées (archéologiques, iconographiques, numismatiques, épigraphiques et littéraires), selon une large chronologie afin de prendre en compte le principe du conservatisme des traditions, caractéristique du milieu maritime.

Cette recherche a abouti à des résultats significatifs. La présence des dieux olympiens est beaucoup plus importante qu'on ne pourrait le croire dans les milieux maritimes, et celle de Poseidon moins essentielle. Même si les traditions ont dû parfois justifier et expliquer une telle intervention, il ressort cependant une cohérence des cultes et prérogatives marines avec la personnalité divine de chacun des dieux. Nous l'examinerons plus en détail avec l'étude de la Laconie et de la Messénie.

Avant cela, il convient de définir ce que nous entendons par «culte marin». Il s'agit d'une manifestation cultuelle, établissant un raport entre une divinité et la mer, entendue au niveau géographique et au niveau des activités humaines maritimes, dans toute leur diversité (grand large, rivage, promontoires, ports, navigation, pêche, etc.) Les critères de repérage d'un culte marin sont les suivants : 1) la topographie : le culte s'exerce dans un lieu à caractère maritime dominant (port, plage, bateau, promontoire) ; 2) l'onomastique : les épiclèses ou épithètes poétiques évoquant un lien entre la divinité et la mer; 3) les actes : sacrifices, prières, ex-voto invoquant la divinité en liaison avec un contexte maritime. Il est important de signaler que l'expression de «culte marin» n'est pas exclusive : si à un endroit précis ou dans une circonstance précise, la divinité est mise en relation avec l'univers marin, par ailleurs l'essentiel de son culte (dans le sanctuaire ou sous l'épiclèse en question) peut relever d'un domaine différent (très souvent l'initiation ou la fécondité).

Les pratiques religieuses s'adressant spécifiquement aux divinités olympiennes sont très variées. Suivant le rythme et l'ambivalence des gens de mer, il convient de distinguer celles réalisées à terre et en mer. Sur la terre ferme, de nombreuses inscriptions de prières ou dédicaces sont gravées à l'intérieur de sanctuaires ou au contact de la mer à l'air libre, par exemple sur la roche d'une île ou d'un port naturel. Des ex-voto sont également consacrés aux dieux, notamment des bateaux sous des formes diverses. Nous en avons recensé au total une centaine (des embarcations réelles, des modèles réduits, des parties de navires, des représentations figurées, des bases en forme de proue), essentiellement pour les époques archaïque et hellénistique, concentrés particulièrement sur certains sites. Outre les bateaux, les sources littéraires, épigraphiques et archéologiques montrent que l'on consacre des ancres, selon une pratique assez courante qui remonte en Orient au IIIe millénaire avant notre ère. A ce jour, une trentaine de cas peut être comptabilisée ; c'est sans compter tous ceux non identifiés comme tels. Les dieux olympiens se voient également offrir du matériel de pêche (hameçons, filets, rames, ...) ou des poissons et coquillages. Enfin des fêtes célèbrent les dieux dans un contexte marin : en particulier les chars-bateaux d'Athènes ou de Smyrne, qui au moins à l'époque hellénistique sont clairement mis en relation avec la mer.

Sur le bateau, les pratiques cultuelles consacrées aux divinités olympiennes sont également variées. Outre les libations et prières à bord dont témoignent les sources littéraires, il porte de nombreuses marques de religiosité. A travers le décor, une représentation ou une évocation du dieu (par son nom, son attribut) peut figurer en différentes parties du bateau. En effet, même s'il ne semble pas exister sur les embarcations grecques de «figure de proue» dans le sens où nous l'entendons, des symboles ou images divines peuvent se trouver — au moins pour l'époque hellénistique — à l'avant : sur le *parasémon*, sur le *stolos* et même sur l'éperon (comme l'a montré l'éperon d'Athlit[4]). Par ailleurs, la poupe est le lieu où les Grecs imaginent — dans les récits, peintures ou monnaies — la divinité prendre place, comme si elle dirigeait la route de l'embarcation. C'est sans doute là qu'étaient placées les statues emmenées à bord mentionnées par les textes, de même que la *stylis* placée à la poupe pouvait porter le nom d'un dieu. A bord, les deux galères géantes hellénistiques de Hiéron de Syracuse et de Ptolémée Philopator allaient jusqu'à comporter un petit temple consacré à Aphrodite.[5] Autre moyen d'attirer la protection de la divinité sur le vaisseau : le baptiser de son nom. Les noms théophores de bateaux sont attestés pour l'Antiquité grecque, mais en ce qui concerne les divinités olympiennes par une épiclèse seule. Dernière pratique observée, celle de la consécration de la ou des ancres à bord, par l'intermédiaire d'une inscription ou d'un décor. Le rapprochement opéré entre les inscriptions des ancres et les noms des bateaux ne permet pas d'identifier les uns avec les autres. En revanche, à l'époque hellénistique, des rapprochements sont possibles avec les éléments de décor du *parasémon* et de la *stylis* : peut-être pourrait-on supposer une correspondance entre le jas et le décor religieux du bateau, tous deux placés sous la ou les mêmes divinités tutélaires ; par ailleurs, il pourrait exister une correspondance entre le nom du bateau et le décor du stolos. D'une manière générale, l'ensemble des documents se référant à la présence du sacré à bord montre que souvent, il n'y a pas une seule divinité attachée au bateau mais plusieurs, comme si l'on cumulait les références divines afin d'attirer sur soi le plus possible de protection. Parmi ces protecteurs en mer, notons la quasi-absence de Poseidon, qui n'apparaît ni dans le décor naval ni sur les ancres ni dans l'onomastique navale grecque.

Après les pratiques cultuelles, il convient de s'attacher aux sanctuaires maritimes. Parmi les zones riches en ce type de sanctuaires, se trouve celle constituée par la Laconie et la Messénie, qui s'avère assez représentative de l'ensemble de la géographie religieuse marine (fig. 1).

Athéna est honorée en relation avec la mer en plusieurs lieux. Pausanias[6] mentionne entre Asopos et Boiai un promontoire appelé *Onou Gnathos* (aujourd'hui île Elaphonissos), caractérisé par un sanctuaire d'Athéna ne comportant ni toit ni statue. Sa fondation est attribuée à Agamemnon ; à côté se trouve le tombeau du pilote de Ménélas Cinadon. Plus au Nord, le Périégète voit sur le promontoire de Brasiai (aujourd'hui Plaka) quatre statues, identifiées comme les Cabires accompagnés d'Athéna.[7] La déesse est également vénérée à Mothone avec l'épiclèse d'*Anémotis*.[8] La légende lui attribue en effet une action apaisante sur les vents violents qui ravagèrent la région, ce à la suite d'une invocation de Diomède. Enfin, sur le promontoire Coryphasion de Pylos, se trouve un *hiéron* consacré à Athéna *Coryphasia*, non loin d'un sanctuaire de Nestor.[9] Ce cap se situait vraisemblablement au nord de Sphactérie, à l'entrée de la baie.[10] L'ensemble de ces témoignages montre une Athéna vénérée sur des promontoires, souvent sur une hauteur que distinguent de loin les navigateurs. Ceci n'est pas sans évoquer le culte de l'Athéna poliade, dominant l'acropole de la cité. Autre caractéristique du culte d'Athéna marine : sa mise en relation fréquente avec un héros (ici Ménélas, Nestor, Diomède), lui attribuant un caractère d'ancienneté. La déesse n'a pas forcément besoin de temple : une statue, un autel peuvent suffire. Ses épiclèses appartiennent à des toponymes littoraux, ou renvoient à une signification précise en relation avec la navigation. Athéna *Anémotis* calme les vents ; ceci est à rapprocher d'une autre Athéna : *Aithuia*[11], car l'*aithuia* (sorte de mouette) annonce selon Elien[12] les vents violents. De manière générale, la déesse préside à l'art nautique et assure les vents favorables.

Le culte marin de Zeus se manifeste dans la moitié Sud du Péloponnèse à Epidaure Liméra. Sur le port se trouve un *naos* de Zeus Sôter; le port – anse portuaire réputée pour ses bons fonds[13] – est parfois désigné sous le nom du dieu.[14] Ce sanctuaire rappelle celui de Zeus Sôter au Pirée.[15] Ces deux cas cachent l'essentiel du culte de Zeus pratiqué par les gens de mer : il se manifeste en tous lieux, sans besoin de sanctuaire bien consacré au dieu. Les sources attestent de nombreux ex-voto ou sacrifices offerts après une traversée réussie, et des invocations prononcées avant ou pendant la navigation. Le nom de Zeus est celui le plus attesté sur les ancres emmenées à bord ; il apparaît également sur une *stylis*.[16] Zeus protège la navigation en procurant une météo favorable – ce qui corespond à son statut de maître du ciel –, un parcours et des escales aisées.

Aphrodite est particulièrement honorée dans l'île de Cythère. C'est la première terre qu'elle aurait rencontrée après sa naissance dans la mer.[17] Pausanias[18] insiste sur l'ancienneté du sanctuaire, qui aurait été fondé par Enée lors de son périple nautique vers l'Italie.[19] Tout marin se doit d'y rendre des dévotions, avant ou après le franchissement du cap Malée.[20] La déesse possède par ailleurs un temple à Caenepolis, implanté sur le rivage même.[21] Les deux cas se situent près des deux finistères périlleux du Sud du Péloponnèse, près des caps Ténare et Malée. Cela renvoie à une Aphrodite Sôzousa, qui préside aux eaux calmes. Cette épiclèse n'est pas sans rappeler le port de Zeus *Sôter*, non loin de Cythère : les deux divinités apparaissent d'ailleurs conjointement sur une ancre de plomb.[22] La déesse aime particulièrement les îles, où se trouvent ses sanctuaires les plus anciens, et les plages d'où elle peut contempler la danse des flots.

Dans l'*Hymne homérique à Apollon Délien*,[23] le dieu détourne les vents afin d'infléchir la course des commerçants crétois vers le golfe de Corinthe, leur faisant passer sans encombre le cap Malée, le cap Ténare, doubler Pylos et naviguer jusque Crissa. Un voyage identique d'un vaisseau de Ptolémée Sôter est attribué à l'action d'Apollon.[24] Par ailleurs, Apollon possède un temple à l'extrémité du port naturel de Zarax (auj. Limani Geraki).[25] La localité littorale d'Epidélion lui est également consacrée.[26] La tradition rapporte à ce sujet qu'un *xoanon* fut porté à cet endroit par les flots depuis Délos, suite au sac de l'île par Mithridate. Au cap Malée, le dieu recevait un culte, dont l'épiclèse est incertaine : une mention peu claire évoque un Apollon *Lithésios,*[27] et à Sparte on honore un Apollon *Maléatès* ou *Akritas*.[28] Enfin à Coroné, sur le littoral à 80 stades de la cité, se trouve un sanctuaire d'Apollon Corynthos (guérisseur).[29] La tradition fait remonter la statue de culte aux Argonautes ; on y a retrouvé par ailleurs de nombreux petits ex-voto de bronze, dont des hameçons ou outils de pêche.[30] Les sanctuaires d'Apollon marin se situent sur des promontoires, ports et rivages, toujours tournés vers le grand large de façon à dominer un large littoral et un vaste espace maritime. Le dieu protège les hommes et les bateaux, lors des navigations côtières. Il a une action positive, menant les hommes – ou des objets – vers une destination précise.

Si Apollon règne au cap Malée, le cap Ténare est le territoire de Poseidon.[31] Son sanctuaire consiste en une simple grotte, située sur une anse latérale du cap. Il possède par ailleurs une statue dans le port de Nymphaion, près du cap Malée.[32] L'image du dieu est associé à la violence: ainsi en témoigne la tradition selon laquelle le dieu ravagea la ville de Ténare, après que des éphores aient arraché des suppliants de son autel.[33] Ce caractère violent du dieu explique qu'il soit aussi peu présent sur les rivages. Plus craint que vénéré, on l'implore afin qu'il ne déchaîne pas les flots de la mer. Poseidon est souvent mis en relation avec Apollon, qui tend à prendre sa place.

Artémis, particulièrement honorée à Sparte, l'est aussi en relation avec la mer, par rapprochement avec Dictynna.[34] Le sanctuaire spartiate d'Artémis Orthia a livré notamment des ex-voto navals du VIIe s. a.C. : la célèbre plaque d'ivoire ciselée représentant le départ d'un navire, et deux reliefs de plaque calcaire figurant des bateaux.[35] A Boiae, la tradition attribue la fondation de la cité à Artémis Sôteira[36] : celle-ci aurait conduit les colons du Sud du Péloponnèse par mer jusqu'à cet endroit en leur indiquant où s'installer. La cité de Las possède pour sa part un sanctuaire d'Artémis sur une pointe.[37] Sur le territoire d'Epidaure-Liméra et sur celui de Teuthone, se trouvent deux sanctuaires d'Artémis, sans doute équivalente à une Dictynna.[38] Dans ses cultes anciens, Artémis marine est honorée sur les promontoires et les rivages, le plus souvent en relation avec un golfe ou une anse. Elle protège ainsi les mouillages ouverts sur le large et le littoral. Elle se montre meneuse de navigation lors du processus de colonisation et particulièrement liée à la navigation spartiate, comme le montre la fondation de Lyctos en Crète, menée à l'instigation de Spartiates et sous la protection de la déesse.[39] Celle-ci se manifeste alors après la traversée jusqu'en Crète par deux signes : l'oubli de sa statue et la perte de l'ancre à bord.

Dionysos est honoré à Brasiai[40]: selon la tradition, c'est là qu'échoua le coffre dans lequel il était enfermé avec sa mère et c'est là que le recueillit Inô. Cet épisode explique le nom de la cité selon Pausanias, d'après le verbe signifiant « être rejeté par les flots » . Le culte de Dionysos marin est lié au contact intime avec l'élément humide, mais calme. Dionysos est par ailleurs un dieu navigateur, que l'on représente volontiers au fil de l'eau.

Ce tour d'horizon des cultes marins des divinités olympiennes en Laconie et Messénie révèle quelques absences : celle d'Héra, dont le culte se développe particulièrement dans le processus de colonisation archaïque vers l'Ouest. Arès et Héphaïstos, ici comme ailleurs, ne reçoivent pas de culte marin, la guerre sur mer étant associée à Apollon ou à Poseidon. Les traces d'Hermès sont difficiles à suivre : honoré dans des grottes ou des endroits isolés, recevant des ex-voto périssables, son existence dans la religion marine grecque n'est quasiment perceptible que dans l'*Anthologie Palatine*.

Les sanctuaires marins sont de divers types : sanctuaires établis et construits, statues ou autels à l'air libre, ou simplement lieux consacrés. C'est que le culte marin peut se rendre partout, même à bord. Dans leur grande majorité, ils se situent dans un endroit maritime « stratégique » : promontoire, anse offrant un port naturel, zone dangereuse par ses courants ou ses vents, point de passage pour une traversée. La répartition de ces espaces consacrés le long des côtes montre aussi le caractère actif de la religion des marins grecs, qui consacrent et baptisent un lieu qu'ils découvrent depuis le large d'après les caractères ou la personnalité attribués à une divinité : ainsi par exemple les caps dangereux ou finistères à Apollon ou Poseidon, tandis qu'autour les lieux d'arrivée après le difficile passage sont dévolus à Aphrodite et à Zeus. Par ailleurs, tout sanctuaire peut recevoir une offrande de navigateur : à l'intérieur des terres, ou même dans un sanctuaire consacré à une autre divinité comme c'est le cas dans d'autres régions.

Au Nord de Pylos, c'est le vide – hormis l'île de Protée connue pour ses inscriptions d'*euploia* d'époque romaine qui ne donnent aucun nom de divinité.[41] En fait, la façade occidentale du Péloponnèse ne comporte plus de sanctuaire marin jusqu'au golfe de Corinthe. La navigation antique qui suivait le littoral du Péloponnèse depuis l'Argolide semble changer à Pylos, pour atteindre directement Olympie ou le golfe de Corinthe. L'emplacement des sanctuaires répond à des navigations de cabotage, succession d'escales et de promontoires à doubler depuis la mer. Les sanctuaires servent alors d'amers, indiquant aux marins l'endroit précis où ils se trouvent. Les périples nautiques et les descriptions des géographes montrent que les sanctuaires et lieux consacrés ponctuaient les côtes du monde grec, traçant ainsi des itinéraires balisés pour les navigateurs.

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NOTES

1 Fenet 1998, à paraître dans la collection de l'Ecole Française de Rome.
2 Wachsmuth 1967.
3 Braudel 1977 : 7.
4 Sur l'éperon d'Athlit, voir Casson/Steffy 1991.
5 Athénée, Deipnosophistes V, 205d et 207e.
6 Pausanias, Description de la Grèce III, xxii, 10.
7 Ibid. III, xxiv, 5.
8 Ibid. IV, xxxv, 8.
9 Ibid. IV, xxxvi, 2.
10 Musti/Torelli 1991 : 279 ; Baladié 1980 : 244.
11 Athéna reçoit l'épiclèse d'Aithuia à Mégare : Pausanias, I, v, 3 et xli, 6 ; Hésychius, s.v. ejn d'T Ai[quia. Elle est également invoquée sous ce nom dans Lycophron, Alexandra, v. 348-386 (voir scholie de Tzetzes au v. 359).
12 Elien, De la nature des animaux, VII, 7.
13 Castellan 1808 : I, 53 et pl. 7 ; Hasluck 1907-1908.
14 Pausanias, III, xxiii, 10 ; Ptolémée, Géographie III, 14, 32.
15 Le sanctuaire est voué à Zeus Sôter et à Athéna Sôteira : Lycurgue, Contre Léocrate 17, 136-137 ; Strabon, IX, 1, 15 ; Pausanias, I, i, 3 ; IG II2, 783, 1035, 5063.
16 Von Duhn 1888.
17 Hésiode, Théogonie, v. 187-197.
18 III, xxiii, 1.
19 Denys d'Halicarnasse, Antiquités romaines I, 50, 1.
20 Baladié 1980 : 245.
21 Pausanias, III, xxv, 9. La cité antique de Caenepolis est localisée près du bourg moderne de Kyparissos : Woodward 1906-1907.

22 Jas découvert en 1905 au cap Palos ; première mention par Laymond/Jiménez de Cisneros y Hervxs 1906 ; lecture des inscriptions par F£ta 1906.
23 V. 388-512.
24 Plutarque, De sollertia animalium 983e-984c.
25 Pausanias, III, xxiv, 1.
26 Pausanias, III, xxiii, 1-4 ; Strabon, VIII, 6, 1. Le site, recouvert par les eaux, se trouve à environ 2 km au nord du village moderne de Vutama : Hasluck/Wace 1907-1908 : 175 ss.
27 Stéphane de Byzance, s.v. λιθήσιος « : ὁ Ἀπόλλων ἐν τῶ Μαλέα λίθω προσιδρυμένος ἐκεῖ».
28 Pausanias, III, xii, 8.
29 Pausanias, IV, xxxiv, 7 ; SEG XI, 993-995. Le sanctuaire se situe près de la plage de Haghios Andreas voisine de Longa, à 20 km au sud de la ville actuelle de Coroné-Pétalidi.
30 Versakis 1916 : 93-96, fig. 32 et 40.
31 Pausanias, III, xxv, 4 ; Strabon, VIII, 5, 1. Cummer 1978.
32 Pausanias, III, xxiii, 4.
33 Pausanias, IX, xxiv, 5-6.
34 Pausanias, III, xiv, 2 et xii, 8. Wide 1893 : 97-117.
35 Plaque d'ivoire (Athènes, Musée national, inv. 15362) : Dawkins 1929 : 214-215, pl. CIC-CX. Reliefs calcaire (musée de Sparte, inv. 1483) : *ibid.* : 195 nΓ 69 et 69a, 368, pl. LXXIV.
36 Pausanias, III, xxii, 12. La cité se trouve au centre du golfe situé au N-O. du cap Malée, face à l'île de Cythère et d'Elaphonisos, occupant ainsi une position maritime stratégique pour les bateaux contournant le Péloponnèse à l'Est.
37 Pausanias, III, xxiv, 9.
38 Pausanias, III, xxiii, 10 et xxv, 4. Teuthone se situe sur la péninsule de Scopas, près du village moderne de Kotrones : Woodward 1906-1907 : 256-257.
39 Plutarque, Mulierum virtutes, 247d-f.
40 Pausanias, III, xxiv, 3-4.
41 Stridj 1904 ; Sandberg 1954 : nΓ 1-28.

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ILLUSTRATION

Fig. 1. Carte de répartition des cultes maritimes rendus aux divinités olympiennes en Laconie et Messénie.

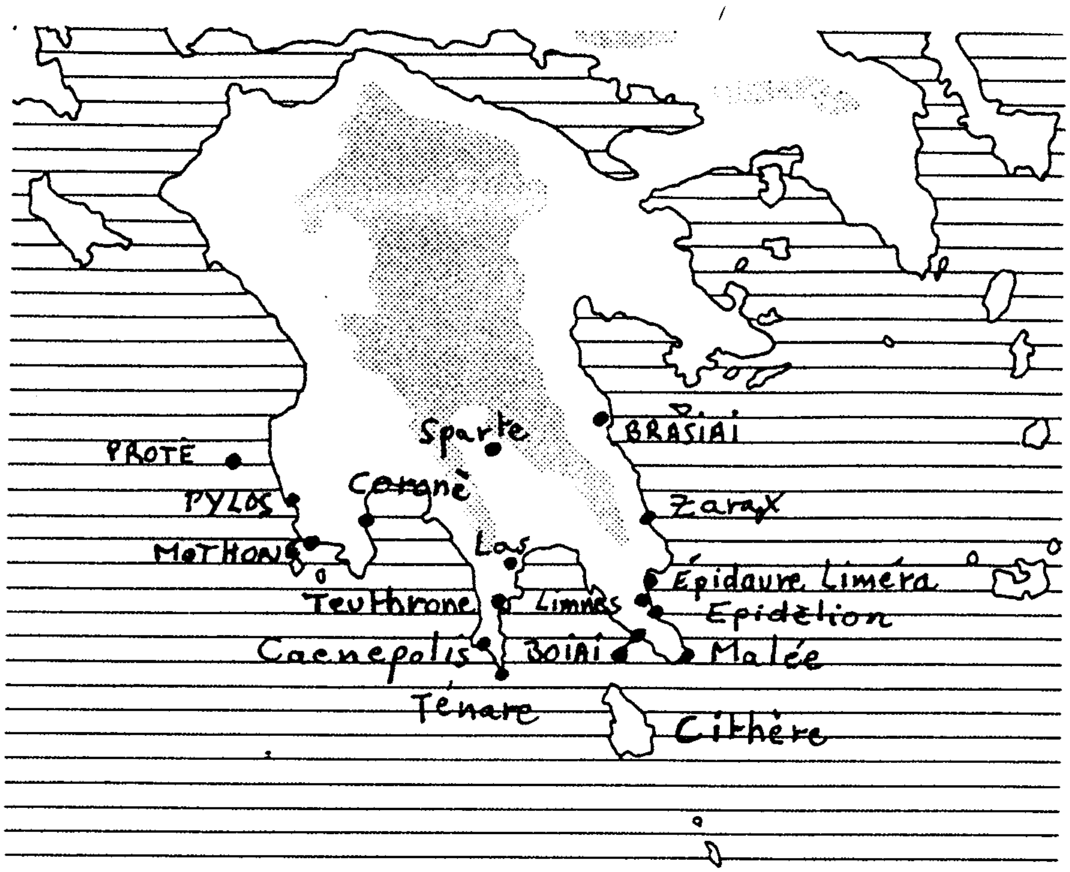
Sparte
BRASIAI
PROTÉ
Coroné
PYLOS
Zarax
MOTHONE
Las
Épidaure Liméra
Teuthrone
Limnes
Epidélion
Caenepolis
BOIAI
Malée
Ténare
Cithère

Fig. 1

LEAD WEIGHTS FOR BALANCING WOODEN GEAR OF HELLENISTIC SHIPS: FINDS FROM THE CARMEL COAST, ISRAEL*

Introduction

Underwater surveys carried out along the Israeli coast in recent decades have revealed numerous shipwrecks, and cargoes and artifacts associated with ancient ships. Among the finds two groups of lead artifacts are of interest. These objects will be described, and their possible use in ancient maritime activities will be discussed below. One group is comprised of five lead bands bent into cylinders which were found at Neve Yam (fig. 1). Another assemblage comprises four elongated bars of trapezoidal cross-section, which were recovered from the northern bay at Atlit (fig. 1). Nail holes found at the sides of the bands, and negative impressions of woodcarvings in the bottoms of the bars indicate that both groups of artifacts were fixed to wooden objects.

The sites and the archaeological context

The lead bands were discovered about 120 m off the Neve Yam shore, at a depth of 3.5 m. The wreckage site is partly protected by a submerged kurkar (*eolianite*) ridge. Other wreckage assemblages recovered from the area indicate that the site may have been used as an anchorage in historical times[1]. Along with the lead bands were also found bronze nails, a bronze bell, several bronze coins of Ptolemy II (late 2nd century BCE), two lead cooking pots and several lead fishing weights[2]. This assemblage and the lead bands were probably from the same wreck.

The lead bars were recovered in the northern bay of Atlit about 150 m off shore, at a depth of 5 m. The bay is partially protected by a small island and a submerged kurkar ridge. The site does not provide a safe shelter in heavy storms. In this area were found many remains of shipwrecks and cargoes, including bronze nails, silver coins of Ptolemy II (late 2nd century BCE), bronze handles of small objects, stone stocks of wooden anchors, and a unique bronze battering ram (3rd-2nd century BCE)[3]. The lead bars most probably belonged to the same context as the silver Ptolemy coins[4].

The Neve-Yam assemblage

Four of the bands were bent into cylinders (figs. 2: a, b, c; 3: a, b, c, d) while the fifth had a wavy shape (figs. 2: e; 3: e). Two of the bands bore Greek inscriptions (figs. 2: a, b; 3: a), probably referring to names. The inscription *Αλε* (figs. 2: a; 3: a) seems to be an abbreviation of Alexander, or Alexandrin, or Alexes, etc. The second inscription *APXAN* (fig. 2: b) is probably a name or an abbreviation of the name Archeion[5]. The weights of the bands varies vary from 1.1 to 2.625 kg (Table I). On the *lateral* sides of four of the bands are found square holes for nails (figs. 2: b, c, e; 3: a, b, c, e).

Table I: Weights of the Lead Objects (kg)

Item ref.	**a**	**b**	**c**	**d**	**e**
Bands	2.625	2.350	1.100	2.050	1.950
Bars	8.6	7.5	10.8	8.3	

The Atlit assemblage

The bar-shaped lead objects (figs. 4: a, b, c, d) have a trapezoidal cross section with a small concave cavity on the top (fig. 5: a, b, c, d). This cavity may have resulted from post-casting shrinkage due to solidification. One bar has one pin-extension on either side (figs. 4: a, 5: a) and another has only a single pin on one side (figs. 4: b, 5: b). Two of the bars have a pin-extension on one side and also a tongue-shape extension at the corner of the bar (figs. 4: c, d; 5: c, d). On the bottoms of the bars negative impressions of woodcarving are visible in the bottoms of the bars (figs. 5-6: a, b, c, d).

Discussion

The nail holes on the lateral sides of the bands and the negative impressions of woodcarving at the bottoms of the bars suggest that they were used with wooden gear. It seems reasonable that the lead objects presented above may have been part of the hull or movable gear of ancient vessels. The cylindrical shape of the bands, and the nail holes (figs. 2: b, c, e; 3: a, b, c, e) at the lateral sides, indicate that these artifacts were nailed onto rounded wooden poles (fig. 7). We may suggest that the bands could be added to the looms of rowing oars, as balance weights (fig. 7). This assumption is supported by an ancient text written by Athenaeus, where he described the construction of a forty-banked ship by Ptolemy Philopator of

Egypt[6]. The author wrote that the *longest oars* (probably the thranites) "*carried lead on the handle and were very heavy inboard, were yet easy to handle in actual use because of their nice balance*"[7]. This passage clearly indicates that lead weights were used *on* the handles of the oars and not *in* them.

In *Book II.93*, Thucydides mentions that each oarsman "*had to carry his oar, cushion and oar-loop*"[8]. When describing the gear of a trireme, Amit M., relying on an ancient text[9], said that thirty *perineos-oars* were carried on the board the vessel. These oars were carried as spare gear and used to replace broken ones, or to be handled by non-rowers in an emergency[10]. We may suggest that the wavy-shaped band (figs. 2: e; 3: e) found along with the cylindrical bands might indicate that such weights were also carried on board as spare gear. It seems that when a rower had to balance his oar band weights were nailed around the loom. Such weights were modular and could be added or removed to achieve a good balance (fig. 7). To identify his weights the oarsman probably inscribed his name on the band, and from then on it became part of his possessions, along together with the oar, the cushion and the oar-loop (strap).

The use of lead weights for balancing rowing oars was well attested by the *Olympias* trials in 1988[11]. During the trials it was observed that the oars had to be balanced by inserting lead into the looms[12]. However, inserting lead into the looms may have had some disadvantages:

1. The cast lead could not be removed in order to readjust the balance of the oars.
2. The cavities of the cast lead weakened the loom. If the lead had to be removed the oar either had to be remodeled (probably shortened) or replaced[13].

The use of lead- band weights was more efficient (fig. 14), as they were not only modular and removable (fig. 7) but they only slightly weakened the oars.

Counter–weights for the steering gear

The lead bars under discussion may have served as cores or weights for wooden objects on board a ship (steering-oars, rudders or wooden anchors). The morphology of wooden anchors with lead cores is well known.[14] (fig. 8: a). Negative impressions of chisel marks in the wooden grooves are found in the bottoms of such stock cores (fig. 8: b). The cores were cast into trapezoidal grooves, as seen by their cross-section. A solidification groove appears in the top surface of the cast lead. The one-armed anchor from the Ma'agan Michael ship (c. 400 BCE) is a perfectly preserved example of a wooden stock with lead cores (fig. 9)[15]. The lead bars discussed above are different in shape from the lead cores of wooden anchors. These objects have two kinds of lateral extensions close to the bottom: one is a pin-shaped (figs. 4: a, b, c, d; 5: a, b, c, d), and the second is a tongue-shape extension at the corner of two bars (fig. 4: c, d; 5: c, d). We may suggest that these bars were used as counterweights on steering-oars of ancient ships (fig. 10: a, b). The bars were probably cast into wooden grooves made in the blade of the steering oar (fig. 11: a, b, c). It may be assumed that the blade was made of two wooden plates (fig. 11: a) attached to each other by mortise-and-tenon joints or other fittings. Before the plates were attached, a trapezoidal groove and the pin/tongue extensions were cut in each plate but in opposite directions (fig. 11: b). Judging by the shape of the bars, we may deduce that after the plates were attached the grooves in the second plate were deepened by irregular chiseling (fig. 11: c), as attested by the negative impressions in the bottoms of the bars (figs. 5-6: a, b, c, d). The lead casting may also have strengthened the wooden plates in addition to the other joints.

The lead bars under discussion could also have been used as weights or cores in the wooden stocks of wooden Classical and Roman anchors.

Lead weights and their contribution to the hydrodynamics of the steering gear

The hydrodynamic forces affecting a steering oar, whether ancient or modern, are similar. Three major forces that act upon a rudder are the *buoyancy*, *water flow* (lift+drag) and *gravity* (fig. 10: a). There are also lateral forces and turbulence, which act on the blade, but they are not relevant to this discussion. One of the methods of overcoming the forces that act to lift the submerged steering oar is a tackle that passes through the upper quarter of the blade and then to the gunwale[16]. However, we assume that additional weights to the blade may have reduced the buoyancy and the lift + drag forces, and there was no need for other methods of support. Our assumption is related to composite steering oars, where the blade is inserted into a groove made in the lower part of the shaft. In ship iconography there is at least one example where bands surrounding the blades of steering oars may be interpreted as lead weights. On the starboard blades of the famous *Isis* ship[17] (mid- 3rd century BCE) a network pattern is depicted on the upper and lower parts, as well as along the axis of the blade (fig. 12). Two thin strips are depicted on the blade of the port side steering oar. Lawrence V. Mott[18] suggested that these bands reinforced the fixing of the blades to the shafts. Remains of concretion, found on the fragments of the steering oar of the Kyrenia ship, were also referred to by Mott as remains of such reinforcement of the blades[19].

During the *Olympias* trials it was observed that the rudders had to be weighted. Lead strips were added around the lower part of the blades (fig. 13). The network pattern on the starboard rudder of the *Isis* (fig. 12) may indicate lead bands used as counter-weights similar to those on the *Olympias* rudder blades (fig. 13). The lead bars discussed above, and the results of the *Olympias* trials, support our suggestion that lead weights were needed for balancing the rudders of ancient ships.

Conclusions

The use of the late 2nd century BCE lead objects presented above can be summarized by the following statements:

1. The lead bands are very well suited to be used as modular and/or removable weights on the oar looms for counterbalancing oars.
2. The inscribed names on two of the bands may indicate that band weights were personal property similar to the oar, cushion and the oar-loop (strap).
3. The lead bars were most suitable for use as counterweights cast into the blades of the steering oar, probably of merchant vessels.

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NOTES

1 Galili, Sharvit and Shifrony, 1998: 35.
2 Galili and Sharvit, 1999: 100.
3 Casson, Steffy and Linder, 1991: 3, 66.
4 Galili and Sharvit, 1999: 99.
5 Liddell and Scott, 1991 (reprint): 121.
6 "*The ship was four hundred and twenty feet long* (c. 138.6 m); *from the top of the sternpost to the water line it measured seventy nine and half feet* (c.26.24 m). *It had four steering-oars, forty-five feet long* (c.14.8 m), *and the oars which are the longest measured fifty-seven feet* (c.18.8 m)"; Deipnosophistae V.203-204.
7 Athenaeus, *Deipnosophistae V.203-204.*
8 Thucydides (Peloponnesian War, 429/8 BCE) made this reference, when the Peloponnesians planned to raid Piraeus. Each oarsman had to carry his own gear while crossing the Isthmus to reach the forty ships anchored at Nisaea, the harbor of Megara. This is one of the ancient texts, which prove that a trireme had as many oars as oarsmen; Rhodes, 1988: 262.
9 Amit, M., 1965:14, n. 4 .
10 ibid., n. 5.
11 Coates, Platis and Shaw, 1990: 49, fig. 29. The oars of *Olympias* launched in 1987 were heavy, weighing 12.3 kg, and the force needed to keep the blade out of the water was very high. To reduce it, in the 1988 trial, the oar-handles (looms) were counterweighted with lead; Morrison, Coates and Rankov, 2000: 216.
12 Coates, Platis and Shaw, 1990: 49, fig. 29.
13 In a trireme the oars were divided into four categories: thramites, zygites, thalamites and perineos. The last group consisted of the spare oars, to replace the broken ones or to be handled by non-rowers in emergency; Amit, 1965: 14.
14 Haldane, 1986.
15 Both arms of the stock were hollowed and each separately filled in with about 22 kg of lead. The stock is affixed so that its weight lies on the arm side of the axis of the shank as is required for anchors of this type; Rosloff, 1991: 224, fig. 2.
16 The Torlonia relief; Mott, 1997: 12, fig. 1.2; Casson, 1971, fig 144; Basch, 1987: 465, fig. 1038.
17 Lucian, *Navigium 5*, described the Isis ship in detail. The illustration of this ship appears on a fresco dated to the middle of the 3rd century BCE; Basch, 1987: 495, fig. 1130.
18 Mott, 1997:43.
19 ibid.

* We wish to thank Baruch Rosen for his useful remarks and John Tresman who edited the article.

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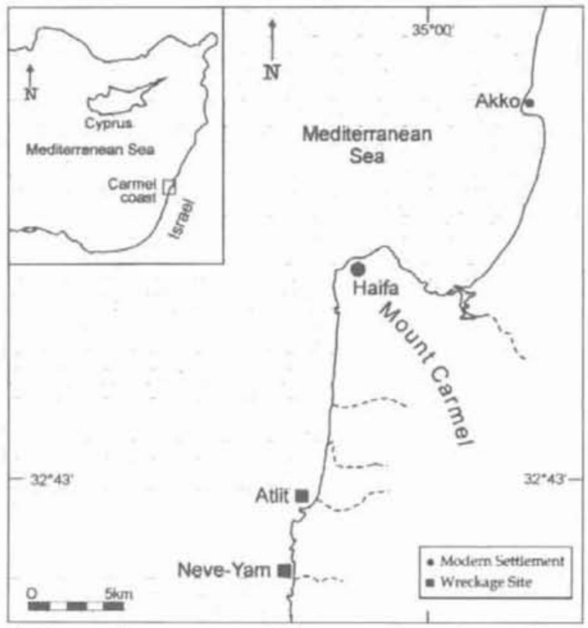

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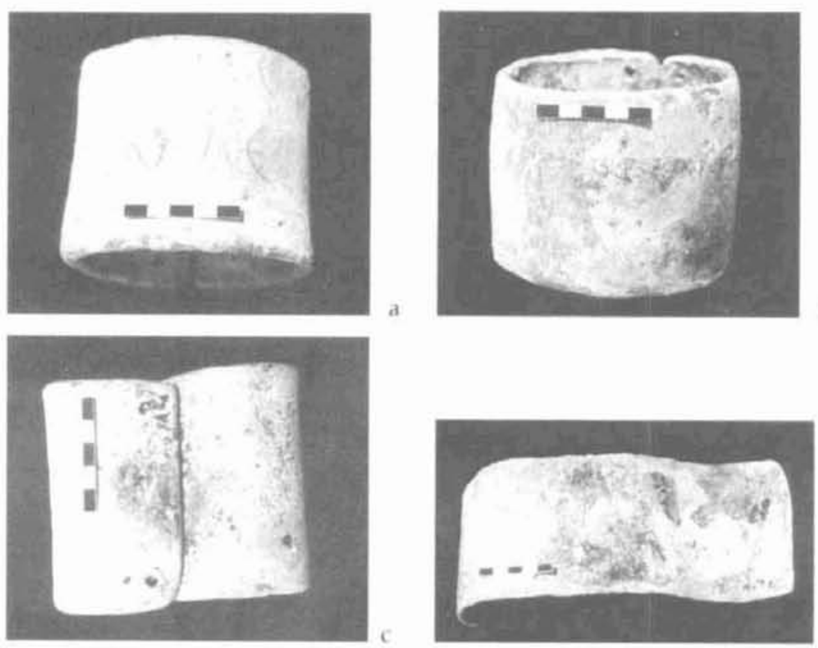

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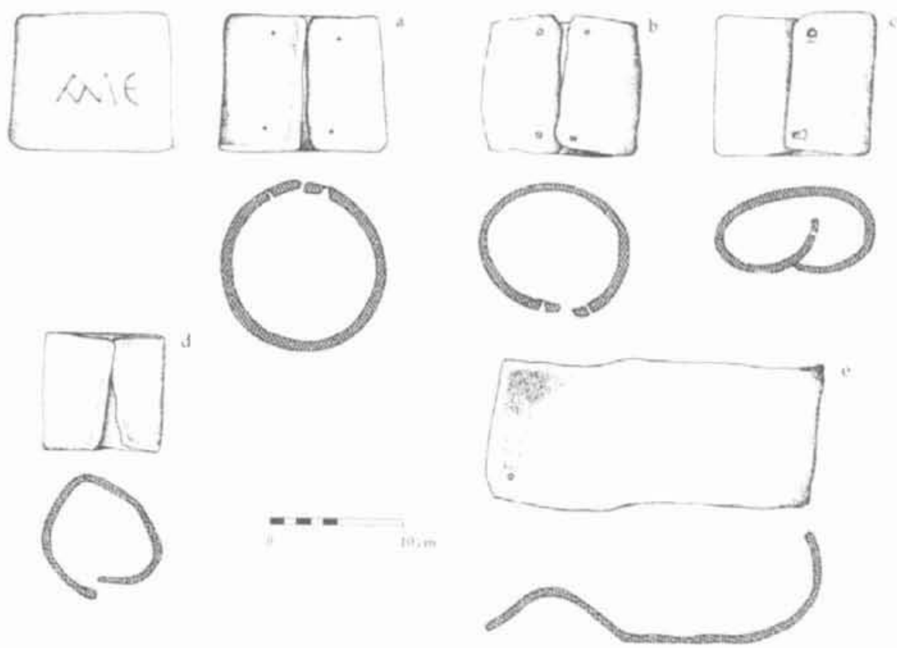

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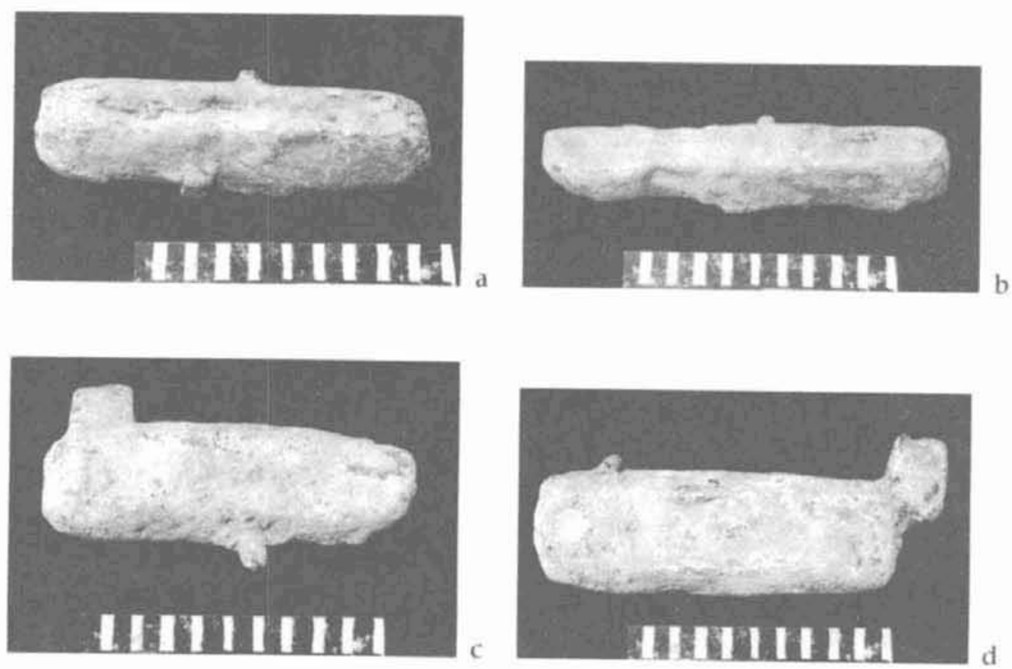

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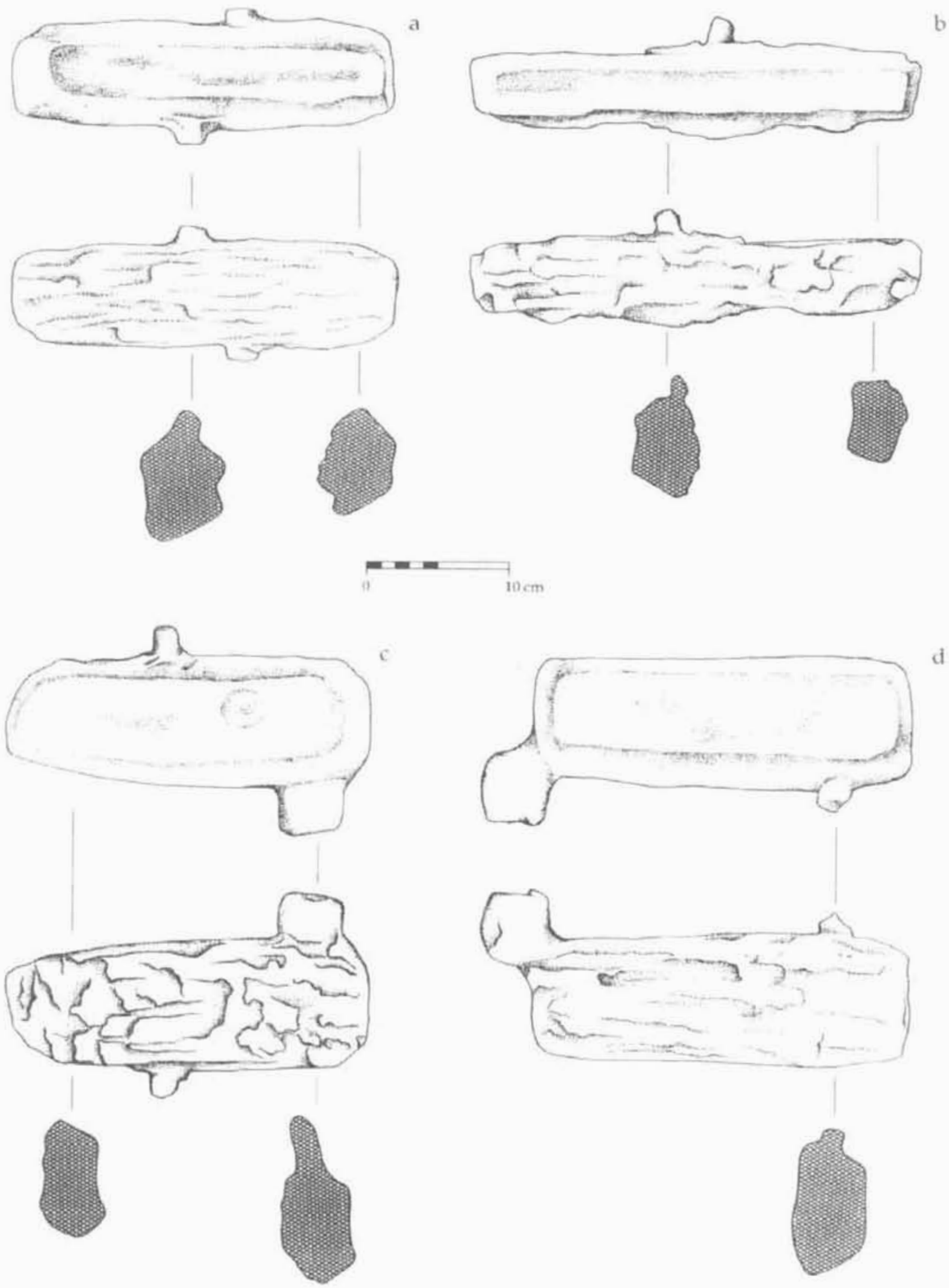

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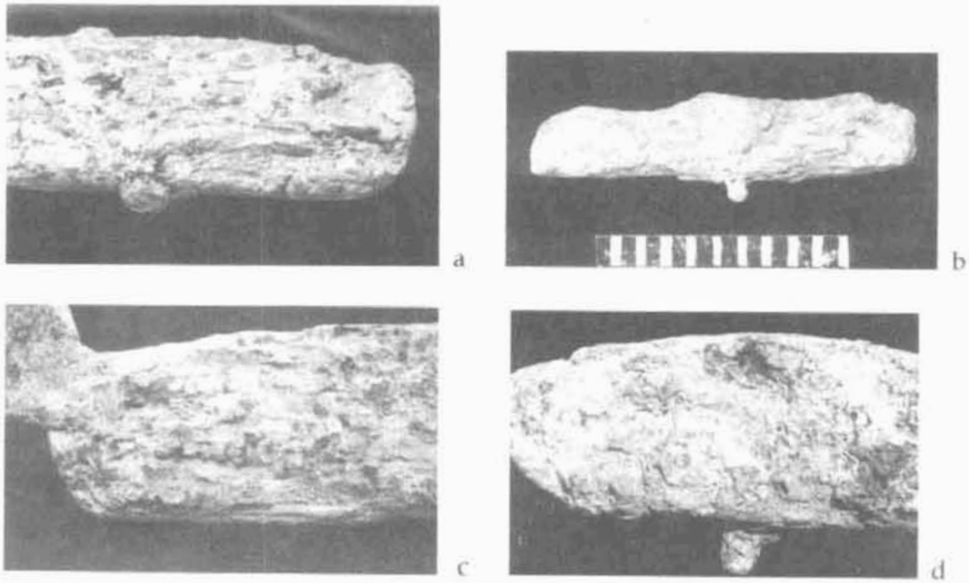

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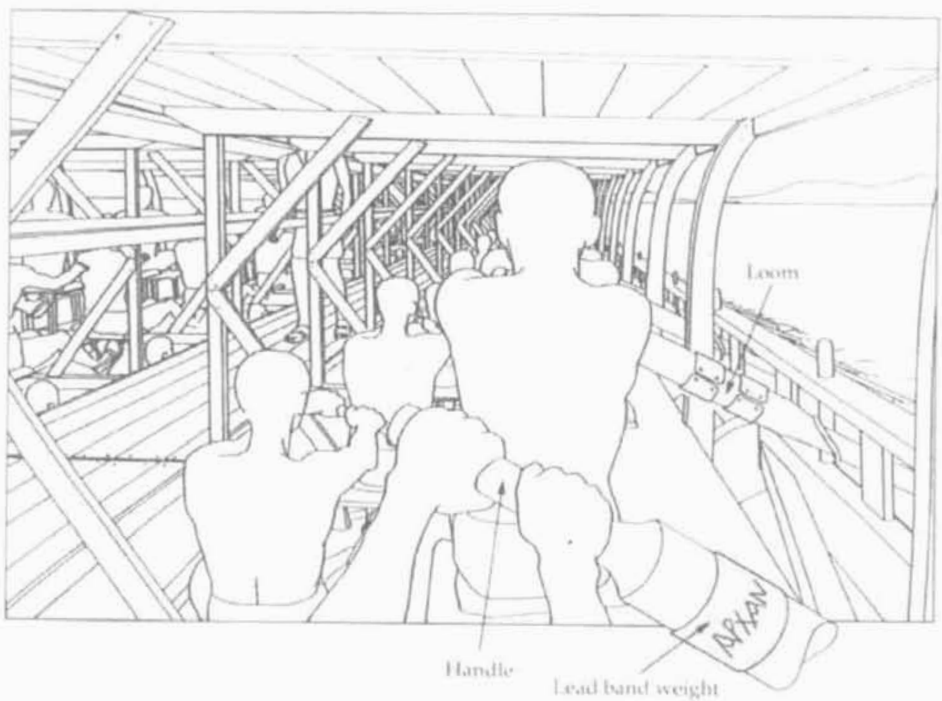

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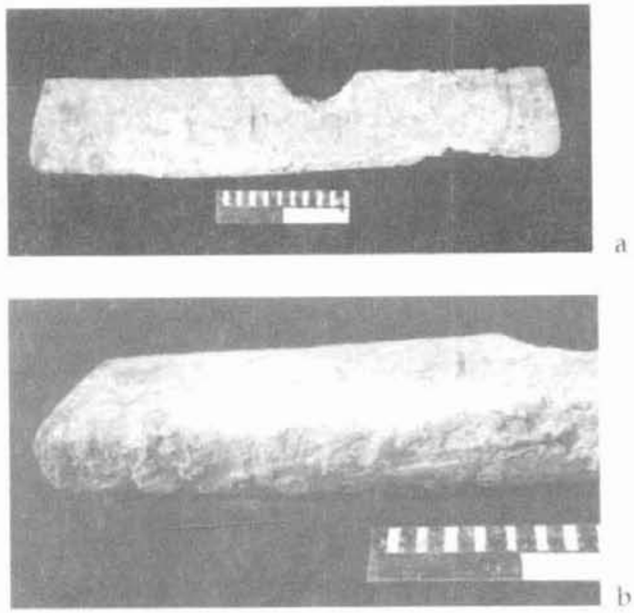

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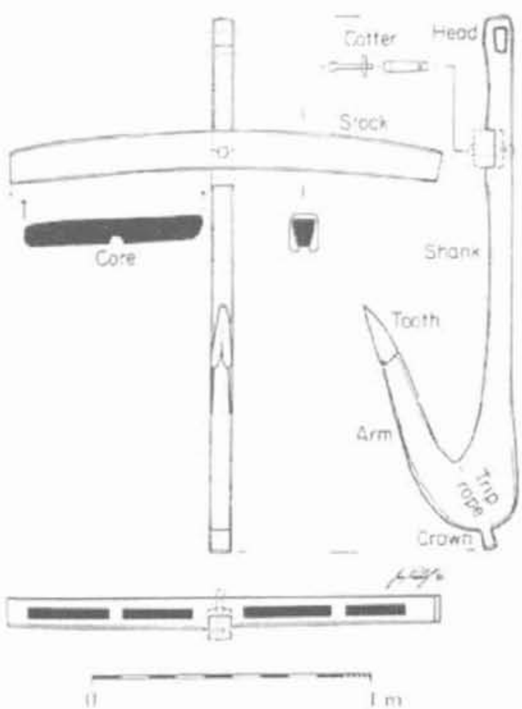

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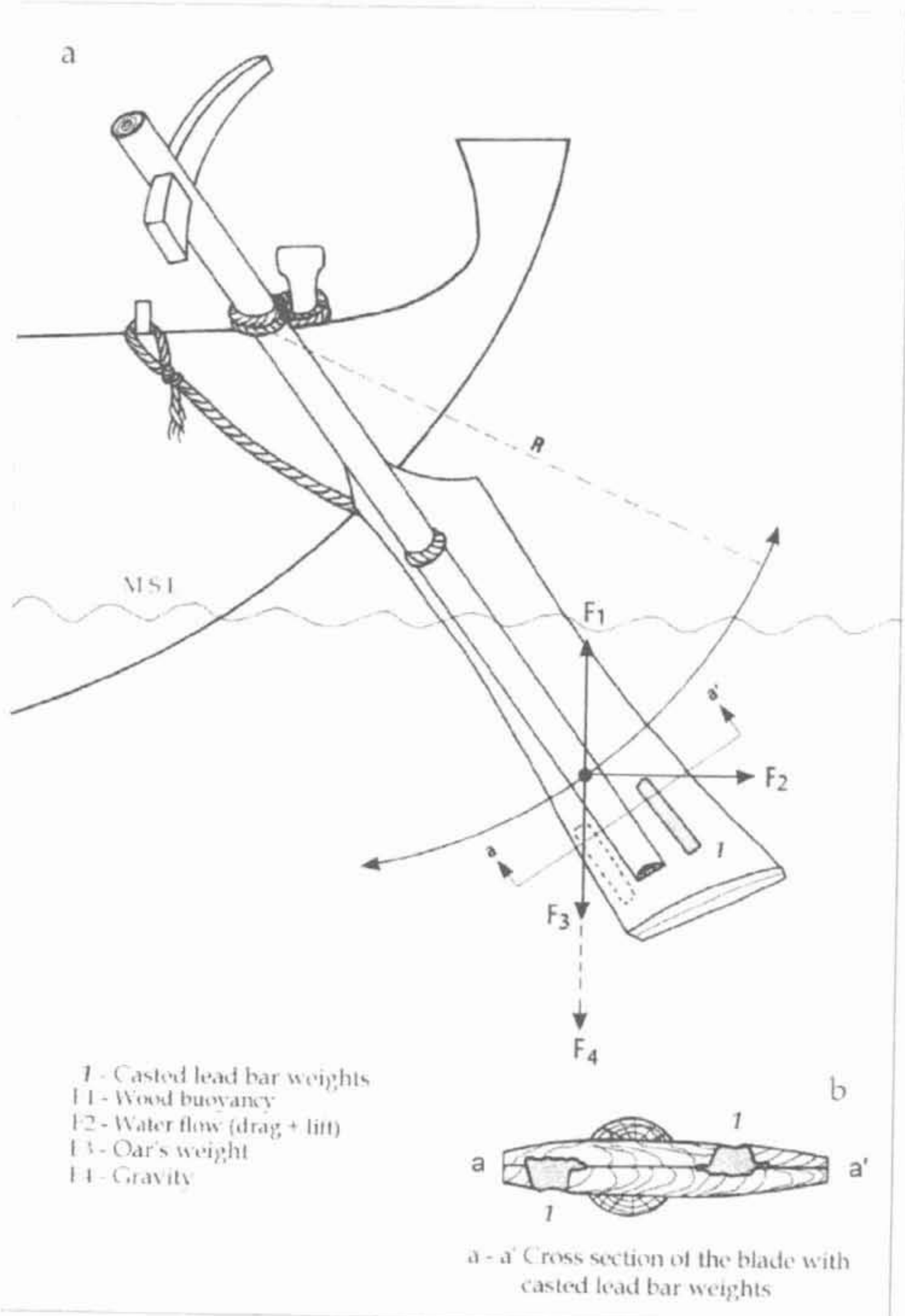

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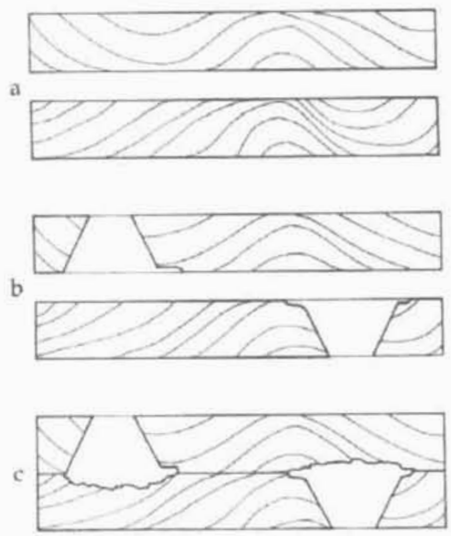

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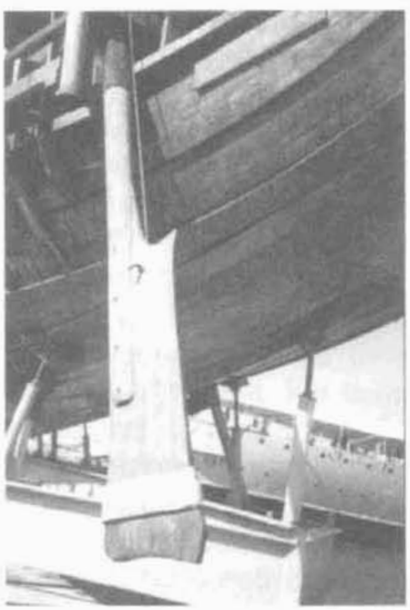

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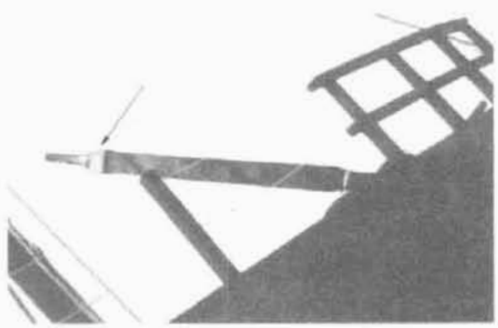

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THE MARSALA PUNIC SHIP IN PLASTER : A MEMORIAL EXHIBIT

Your past support in connection with the Punic Ship prompts me to bring to your attention the creation, in Marsala, of a permanent display which, by using plaster casts, focuses on the vessel's two most significant aspects: its shape and the writing on it.

It will be remembered that, 13 years ago, in 1986, the HIPNT petition to the Sicilian Government joined two other petitions from France and Great Britain, all three protesting against the surreptitious dismantling and scrapping of material relating to the Ships excavation, which was at that time being prepared for display in Marsala, in a building expressly expropriated to become "The Punic Ship Museum".

Even before that, progress had not been smooth. Twelve years earlier, in 1978, the delicate newly treated timbers, fresh from the treatment-tanks, had had to be put straight into this building, which was then in a derelict state. The floor was wet, so the larger timbers were quickly moved into a metal framework reproducing the vessel's calculated lines. Even so, rain and dust still fell onto them through the building's worm-eaten roof, so a huge plastic tent had to be erected over the partially reconstructed stern.

This tent also served as a shelter for organic matter from the excavation: animal bones, samples of plants from the dunnage and of corroded powdery lead sheathing, as well as timbers from related wrecks, including a part of the ram from another wreck which was only sounded, but which also bore Phoenicio-Punic lettering. Twenty one years later these things probably still survive, although they have been neither cleaned nor displayed museographically.

But reverting to the 1970s: preparations for eventual display had been started outside the tent. For example: a two-sided structure had been built with a concave side to hold small finds, while its convex side provided a surface on which to reproduce the recorded pattern of the vessel's lead sheathing. Another major exhibit was a full-scale replica of the "Sister Ship's" ram, to be accompanied by the single ram-timber that had been raised, together with measured drawings and photographs of the ram which had been made underwater.

The display items remained safe for 8 years, then orders came to scrap them. But the workmen charged with the destruction were from Marsala, so they hid the dismantled exhibits in a disused cinema.

When the Sicilian Government heard of the affair, and after the three foreign petitions had been delivered to them, the Assessore Bene Culturale (that is to say the official responsible for cultural matters to the independent Sicilian Parliament) ordered (and I quote) that "the Punic Ship be put back". Like so many other people, he used this collective description to cover all that pertained to the 5 seasons of excavation at sea, together with the structures that had been built to display it.

He also realised that after 9 years of neglect in unstable atmospheric conditions things must have deteriorated (indeed even the modern metal supports had rusted and sagged dragging down the treated wood they had supported). So he also ordered that international experts should be called in to advise on repair, reconstruction and museographic display.

This order was quickly carried out and estimates submitted by specialists who included: the museographic architect Alan Irvine; the naval architect Austin Farrar, and Danish technicians under the respective Directors of the Danish National Museum at Roskilde (Ole Crumlin-Pedersen) and the National Conservation Laboratories (Kirsten Jespersen).

Their advice and their estimates were accepted, and the Sicilian Parliament duly paid the money into a Sicilian account. But those appointed to administer the account locally simply failed to claim the money, so after 3 years it automatically reverted to the state.

Since then, so I am told, a new scheme involving direct contact with Danish technicians is being mooted. Let us hope that after nearly three decades of difficulties, it will succeed where other solutions have failed.

Depite all this, important aspects of the Ship are sure to be remembered in Marsala through the small private display that I am announcing. The origin of its contents is amusing: it results from the fears and misgivings I suffered at the beginning of the excavation, in 1971, after some of the ship's most significant timbers had been raised, but before I had come to know the people of Marsala and the efficient infrastructure of the town's trade in wine, which eventually permitted the building of a conservation laboratory.

In 1971, the Sicilian authorities had ordered a rescue-excavation, because the movement of a sand-bank had both revealed and endangered the Punic Ship's stern-post, to the extent that winter storms were likely to have carried it away. Once excavation started, red maple-wood timbers and yellow pine-wood planking were revealed looking good as new, and to our astonishment, they bore Phoenico-Punic calligraphy that had been painted with a small brush. But the main interest was obviously architectural, for the stern-post and keel plus 5 floor-timbers and 2 garboard strakes were *in situ*, thus providing a basis for deducing the hull's shape.

The problem was how to make adequate records of such intricate three dimensional relationships, for the standard photographs and drawings seemed inadequate, especially since I could not – at the time - even imagine the possibility of conserving the original wood locally.

I remember sitting by the sea at the end of the season, outside the disused barracks which had been lent to the expedition, pouring sea-water (for there was no freshwater) over the rubber mattresses that protected the large and recently raised timbers. The barracks were at least one hour's drive from Marsala, over rough ground and then over a pot-holed secondary road. A journey that had had to be made most evenings in order to take films into town to be developed. During these expeditions I often saw funerals going into the big church, and gradually heard about local customs. Although the dead were buried within 24 hours, there was a long-standing tradition of posthumous portraiture. This involved using the defunct's best clothes and getting some kind of record of his, or her face: perhaps a sketch - a photo - or a death-mask.

Eureka! death-mask-makers must have the secret of non-destructive plaster-casting. They must know how to keep the temperature of the plaster down and what resist to use so that it could be removed from delicate organic matter (in the event, the resist turned out to be soft green-soap). To cut a long story short: the vital timbers were eventually cast in plaster.

Later, after the mission had acquired a patron and new member: Dr. Pietro Alagna, its logistic problems were solved. Thanks to him chemical conservation was assured. The plaster casts then began to look rather silly, nevertheless a use was found for them. The original colours of the woods and some of the painted signs were reproduced onto them, then they were lent to the local secondary school, together with other records, to serve as a "Mini Museum" which allowed the children to follow the course of the excavation.

Once the ship's real timbers got their Museum (or so we optimistically thought) things changed again. The School needed the "Mini Museum Room" for other things, so the casts were put into the newly vacated conservation laboratory. There they remained until last year, when that space too became needed for other purposes. On hearing this, my reaction was to have the casts thrown away, but others thought differently. Once again, Dr Alagna generously solved the dilemma.

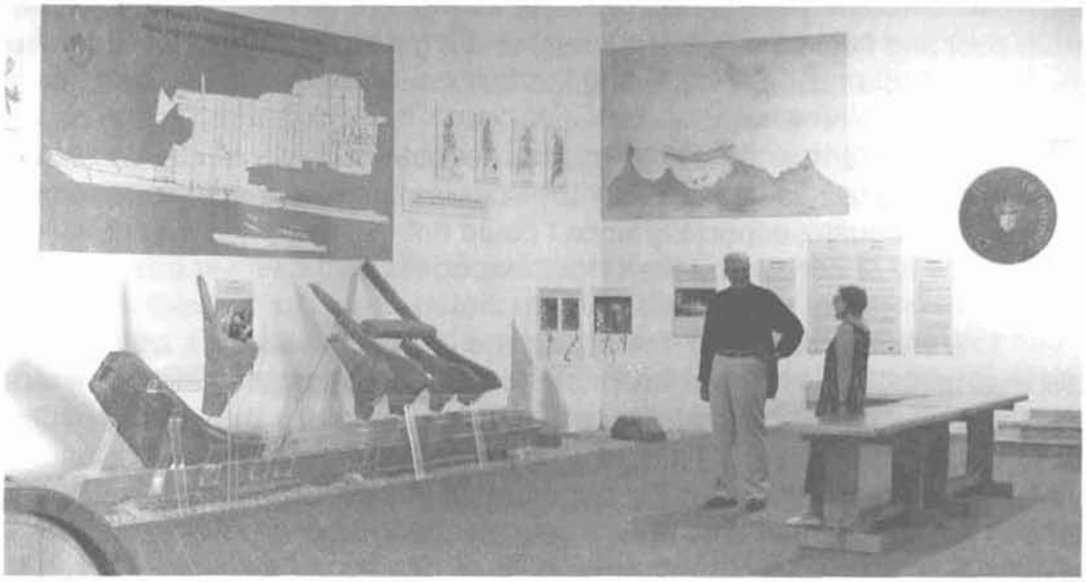

Photo F. Rancatore

The Pellegrino Wine Establishment, which he directs, has monumental (and spotlessly clean) halls which were originally built to house the pyramids of giant oak barrels wherein traditional Marsala Wine is matured by using the "Soleras system". Today, other wines are also produced in a mechanised and more up to date part of the establishment, so that the traditional halls have tended to become a show-place visited by tourists as well as clients. They are so spacious that they already house a collection of exquisitely painted, traditional Sicilian carts and to this will be added the casts of the Ship's stern which have once more become a precious record of the original.

Given the firm's long-standing patronage, there is a kind of poetic justice in the Stabilamento Pellegrino becoming a safe haven in which "the Punic Ship" can find its last rest. The casts are accompanied by photographs of the painted signs and of the wood's original colours (as they appeared underwater, before oxidisation darkened everything) as well as site-plans; a short account of the history of the excavation and a bibliography (which can be consulted in the Municipal Library). The names of those who either patroned or participated in the excavation are also listed.

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PRELIMINARY ANALYSES OF ARCHAEOBOTANICAL MATERIALS FROM THE NINTH CENTURY A.D. SHIPWRECKS OF BOZBURUN, TURKEY AND TANTURA LAGOON, ISRAEL

The recovery and analysis of plant remains from the Bozburun Byzantine shipwreck off the southwest coast of Turkey and the Abbasid period shipwreck found at Tantura Lagoon, Israel have revealed archaeobotanical assemblages that identify 1) materials used to make ropes, baskets, and matting, 2) plant-derived cargoes and provisions, and 3) the possible geographical origins and/or travel routes for the ships and cargoes. Plant materials recovered include fruits, seeds, pollen, phytoliths (silica-bodies), and epidermal tissues. Preliminary analyses indicate that these botanical assemblages are significant and valuable for the interpretation of human activity in the contexts of ninth century A.D. subsistence, trade, and economy in the eastern Mediterranean basin.

The archaeobotany of shipwrecks has a short history, yet in only 40 years the sub-discipline has developed techniques that extract some of the most significant archaeological data recovered from underwater sites. C. Haldane has chronicled the major macrobotanical investigations of ancient Mediterranean shipwrecks, while E. Weinstein has reviewed several projects that illustrate pollen analysis (palynology) applied to shipwreck archaeology.[1] The French excavation of the Roman shipwreck at Madrague de Giens, the British excavation of the tenth century A.D. Clapton logboat, the Bronze age Uluburun shipwreck near Kaş, Turkey, and the American excavation of the Betsy, an eighteenth-century revolutionary war vessel, are among the most productive and comprehensive archaeobotanical investigations of shipwrecks.[2] In this regard, the preservation, recovery, and identification of pollen, phytoliths, epidermal tissues, seeds, and fruits from the Bozburun and Tantura Lagoon projects represent significant contributions to shipwreck archaeobotany.

Materials and Methods

Archaeobotanical investigations of the ninth century A.D. shipwreck sites of Bozburun, Turkey and Tantura Lagoon, Israel included the collection and analysis of sediments, seeds, fruits, and artifacts of botanical origin. The collection strategy for sediments targeted all microscopic plant remains, including pollen, phytoliths, cystoliths, starch grains, epidermal tissue fragments, and fibers. The techniques used to collect these sediments followed established methods for identifying environmental pollen assemblages, as well as new techniques developed by the author and others for the recovery of cultural assemblages from artifacts and from the hulls of ships.[3] Macroscopic plant remains such as seeds and fruits were recovered directly from the sediment matrix of the site and from amphoras, using flotation techniques established by Weinstein during the excavation of the HMS *Betsy* and by Pulak and Haldane at Uluburun, together with new techniques.[4] Additionally, rope and basketry were recovered in quantity and with sufficient preservation to allow an identification of the parent plant material from which each artifact was made.

Methods of collection and analysis of microscopic and macroscopic plant remains diverge from the moment the excavation begins. Microscopic remains are assumed to be present in sediments, regardless of their provenience. Therefore, sediments recovered from the inside of artifacts, in contact with the hulls of the ships, from the site sediment matrix, and from the modern terrestrial environment were collected in sufficient quantity to allow for the recovery of pollen, phytoliths, and other components, each as a separate sample. These were packaged for subsequent processing and analysis in a laboratory setting. The macrobotanical components, however, were collected and analyzed in the field to the extent that taxonomic identifications were possible, leaving a minimal amount of analysis to be performed in the laboratory. When performing flotation in the field to analyze the contents of artifacts, the entire contents of every artifact were sieved using a series of progressively smaller screen sizes, ranging from five to one millimeter. In addition to the samples retrieved from the screens, all remaining material floating on the surface of the catch basin was collected, as were samples (usually 20 milliliters) of the remaining sediment in the bottom of the basin.

Sediments collected for analyses of microscopic plant remains were reduced using a series of chemical and mechanical treatments designed to remove all unwanted mineral and organic components. *Lycopodium* spp. L. tracer spores were added to the samples during chemical treatment to ensure that abundances and concentrations of pollen were original, and not due to a loss of pollen grains during the processing stage. Additionally, samples of botanical artifacts such as rope and basketry were analyzed for the presence of pollen, and for diagnostic phytoliths and epidermal tissues.

The Bozburun Shipwreck

The Bozburun Byzantine shipwreck was found near the entrance of the bay of Selimiye, Turkey, on the southwest turn of the coast (Fig. 1). The ship was constructed in the style of a merchant vessel and carried a primary cargo of over 1,000 amphoras (Fig. 2), 970 of which were sufficiently intact for analysis, and are being studied in detail by Christine Powell.[5] Greek graffiti on many of the containers, the style of their manufacture, the location of the site, and dendrochronological analysis of the hull suggest a ninth-century Byzantine context.[6] The majority of amphoras appear to have held wine. In addition to the amphoras, other items of potential archaeobotanical value were recovered, including eight ceramic jugs (Fig. 3), nine ceramic pots, two copper jugs, three glass goblets, one oil lamp, fragments of plates and bowls, and rope.[7]

The amphoras were of 4 major classes, with volumes ranging from eleven to fifteen liters, similar to the capacities of the small type 2 amphoras from the seventh-century Yassi Ada shipwreck.[8] Among the 456 whole amphoras with contents at Bozburun, 410 were analyzed, and 332 produced seeds and other visible organic material. Sixty whole amphoras were stoppered, and 23 of these contained seeds. Table one presents a representative sample of the recovered assemblages of seeds. Though the majority of amphoras were un-stoppered, 316 of these also contained seeds. Fortunately, at least one stoppered container representing each of the four classes was recovered, and seeds were present in the majority of amphoras with graffiti. Red, pulpy liquid was poured from two stoppered amphoras, and purple, pulpy, organic sediment (lees) was found in both stoppered and un-stoppered amphoras. Grape seeds were the most abundant seed type found, ranging from 7,585 in a single amphora, while several contained only one grape seed each. One hundred and eight un-stoppered amphoras did not contain seeds. If the amount of grape seeds in wine were a measure of refinement, the Bozburun cargo was quite diverse.

Grape seeds were the most abundant type in amphoras, both in the number of containers that they occupied, and by the shear quantity of seeds overall. Grape seeds occupied 297 of the un-stoppered amphoras and were the primary contents of the two stoppered jugs. Olives (*Olea* sp. [Tourn.] L.), were next, occupying 22 amphoras, followed by *Pistacia* sp. L. (*terebinthus* type), which were present in 18 amphoras, but always accompanied by grape seeds.

Class 1 amphoras (Fig. 2) dominated the site, representing 929 of the 970 discrete containers recovered.[9] Of the 302 un-stoppered amphoras with organic contents, 298 were of the Class 1 category, as were all but one of the 23 stoppered amphoras that contained seeds. The "in-situ" stoppers themselves included three that were ceramic, but the remaining 57 were cambium, or bark, of Pinaceae family trees. Parallels for Class 1 amphora types are known from medieval sites in Turkey, but also Greece and Italy for the same period, as well as from kiln sites in the Crimea for the ninth and early tenth centuries.[10]

The majority of Class 1 amphoras did not have graffiti. Unmarked (complete) amphoras comprised 20 of the stoppered and 235 of the un-stoppered Class 1 containers with organic contents. Thirteen unmarked amphoras were still stacked in rows, probably as they were in the hold of the ship.

One of the well-stoppered amphoras with red liquid (Lot 9042) also contained six grape seeds (*Vitis vinifera* L.) and a small, possibly immature, bean fruit (Fabaceae family).[11] Pliny, in the first century A.D. text *Natural History,* notes that wine was made from carob.[12] Other notable plant remains from unmarked, stoppered amphoras include four that held only liquid (no apparent sand, etc.), two with grape "skins" in addition to grape seeds, and 3 with *Pistacia* sp. fruits (L.) accompanying the grape seeds. Pedanios Dioscorides, born in Anazarbus in Cilicia, describes medicinal drugs in the years 60-78 A.D. In this work, *De Materia Medica,* he states that *Pistacia* fruits were used to flavor wine.[13] A few un-stoppered amphoras contained olives, grape seeds, and *Pistacia* fruits (Lot 8802) together in the same container. Comparatively, four amphoras from the seventh-century Yassi Ada shipwreck also contained both grape and olive seeds.[14]

One unmarked, un-stoppered Bozburun amphora contained 917 grape seeds (Lot 2298). Another un-stoppered amphora (with a symbol similar to a reversed "K") contained 1,575 olive pits (Lot 2175). Still another unstoppered amphora contained 58 *Pistacia* fruits (Lot 1946). All three were recovered from the area of the stern. Most unmarked, un-stoppered amphoras, however, contained less than 10 seeds, usually of grape. Hocker suggests that the provenience of the amphora with 1,575 olive seeds near the stern may indicate olives as a shipboard ration, while Haldane, citing several medieval documents, suggests that shipboard diets usually excluded olives.[15] A compromise may be that olives were consumed onboard the Bozburun vessel, but by members (or passengers) other than the lower-class crew. Regardless of their intended use, they probably represent something other than a beverage.

Graffiti found on Class 1 amphoras includes Greek letter combinations such as AN, ΕΠΙΣ, ΓΕ, ΛΕ, ΛΕΟΝ, and NIKITAS and a symbol that can be interpreted as a tree. Amphoras marked AN and ΓΕ represent the most numerous categories of containers with graffiti, and were the only types that frequently contained seeds. The only amphora marked AN that was stoppered contained 4 grape seeds and 1 *Pistacia* fruit (Lot 8862). Nineteen un-stoppered AN amphoras had a range of grape seeds from 192 to a single seed, while 1 contained no seeds. Like some of the unmarked amphoras, nine amphoras marked AN were also still stacked in recognizable rows. One stoppered amphora with graffiti type ΓE contained 35 grape seeds (Lot 8665). Nine un-stoppered ΓE amphoras contained grape seed quantities ranging from 63 to a single seed. An un-stoppered ΓE amphora produced a single almond (*Prunus Amygdalus* sp. [Tourn.] L.).

Amphoras marked ΓE, ΛEON, and with the "tree" symbol were represented in the seed assemblage by only one amphora each, and those contained only grape seeds. An un-stoppered amphora marked ΓE had two seeds, while an un-stoppered amphora marked ΛEON, contained 423 grape seeds (Lot 1434). The "tree" symbol is known from contemporaneous sites in Greece and the Crimea.[16] An un-stoppered container at Bozburun with this symbol contained 195 seeds. Amphoras marked NIKITAS and EΠIS did not contain seeds, but an amphora marked EΠIF contained 94 grape seeds.

Hocker suggests that the graffiti represent ownership, and, in the case of graffito type AN, possibly even a passenger onboard the ship.[17] A similar interpretation of ownership is suggested by van Doornick for amphoras found with the seventh-century Yassi Ada shipwreck, and amphoras of the eleventh-century Serçe Limani shipwreck, some of which were clearly marked ΛEON.[18] It is worth noting that Byzantine commerciarii and warehouses are known to have existed at least until the eighth century as evidenced by lead seals.[19] These institutions may have evolved into more privatized organizations in the ninth century, which facilitated the purchase of agricultural produce by "middlemen".

The other three classes of amphoras are represented in the seed assemblage by a total of only five containers (less than 100 total for the site), and these only contained grape seeds. A stoppered Class 2 contained 7,585 grape seeds (Lot 10205), which was the highest count from the site. The extremely high quantity of seeds may indicate the former presence of grapes or raisins. According to Pliny, grape "bunches" (technically, "panicles") were stored in jars, grapes were preserved in must, and raisins were soaked in wine.[20] Columella also mentions grapes stored in must, and putting grapes in jars that were sealed with stoppers and pitch.[21] An un-stoppered Class 2 amphora held a single grape seed. It may be significant that the Class 2 amphoras have significantly larger mouths than the other classes, which could be an exception concerning the loss of seeds by water currents, etc.

There were only two stoppered Class 3 amphoras, and neither contained seeds, but 17 grape seeds were found in an un-stoppered Class

3 container. Parallels for Class 3 amphoras are known from Crimean kiln sites and from the southeastern Crimean coast.[22] The only stoppered Class 4 amphora did not contain seeds, but two un-stoppered containers held 12 and 15 grape seeds.

The range of grape seed quantities in un-stoppered amphoras is similar to stoppered amphoras, and the upper range of seed quantities of grape. Olive, and *Pistacia* in un-stoppered amphoras is well beyond statistical probability for contamination. It is also possible that a secondary "in-situ" condition exists, meaning that intrusive elements, if present, originated from the ship itself, and not from the environment. The amphoras at the Bronze Age Uluburun shipwreck contained many small, inorganic artifacts, described by Haldane as originating from the ship, and entering the amphoras during the shipwreck's disintegration.[23] Additionally, Haldane conducted an experiment in which an un-stoppered amphora full of seeds was left on the seafloor for three months. Only a loss of a few seeds was observed; no new seeds arrived.[24] The comparative time scale, however, may be problematic. Environmental and biological causes for the loss of amphora contents were probably a factor at Bozburun, but probably only for the upper levels of amphoras, which, for the most part, were not intact. If a few seeds were lost in the lower levels of intact amphoras, it is not likely that the interpretation of, say, 20 grape seeds as the contents of an amphora will be dramatically different from the presence of 30 grape seeds.

An un-stoppered amphora contained a degraded pinecone (*Pinus* sp. [Tourn.] L.), two contained a cypress cone (*Cupressus* sp. Tourn. ex. L.), two contained oak acorn cupules (*Quercus coccifera* sp. [Tourn.] L.), one contained a degraded sweet gum fruit (*Liquidambar* sp. L.), and three contained almonds. The site sediment matrix also contained all of these, but they could represent intentional additives. Pliny notes that wine was made from "fir-cones" and parts of cypress trees.[25] Two almonds were also found in amphoras at the eleventh-century Serçe Limani shipwreck.[26] Neuberger, in *Technical arts of the Ancients*, notes that almonds were added to wine in antiquity.[27]

In addition to plant remains, small fish vertebrae were present in two stoppered and 11 un-stoppered amphoras. An un-stoppered amphora contained 4 vertebrae, and one of the stoppered amphoras was marked TIMOΘL. In *Natural History*, Pliny states that allex, or sediment of garum, was made into a beverage.[28] Casiano Baso's sixth century A.D. study of ancient Greek agricultural practices, *Geoponica*, cites a contemporaneous recipe from Bithynia, on the southern coast of the Black Sea, for the addition of two parts wine to one part fish sauce (garum).[29] A modern "fish wine" is also produced in Turkey today.

Two of the eight intact jugs were still stoppered. One jug contained 2,680 grape seeds, five whole grapes, and two *Pistacia* fruits *(terebinthus* type), while the second stoppered jug contained 3,362 grape seeds and fifteen whole grapes. The jugs were found near the stern, and are suspected to be part of the ship's rations, as were jugs of similar volume found in the same relative locations on the seventh-century Yassi Ada shipwreck.[30] Pollen assemblages from the two stoppered jugs included *Vitis* (grape) and mint (Lamiaceae). The amount of mint family pollen (compared to the local environment) suggests that spices were added to the contents of the jugs. Medieval Arabic authors mention the use of syrups made from raisins and other fruit, and the use of "sweet-sour" sauces and fruit juices as marinades for meat by the Sassanid Persians.[31] Pliny mentions wine made with wild mint, making the use of mint in condiments a possibility.[32]

Preliminary analyses suggest that the majority of seeds found inside both the stoppered and un-stoppered amphoras represent original contents. Aside from the well-known economic types (grapes, olives, *Pistacia*, etc.), passages from *Natural History* indicate that plant sources for wine and wine additives encompass seeds, fruits, flowers, and fibrous tissues of many woody and herbaceous species, though it is possible that seeds such as *Althea* sp. [Tourn.] L. (hollyhock, etc.), *Euphorbia* sp. L., *Poterium* sp. L. (thorny burnet), *Rumex* sp. L. (curly doc), *Vitex* sp. Tourn. ex. L. (chaste tree), and a single seed that resembles Aizoaceae *Tetragonia* sp. L. (mesembryanthemum family) are intrusive, even for stoppered containers, representing accidental inclusion during the functional life of the amphoras. The extreme view would be that spaces between the stoppers and the mouths of the amphoras were as much as two millimeters at times, which is larger than the dimensions of most of the seeds mentioned above, and that the seeds therefore are post-submersion intrusive elements.

Thorny burnet seeds were also present in amphoras of the seventh-century Yassi Ada shipwreck, causing van Doornick to speculate on the use of this plant as dunnage, as was the case with the Uluburun shipwreck.[33] It is possible that thorny burnet was used in this manner at Bozburun, but there were no large, herbaceous caches found among the amphoras. Other seeds suspected to be intrusive include *Vitex* (also known as the "chaste" tree), though it was familiar to the Greeks and Romans, is known for its medicinal use, is a source for yellow dye, and supposedly has the ability to subdue sexual appetites.[34]

Pollen assemblages from Bozburun were recovered from within containers, from the sediments in contact with, and in proximity to, the hull, and from the modern environment (Table 2). One of the well-sealed amphoras containing red, pulpy liquid (Lot 9042) and another stoppered amphora with purple, organic sediment (Lot 3569) contained high quantities of *Vitis* (grape) pollen. This is not surprising, but it is significant, because *Vitis* is an insect-pollinated plant, therefore not producing large amounts of pollen. *Vitis* pollen is rarely found in environmental assemblages; when it is present, the quantities are extremely low (Lot 8220). When *Vitis* pollen occurs in quantity, it indicates a concentration of grapes and/or grape vine derivatives. The deposition of *Vitis* pollen can be from the process of making wine from grapes alone, but Pliny also mentions the addition of two pounds of wild vine flowers to a jar of must.[35]

Several amphoras contained large quantities of pollen from plants other than grape. Pollen of the Cupressaceae family was abundant in two well-stoppered amphoras (Lot 9042 shown; Lot 8466 not shown), which is uncommon, due to the fragile, thin-walled nature of these pollen grains, which usually results in poor preservation at best. It is possible that this pollen type preserved well due to the protected, and formerly acidic, environment that promotes pollen preservation. Pollen of this size, shape, and with a lack of ornamentation on the surface of the grain represents trees that include cypress (*Cupressus* sp. Tourn. ex. L.) and juniper (*Juniperus* sp. Tourn. ex. L.). The abundance of this pollen type probably indicates the addition of flowers or other parts of these plants to wine (three un-stoppered amphoras contained a cypress cone), and in fact Pliny notes that wine was made with cedar, cypress, and juniper shrubs, and from the flowers of other herbaceous plants.[36]

It is also possible that these merely represent an exposure of the wine to open air during the flowering season of Cupressaceae trees, common in the eastern Mediterranean and Black Sea regions.[37] If the presence of this particular pollen type represents "background" vegetation and exceptional preservation, then it may not be accurate to compare these relative abundances to assemblages that represent environmental records in antiquity. Stoppered amphora 8466 also contained a large quantity of cultivated grass pollen (cerealia), which may represent an additive as well.

Lot 10110 represents pollen from a very large amalgamation of pitch, probably spilled from a container, recovered from the hull. In analogy to the abundance of *Pistacia* sp. L. pollen in resin samples from the Bronze Age Uluburun shipwreck, the abundance of *Poterium* pollen suggests that some part of the thorny burnet shrub, such as the papery fruits, may have been a principle component of the pitch found at Bozburun.[38] The same argument can be made for the abundance of non-cultivated grass pollen present in the pitch, though the evidence is not as strong. Other pollen present include types not found in other archaeological samples, such as beech (*Fagus* sp. L.) and walnut (*Juglans* sp. L.). The environmental pollen assemblage in the pitch may indicate a particular geographical region, as was the case with resin from Roman containers analyzed by Pons, and later, Arroba.[39] The natural properties of pitch make it a good pollen "trap" that protects the grains from environmental degradation, and isolates pollen trapped during the pitch's liquid state from subsequent contamination. In the laboratory, a 50 milliliter piece of pitch was reduced to 20 milliliters by removing the outer layers, ensuring that the "core" had no surfaces in contact with the site sediments or seawater.

Pitch was also present on the inside rims of the mouths of many amphoras, and was the sealing agent for those that remained stoppered. In a few cases pitch was found at the bottom of an amphora, but appeared only to have dripped down when a stopper was sealed, and did not uniformly coat the inside.

In addition to plant remains, the majority of stoppered amphoras also contained small amounts (less than 100ml) of sand, clay, and pulverized shell fragments that entered through spaces between the stopper and the amphora mouth, though the two well-stoppered amphoras contained only liquid, grape seeds, and purple, organic sediment. The un-stoppered amphoras held their seeds within a matrix of sand and clay that at times completely filled the amphoras.

Several un-stoppered amphoras contained stratified sediments composed of gray, clayey layers covering a purple organic layer in the bottom of the amphora. Pollen from the clay layer was typical of the site sediment matrix, while the purple organic sediment was dominated by grape pollen. This provides evidence of wine in otherwise sterile containers.

Some of the intact, un-stoppered amphoras were observed to be dwellings for octopus, and were probably homes to many other marine animals, right up to the time when the amphoras were removed from the site. The contents of these amphoras showed a pattern, which consisted of many crab and other shell fragments, and sediment with a distinct texture and odor. Crabs are known to be the favorite food of the octopus.[40] Ferrari and Adams discuss the effects of marine life on shipwreck sites concerning the burial, stratigraphy, and stability of site sediments.[41]

At Bozburun, the contents of these amphoras were interpreted with caution, though most contained seeds and other macrobotanical components that were typical of both type and quantity found in other amphoras. Bioturbation attributed to octopi probably only occurred on the top of the accumulated sediments within the amphoras, and the seeds and other original contents were mostly undisturbed, held in the very bottom of the sediment matrix that served as the floor of the octopus den. Evidence exists that shows a preference of octopi to occupy cavities, although

Cephalopoda spp. are known to bury themselves in sediment.[42] J. Cousteau reported that octopi were found inside almost every Greek amphora from a shipwreck in the Mediterranean off the coast of Marseilles.[43] Inside the amphoras, they found pieces of ceramics, pebbles, and shells.

The short-term approach to this issue for the Bozburun materials has been the avoidance of pollen analysis of sediments from amphoras that have large quantities of shell fragments, except for comparative purposes. Sediments from two amphoras representative of this condition were analyzed.

Sediments from the remaining artifacts revealed patterns that were similar to the modern pollen assemblages for the site sediment matrix and for the region, including high percentages of *Pinus* and the Rosaceae family shrub *Poterium* (thorny burnet), both common on the rocky cliffs surrounding the inlet. The abundance of *Poterium* and *Pinus* in stoppered amphora 10304 illustrates the variations in "stoppered" states, in this case poorly stoppered with a dominance of environmental types, judging from the similar abundance of pine pollen and others in the site sediment matrix. The similar texture and color of sediments suspected to be bilge mud to the site sediment matrix, together with its abundance of pine pollen indicates that it is probably post-depositional, and not actual sediments that accumulated in the bilge during the functional life of the vessel. The same conclusion was drawn by Branch when analyzing the suspected bilge sediments of a tenth-century logboat from London.[44]

In the absence of bilge mud and caulking, containers become the only source of environmental pollen assemblages that may be contemporaneous with the functional life of the ship. The only containers that do not possess pollen assemblages similar to the site sediment matrix are the well-stoppered amphoras. Yet these contain assemblages that mostly reflect their contents, rather than a typical environmental "signature". Seven stoppered amphoras contain *Pinus*, *Quercus*, and *Poterium*, and six of these also contain *Olea*. The two that contain *Ceratonia* sp. L. (carob) do not contain Chenopodiaceae/*Amaranthus* sp. L (goosefoot). Presently it is not clear whether these assemblages are useful for the identification of regional vegetation. The overall species composition does not conflict with modern or ancient local assemblages up to 3,200 years old.[45]

Three comparative sediment samples were collected for pollen analysis. A modern environmental sample (8220) composed of approximately 20 "pinches" of sediment was collected from points along the roadside in Selimiye, the nearest town to the archaeological site.[48] Samples 8331 (clay) and 8332 (sand) were taken directly from stratified layers of the site sediment matrix. The dominance of *Quercus* in the terrestrial sample versus *Pinus* in the underwater sediments may reflect the modern (and ancient) dominance of pine trees on the slopes opposite of the bay of Selimiye, and on a small peninsula on the Selimiye side of the inlet, versus the presence of oak in the town of Selimiye itself. The layers of sediment onsite were stratified, and therefore are significant for the environmental pollen assemblages they contain. The pollen assemblages suggest that the regional vegetation has not changed significantly in the last 1,100 years.

Rope recovered from the Bozburun shipwreck (Fig. 4) revealed deposits of plant silica, or phytoliths, that identify the parent plant material as palm (family Arecaceae) (Fig. 5), known for its use in rope making in antiquity.[47] Hourani, in *Arab Seafaring*, states that rope was made from the coconut palm in the Medieval period in the Maldives and Laccadives (modern Lakshadweep) in the south Arabian Sea and north Indian Ocean.[48]Cell patterns from epidermal tissues of the Bozburun rope (Fig. 6) resemble those typical of the Chamaedoroid sub-family (after Tomlinson).[49] This sub-family does not include the genera of well-known types such as date palm (*Phoenix* sp. L.), coconut palm (*Cocos* sp. L.), or Doum palm (*Hyphaena* sp. L.). However, the classification by Willis places *Chamaedorea* and similar types in the same sub-family of Ceroxylloideae, which does include coconut palm.[50]

The Tantura Lagoon Shipwreck

The Abbasid period shipwreck at Tantura Lagoon, Israel, approximately twenty-five kilometers south of Haifa between a series of small islands and the coast (Fig. 1), has a fast-modeled hull that suggests something other than a large cargo vessel.[51] Oil lamps associated with the shipwreck, combined with the site's location, point to a ninth-century Abbasid Caliphate context.[52] Significant archaeobotanical materials recovered from the site include a gourd, two well-preserved woven fibrous artifacts (matting and a basket), extremely well preserved rope, caulking, and sediments suspected to be "bilge mud", which contained pollen, diagnostic plant epidermal tissues, and seeds.

One of the most interesting botanical artifacts found was a small yellow-orange gourd, which had three equally spaced holes around the rim, probably for the attachment of string.[53]

The artifacts composed of fibrous plant tissue were well preserved at Tantura Lagoon. The basket and matting (Figs. 7 & 8) both displayed epidermal tissues with stomata and cell arrangements typical of sedge (family Cyperaceae) (Fig. 9), known for similar utilization since the Bronze

Age, especially in ancient Egypt.[54] Rope from Tantura Lagoon was also well preserved (Fig. 10). Stomata and cell patterns of the rope's epidermal tissues are difficult to identify, due to the lack of definitive shapes and elements (Fig. 11). The rope may be constructed of rush (family Juncaceae), owing to its comparatively uniform and "plain" appearance. The rush family is known for possessing strong fibers, but not cited by Lucas specifically for the manufacture of cordage.[55] The Arab geographer Al-Muqaddasi, in a Medieval text, states that rope was imported from Amman.[56]

Caulking was well preserved at Tantura Lagoon, but it is covered with a substance that obscures the fibers, cell patterns, and/or phytoliths, making a quick identification difficult. Hourani notes that a mixture of pitch or resin and whale oil was used in conjunction with "dusur", translated as "from the wood of date palm", in the Medieval period.[57] The presence of such substances follows known practices for waterproofing ships.[58]

The analysis of rope, matting, and basketry using phytoliths and epidermal tissues are expedient techniques, and are not intended to be a substitute for fiber analysis (using transmission electron microscopy with cross-sections of isolated plant fibers). It is evident, however, that these methods are useful for quick assessments, and were first used in shipwreck archaeobotany by Joan du Plat Taylor, Sir George Taylor, and Charles Russell Metcalfe himself during the analysis of fibrous materials from the Bronze Age Cape Gelidonya shipwreck, excavated by George Bass in 1960.[59]

Sediments found between the keel, frames, and planking, or "bilge" area contained small quantities of economically significant seeds (Table 3). *Cucumis* sp. (Tourn.) L. (melon), *Juglans* sp. L. (walnut), *Olea* (olive), *Prunus* sp. (Tourn.) L., or plum, etc., *Rubus* sp. (Tourn.) L., or blackberry, etc., and *Vitis* (grape) are all familiar foods. *Coriandrum* sp. (Tourn.) L., or coriander is known for its use as a spice and condiment. Bilge mud sample 11109 contained the most seeds, and was in proximity to the *Prunus* seed (sample 1106), the intact, bag-shaped amphora (sample 11075), and the oil lamp (sample 11085), which also represents the most abundant seed assemblages for the site. Included in these assemblages were two "skins" (exocarp) of olives, which are not usually preserved. These samples were located near the narrow end of the hull remains, away from the middle of the ship. This may be significant for the interpretation of human activity onboard the vessel.

The contents of the bag-shaped, intact amphora represent the only occurrence of a degraded cultivated grass seed and an Apiaceae (carrot family) seed from the site. Together with the presence of grape and melon seeds, this assemblage represents plants used for food and spices. The contents of the oil lamp are suspected to be intrusive for the artifact, but represent a secondary "in-situ" situation in which seeds onboard were trapped by the lamp as the ship sank.

Hourani, in *A History of the Arab Peoples*, states that the diet of the well-to-do in Medieval Arab cities consisted of mostly fruits and vegetables, including grapes. Meats were seasoned with spices, and wine, although forbidden by the Qur'an, was consumed.[60] Al-Muqaddasi mentions raisins, nuts, and plums as imports for other parts of the Arab world from Syria and Palestine.[61]

Pollen from the bilge sediments was abundant and well preserved, as demonstrated by the concentration values at the bottom of table 4. Sample 11082 had such a high concentration of pollen that it was processed a second time to confirm the results. Herbaceous types were the most abundant, including *Artemisia* sp. L. (sagebrush), Chenopodiaceae/*Amaranthus* (goosefoot, etc.), and Caryophyllaceae *Paronychia* sp. (Tourn.) L. In addition to pollen, the bilge sediments contained considerable quantities of plant epidermal tissue fragments and loose fibers, suggesting that these sediments do in fact represent actual bilge deposits. Grape pollen was present in organic rich sediments (sample 11201) in proximity to the walnut (*Juglans*) shell fragment found in the bilge area of the ship.

One of the significant differences between the bilge mud and the modern environmental samples is the presence of Poaceae (grass), both cultivated and wild. The relatively high quantities of grass pollen may indicate a presence of some form of grass on the ship. Greig notes that the presence of both of weed grass and cultivated grass pollen suggests the purposeful importation of hay.[62] With the exception of grass pollen, the overall assemblages from the bilge mud samples are not significantly different from the local vegetation. The environmental assemblages found on the Tantura Lagoon shipwreck are very similar in species composition to those of stratified layers in cores that correspond to the ninth century, but also modern assemblages, which is not contradictory, since the regional vegetation has not changed significantly in 1,100 years.[63] In fact, the term used to describe pollen assemblages for as far back as 4,500 years is "Recent".[64] Additional supporting evidence for the identification of these sediments as "bilge" include its gray, clayey appearance and the large quantity of microscopic, fibrous material present in the sediment. The sediment matrix for the site is, conversely, brown sand, which contains little or no fibrous remains.

Grass pollen (Poaceae family) was also prevalent in the matting (sample 10211), in the highly processed organic material, which may be manure (11041), in the Abbasid oil lamp (11085), and in the caulking

(11196). An analysis of pollen from a seventeenth-century ship's moss caulking revealed pollen which represented a particular regional vegetation assemblage of France.[65] Pollen from caulking at Tantura Lagoon may also be an accurate indicator of regional vegetation. If so, it suggests that the ship was used primarily (or most recently) off the coast of a region similar to modern-day Israel, which is not inconsistent with the interpretation of the ship's use based upon the hull remains.

In addition to grass, the higher quantity of Pistachio (*Pistacia*) in the ship's caulking is notable. Although *Pistacia* is often found in sediments as a "background" or general environmental type, and is abundant in the modern terrestrial samples ("Tel Dor" and "Beach"), the relatively high quantity here may represent the use of terebinth resin in the caulking process, due to the absence or minimal presence of *Pistacia* in the bilge mud and other artifacts.

Conclusion

The archaeobotanical assemblages reflect the differences in function for the two ships. The cargo ship, or "merchantman", found at Bozburun was carrying over 1,000 amphoras, the majority of which probably contained wine. The variation of graffiti among the amphoras that probably represents ownership, combined with the sheer quantity of items suggests that this assemblage represents a commercial venture, interspersed with onboard rations of olives, grapes, and condiments. The Bozburun ship and cargo fit nicely into the framework of long-distance exchange as described by Tomber, and exemplify several aspects, including the relative abundances of amphoras to other ceramics onboard during a commercial trip, and the fact that amphoras are indirect indicators of economies driven by agriculture, and it is therefore their organic contents that are the commodity.[66] More extensive analyses of the variation that exists in the quantities and types of seeds, pollen, and other archaeobotanical components, both among and between groups of amphoras delineated by such variables as the presence or absence of graffiti, graffiti types, style of manufacture, and spatial analyses of the cargo in the ship, may reveal more subtle aspects of viticulture and maritime commerce in the Byzantine Empire.

The Tantura Lagoon shipwreck is one of the few sites, if not the only site, known to have actual "bilge" sediments. Amphoras, though, appear to be less significant for the Tantura Lagoon shipwreck, and it is less clear what purpose this ship served. From an archaeobotanical perspective, the most significant seed assemblages were found in the bilge area, and represent a substantial range of known food plants and spices, though in far smaller quantities than in the Bozburun assemblages. It is possible that these represent intrusive elements not contemporaneous with the hull. Tantura Lagoon does hold the remains of at least seven ships and associated botanical remains, which place it into the category of sites discussed by Parker, and require consideration concerning stratification and contamination, but the archaeobotanical assemblages do not conflict with what is known about the common diet for peoples that occupied the territories of the Abbasid Caliphate during the ninth century.[67]

Although the preliminary analyses of these archaeobotanical assemblages have produced significant results, it is probable that discoveries will continue, as extensive examination reveals more subtle patterns and relationships among the artifacts and the plant remains that still occupied them 1,100 years later. As demonstrated by the Bozburun and Tantura Lagoon excavations, archaeobotany has established itself as a necessary component of shipwreck archaeology.

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*I would like to thank the following individuals and organizations: Fred Hocker (Director, Bozburun excavations), Shelley Wachsmann (Director, Tantura Lagoon excavations), George Bass, Vaughn M. Bryant, Jr., John G. Jones, Arlene Miller-Rosen, C. Wayne Smith, Harry E. Tzalas, Mina Weinstein-Evron, and the board, staff, and members of the Institute of Nautical Archaeology. Additionally,

-From the Bozburun project: Oguz Alpözen, Amy Borgens, Gül Dölen, Esra Altinanit Göksu, Claudia Gorham, Matthew Harpster, Xila Matthews, Troy Nowak, Asaf Oron, Harun Özdas, Christine Powell, Phillip Sweeny, Ken Tretheway, and the Smothers Foundation.

-From the Tantura Lagoon project: Chris Brandon, Stephen Breitstein, Steven Butler, the National Geographic Society, the L. J. Skaggs and Mary C. Skaggs foundation, Robert and Hallie Anderson, Ned and Raynette Boshelle, Theodore and Francis Halpern, Harry and Joan Khan, II, Rubin and Norma Kershaw, and John and Ellie Stern.

NOTES

1 Haldane, 1991; Weinstein, 1996.
2 Haldane, 1991; Jacobsen et al., 1998; Marsden, 1989; Tchernia et al., 1978; Weinstein, 1992.
3 Adam & Mehringer, 1975; Weinstein, 1996.
4 Haldane, 1993; Weinstein, 1992.
5 Hocker, 1998.
6 Hocker and Scafuri, 1996; Personal communication, M. Newton and P. Cuniholm, Cornell University, Aegean Dendrochronolgy Project.
7 Hocker and Scafuri, 1996: 7-8; Hocker, 1998: 6.
8 Bass and van Doornick, 1982: 163.
9 Hocker, 1998: 4.
10 Arthur and Auriemma, 1996; Hocker, 1998: 4.
11 Authorities for plant names follow Willis, 1957 unless indicated otherwise.
12 Pliny XIV: 103.
13 Dioscorides V:40.
14 Bryant and Murray, 1982: 328.
15 Ashtor, 1970; Bell, 1926: 279; Haldane, 1993: 354; Hocker, 1998: 6; Jados, 1975: 79.
16 Hocker, 1998: 5.
17 Hocker, 1998: 4.
18 Van Doornick, 1989: 250, 256.
19 Oikonomides, 1986: 11, 42; Treadgold, 1997: 410.
20 Pliny XIV: 17, 29, 82.
21 XII: xvi, xxxix, xliii.
22 Hocker, 1998: 5.
23 Haldane, 1993: 349.
24 Haldane, 1993: 349.
25 Pliny XIV: 103.
26 Haldane, 1991: 216.
27 Neuburger, 1969: 107.
28 Pliny XXXI: 95.
29 Baso 20:46, 4.
30 Bass and van Doornick, 1982:165, 168-172.
31 Ashtor, 1970: 8; Lopez and Raymond, 1955: 29; Tannahill, 1973: 175.
32 *Natural History* XIV: 105.
33 Haldane, 1993: 356; Van Doornick, 1989: 252.
34 Polunin and Huxley, 1987: 155.
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36 Pliny XIV: 112.
37 Neuburger, 1969: 107.
38 Jacobsen et al., 1998.
39 Arroba, 1976; Pons, 1962.
40 Lane, 1960: 25.

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42 Lane, 1960: 74.
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45 Bottema and Woldring, 1990.
46 Adam and Mehringer, 1975.
47 Danin, 1995: 38; Lucas, 1962: 134-135; Pliny XVI: 89.
48 Hourani, 1995: 91.
49 Tomlinson, 1961.
50 Willis, 1957: 484.
51 Wachsmann, 1995; Wachsmann et al., 1997.
52 Wachsmann et al., 1997.
53 Wachsmann et al., 1997: 10.
54 Lucas, 1962: 131, 136-137.
55 Danin, 1995: 38.
56 Al-Muqaddasi: 179.
57 Hourani 1995: 97.
58 Black, 1999.
59 du Plat Taylor, 1967: 161-162.
60 Hourani, 1991: 127-128.
61 Al-Muqaddasi: 180-181.
62 Greig, 1982: 63.
63 Horowitz, 1979: 215; Weinstein, 1979; 181.
64 Horowitz, 1979: 343.
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66 Tomber, 1993.
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ILLUSTRATIONS

Fig. 1

Fig. 2

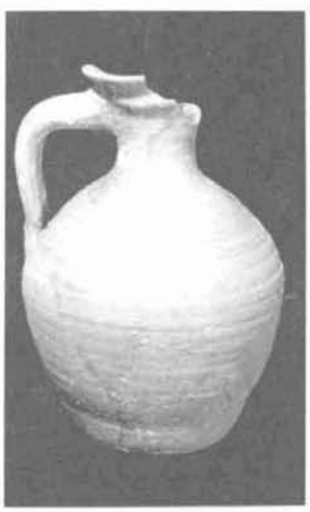

Fig. 3

Fig. 4

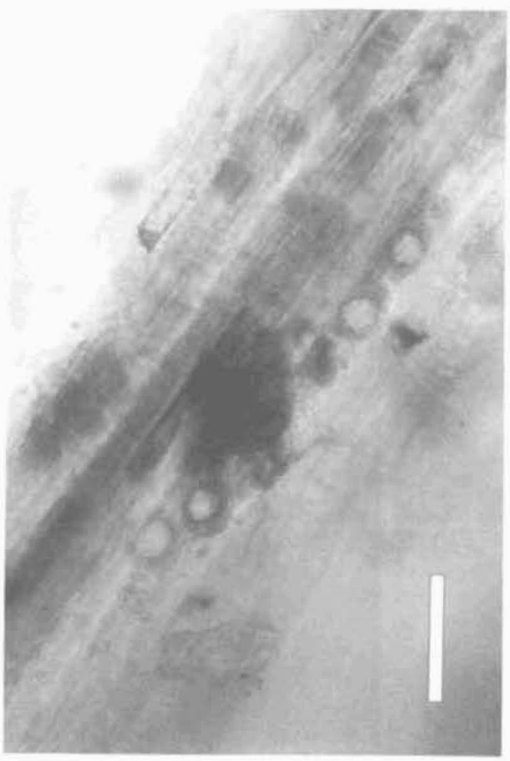

Fig. 5

Fig. 6

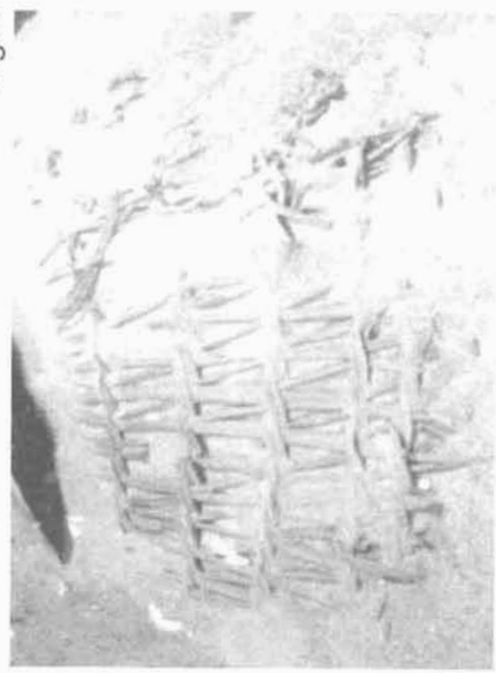

Fig. 7

Fig. 8

Fig. 9

Fig. 10

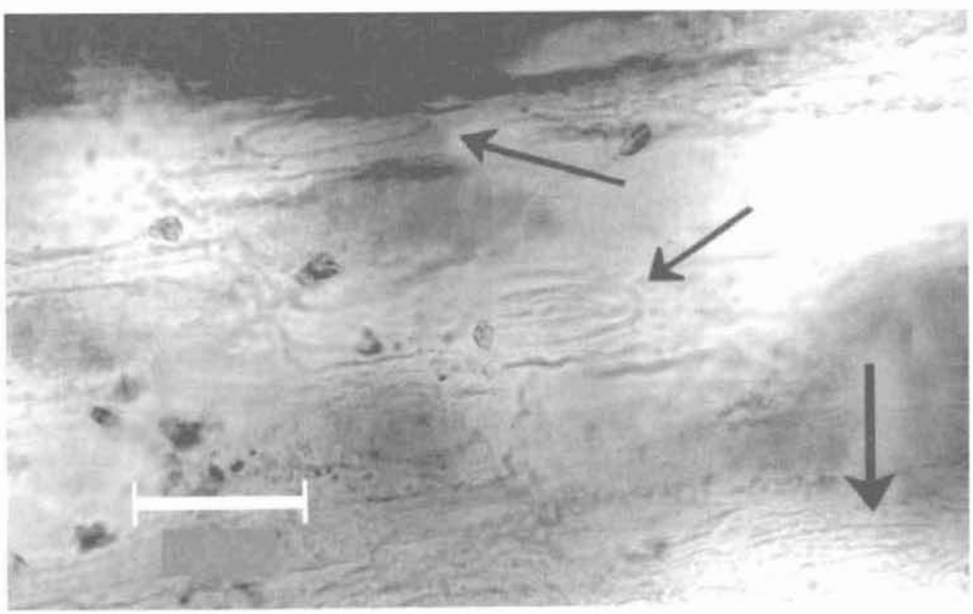

Fig. 11

Table 1. Seed Assemblages from the Bozburun Shipwreck.

	Stoppered Amphoras									
Lot	8319	8665	8862	8981	9042	9341	9794	9912	9947	10205
Fabaceae (*Acacia*-type)					1					
Malvaceae (*Althea*-type)	1									
Pistacia (terebinthus-type)			1				4			
Poterium (*Sarcopoterium*)	1						1			
Rumex	1									
Fabaceae (Trifolium-type)	1									
Vitex	1									
Vitis vinifera		35	4	81	6	298		107	7	7585
indeterminate	1			1						
Total seeds*	6	35	5	82	7	298	5	107	7	7585

	Unstoppered Amphoras									
Lot	1434	1946	2175	2298	8802	9142	9369	9638	10029	10177
Cupressus sp.						1				
Malvaceae (*Althea*-type)						1				
Olea europea			1575		175	1	1			
Pistacia (terebinthus-type)		58			2			1		1
Poterium (Sarcopoterium)									1	
Quercus						1				1
Aizoaceae *Tetragonia*-type										1
Vitis vinifera	423			917	25	374	200	432	9	282
indeterminate						3				
Total seeds*	423	58	1575	917	202	381	201	433	10	285

* Quantities represent total minimum of individuals (MNI).

Table 3. Seed Assemblages from the Tantura Lagoon Shipwreck.

	Bilge mud					Miscellaneous			
Sample	11011	11061	11106	11108	11109	11045	11046	11075	11085
Apiaceae								1	
Capsella-type									1
Coriandrum					1				1
Cucumis	1				1			1	3
Juglans					1	1			
Olea europea			1	3	2				
Poaceae								1	
Prunus					1		1		
Rubus	1								
Vitis vinifera	1	2			4			1	14
Indeterminate		1						1	
Total seeds*	3	3	1	3	10	1	1	5	19

*Quantities represent minimum number of individuals (MNI).

Table 2. Pollen Assemblages from the Bozburun Shipwreck.

	Archaeological							Environmental		
Lot	3569	8498	9042	9182	10110	10304	Bilge	8220	8331	8332
Arboreal pollen										
Alnus										1
Carpinus-type				1						
Ceratonia			5							
Cupressaceae	3	1	99			1			1	
Fagus					1					
Fraxinus										1
Juglans					2			1	1	
Liquidambar				1	1	1				
Olea	14	1	8	11	9	7	16	18	22	10
Pinus	15	156	2	161	23	92	162	32	138	138
Pistacia spp.	1	1		2	1	1	3	1	7	1
Quercus spp.	6	10	3	13	9	7	5	109	11	24
Rhamnaceae			1		1					
Ulmus										1
Total arboreal pollen	39	169	118	189	47	109	186	161	180	176
Non-arboreal pollen										
Apiaceae	4		1		1					
Artemisia	1	2		4		1	1		1	2
Asphodelus									1	
Asteraceae (Heliantheae)			1		2			1	2	1
Asteraceae (Liguliflorae)					1	2	1	1	3	
Asteraceae (Ambrosiaceae)		1		1	2	1		1		1
Cannabinaceae	1									
Centaurea-type	1									
Chenopodiaceae/*Amaranthus*	1	2			2	1	2	1	2	8
Cyperaceae									1	3
Ericaceae		1		1	2			1	1	2
Fabaceae	1				1			30	1	
Lobelia-type		1								
Mentha-type			1				1	7		
Plantago	1		2					3	1	1
Poaceae		1	3	1	14	1	2			1
Poaceae (Cereal type)	2		1							
Ranunculaceae		4								1
Poterium (*Sarcopoterium*)	9	3		17	152	73	5		4	2
Vitis	138		69					3		
Other	2		2	1	2	1	1	2	3	2
Total non-arboreal pollen	161	15	80	25	179	80	13	50	20	24
Indeterminate	3	11	3	4	5	0	0	30	8	21
Unknown	4	11	6	28	16	21	8	21	12	16
Total pollen	207	206	207	246	247	210	207	262	220	237
Total tracer spores	60	210	30	200	40	136	94	35	43	307
Sample quantity*	15	20	24	5	20	10	5	10	17	20
Concentration (grains/ml or g)	6210	1108	7763	5560	6978	4169	9954	16918	6802	872

*Samples 8220, 8331, 8332, & 8498 are in grams, all others are in milliliters.

Table 4. Pollen Assemblages from the Tantura Lagoon Shipwreck.

	Bilge mud			Miscellaneous					Environmental	
sample	11072	11082	11108	10211	11041	11085	11196	11201	Tel Dor	Beach
Arboreal pollen										
Betula		1		1						
Casuarina									7	2
Ceratonia		2		1	2	1				1
Citrus		1				2				
Cupressaceae		2	2			1		6		
Olea	6	2	4	5	2	1	2	4	2	
Pinus	2	2	1		1	1	1		3	6
Pistacia spp.					3		15		30	39
Quercus spp.	5	1	2	8	3	3	2	3	4	4
Rhamnaceae				3	1					
Rosaceae	1		1						6	
Other					3		1			3
Total arboreal pollen	14	11	10	18	15	9	21	13	52	55
Non-arboreal pollen										
Alisma-type	14									
Apiaceae	8	14	6	19	4	10	26			2
Artemisia	18	39	27	23	9	3	6	2	2	9
Asteraceae (Heliantheae)	5	9	4	2	3	4	4			4
Asteraceae (Liguliflorae)	1				2		1		5	
Boraginaceae	1	13		3					1	
Centaurea-type	3	2			3		3		8	1
Chenopodiaceae/*Amaranthus*	44	26	129	34	3	42	58		54	3
Cirsium-type									24	13
Cyperaceae	3	2	8	1					1	
Ericaceae		5	2	30	3	38	1			
Fabaceae	8	4	4	2	3	14	6	4	7	1
Mentha type				3	1	2				
Myrtus-type	1		1	2	4	4	21			2
Paronychia-type	69	9							8	
Plantago	3	3					2			
Poaceae	18	48	6	38	66	32	22			
Poaceae (Cereal-type)	4	15	7	20	71	14	16	2		
Polygonum	1	3	2		1					
Ranunculaceae				2	6	2	2		2	
Rumex		1				2	2			
Sarcopoterium (Poterium)	2	1	5	1		1	6		2	
Silene									2	23
Typha/Sparganium-type	3	6	8	2		3	3			
Urtica				2	1	1	1			
Vitis	1	2			1	11	1	178		
Other	6	4	4	1	5	6			10	8
Total non-arboreal pollen	213	206	213	185	186	189	181	186	126	66
Indeterminate	11	5	7	16	15	8	11	3	24	35
Unknown	4	20	4	6	7	11	14	0	10	31
Total pollen	242	242	234	225	223	217	227	202	212	187
Total tracer spores	118	1	3	49	156	44	59	124	61	253
Sample quantity (ml)	35	35	35	30	35	50	35	5	50	45
Concentration (grains/ml)	1582	186686	60171	4133	1103	2663	2968	8797	1877	443

LE SIEGE DE SYRACUSE ET LES MACHINES D'ARCHIMEDE ET DE MARCELLUS

En 214 av. J.-C., Hannibal qui a commis le crime de ne pas marcher sur Rome après Cannes, ravage l'Italie du sud (sauf les villes grecques, car il se présente comme le champion de l'hellénisme contre Rome). Mais il piétine quand un coup de tonnerre s'abat encore sur l'Urbs. Syracuse, cette riche et immense cité (à la mort du tyran Hiéron, ami pendant 54 ans des Romains) et la Macédoine de Philippe V entrent en guerre, cette dernière avec sa fameuse phalange qui n'a pas encore rencontré la légion. Le spectre de la triple alliance Syracuse/ Carthage/ Macédoine accable Rome. Mais en ce qui concerne la Macédoine, l'affaire tourne court. Philippe V n'a pas de flotte mais une flottille de 120 pentecontores pour passer le canal d'Otrante avec, entassés dedans, ses soldats lourdement armés. Il suffit aux Romains d'un détachement de quinquérèmes pour leur faire faire demi-tour. Sans cela, la force de choc de la phalange (40 000 fantassins avec des piques de 6 mètres) encadrée par l'armée ultra-mobile d'Hannibal, aurait pu « défoncer » les légions. Reste Syracuse qui est aussi une ville grecque par excellence, avec à sa tête le célèbre Archimède chargé de la poliorcétique.

Syracuse, qui avait résisté aux Athéniens lors de la guerre du Péloponnèse, est une ville immense, mais son enceinte est encore plus démesurée et aux trois quarts vide d'habitants. Ceux-ci sont concentrés sur ses deux ports. L'enceinte englobe le plateau des Epipoles, verrouillé par une forteresse, l'Eurylée, construite après le siège des Athéniens par Denys le tyran et renforcé par Hiéron qui, ami de Rome, laisse néanmoins Archimède améliorer les défenses de la ville. Il va donc perfectionner l'Eurylée. Archimède est sur beaucoup de points un précurseur de Vauban : l'Eurylée est protégée par une triple barbacane en triangle pour casser ou faire glisser les boulets ennemis. Chacune des barbacanes se couvre l'une l'autre d'archères et de catapultes, et est séparée par un large fossé qui permet la mobilité des troupes amies. Enfin se trouve la grande batterie, bâtiment en hauteur, muni de catapultes géantes et protégées. Comme d'après les ruines, nous savons qu'entre elle et le parapet du dernier rempart, il y a environ 200 mètres, cela nous donne une idée de la portée de catapultes réputées précises (illustration n°1). Les canons de Mazarin laissés à Louis XIV en 1660, portaient avec plus ou moins de précision à 200 – 300 mètres....

Syracuse était donc quasiment imprenable par terre. C'est pourquoi un des deux consuls, qui dirigeait en fait les opérations globales, Marcellus, décida d'attaquer le mur de mer proche de la ville. Marcellus n'avait que 50 quinquérèmes, une autre partie de la flotte romaine avait été envoyée contre la macédoine, comme nous l'avons vu et une autre partie encore en Espagne.

Polybe écrit : « Les Romains décidèrent d'attaquer d'une part avec des forces terrestres du côté des Epipoles, d'autre part avec des forces navales, là où le rempart borde la mer. » Munis de mantelets, de projectiles, de tout ce qu'exige un siège, mais ils avaient compté sans la valeur d'Archimède...

« Archimède avait préparé à l'intérieur de la ville aussi bien pour s'opposer à une offensive par la mer, des moyens tels que les défenseurs ne seraient jamais pris au dépourvu, ils auraient une parade toute prête à n'importe quelle action de leurs adversaires. Appius, consul, pourvu de mantelets et d'échelles, entreprit de les appliquer au mur qui aboutit aux Epipoles du côté de l'est ; mais ce fut un fiasco tant la position était forte. Pour sa part, Marcellus, son collègue dirigeait contre le port ses 50 quinquérèmes, pleines chacune d'hommes armés d'arcs, de frondes et de javelines, qui servaient à refouler les défenseurs des créneaux. »

Mais ce qui nous intéresse ici particulièrement ce sont les huit quinquérèmes dépourvues de rames, les unes à droite, les autres à gauche et accouplées par leur flanc dégarni. Sous l'action des rames du flanc extérieur, elles amenaient près du rempart ce qui fut appelé « sambuque ». Celles-ci étaient des engins du type suivant : on prépare une échelle dont la hauteur est celle du mur, quand l'échelle est dressée; on en blinde et abrite chaque côté avec des cuirasses très hautes et on couche l'échelle à plat où se joignent les flancs des navires accouplés, de façon qu'elle dépasse de beaucoup les éperons de proue. « Au sommet des mâts sont fixées des poulies avec des cordes. Alors, quand vient le moment de s'en servir, les cordes qui sont attachées au sommet de l'échelle, sont tirées au moyen des poulies par des hommes qui se tiennent à la poupe. Ensuite, grâce aux rangs de rames extérieurs, les navires approchent de la terre et on essaye d'appuyer ces engins contre le mur. Au sommet de l'échelle se trouve une plate-forme protégée de trois côtés par des mantelets ; quatre combattants y montent pour affronter les défenseurs des créneaux qui s'opposent à l'application de la sambuque. Quand elle est en place, et que les attaquants dominent le rempart, ils enlèvent les mantelets latéraux et montent sur les courtines ou les tours. Les autres les suivent par la sambuque, l'échelle tenant solidement aux deux navires grâce aux cordes. Cet appareil mérite bien le nom qu'il a reçu ; quand on a procédé au levage, la silhouette et son échelle qui ne forment plus qu'un ressemble à une sambuque (instrument de musique de forme triangulaire) ».

C'est l'échelage médiéval toujours sans artillerie mais appuyé par des javelots et des archers.

Les Romains comptaient bien se porter contre les tours avec cet équipement. Mais Archimède avait préparé des engins pour toutes les distances de tir : de loin, quand leurs vaisseaux approchaient, ses balistes et ses catapultes les plus puissantes les endommageaient, provoquant de l'embarras et du desarroi puis, quand la portée de ces armes devenaient trop longues, il en utilisait de plus petites, successivement en fonction des nouvelles distances, causant une telle confusion qu'il arrêta complètement leur élan et leur avance.

Finalement Marcellus fut contraint d'attaquer furtivement à la fin de la nuit. Mais quand il fut dans l'angle mort des armes, près du rivage, un autre dispositif qu'Archimède avait mis au point contre les combattants embarqués, les attendait. Il avait fait pratiquer dans les remparts jusqu'à hauteur d'homme des ouvertures très rapprochées, larges d'une main environ du côté extérieur ; il avait posté là à l'intérieur du mur des archers et des scorpions qui tiraient sur ces soldats embarqués, les mettant hors de combat.

« Il y avait encore des machines qui lâchaient contre les Romains des pierres capables de faire évacuer la proue par les combattants et en même temps faisait descendre un grappin de fer attaché à une chaîne. Par ce moyen, l'homme qui dirigeait le matereau, effectuait une prise de façon à saisir le navire par la proue et le soulevait. Quand cela se produisait, certains bateaux tombaient sur le côté, d'autres mêmes se retournaient, la plupart plongeaient dans l'eau. Marcellus était mis en difficulté par tout ce que lui opposait Archimède et il voyait que les défenseurs repoussaient ses tentatives en lui causant des dommages et en se moquant de lui. »

Ces descriptions si précises et si vivantes de Polybe sont dues, ne l'oublions pas, au fait qu'il était lui-même un grand spécialiste de poliorcétique. Notre effort a été de reconstituer au mieux par le dessin ci-joint (illustration n°2) cette fameuse sambuque et les contre-ouvrages d'Archimède sur le mur de mer.[1] Nous présentons également en contrepoint les illustrations (n° 3, 4 et 5) de la traduction du XVIIIème siècle faite par Folard.[2]

A la fin Appius et Marcellus se replièrent dans leur camp et tinrent conseil avec les tribuns et on décida à l'unanimité d'essayer toutes les possibilités sauf la prise d'assaut de Syracuse. Pendant les huit mois qu'ils tinrent la cité assiégée, ils n'osèrent plus jamais essayer une prise d'assaut. Ils estimaient que la famine serait le meilleur moyen de réduire les assiégés vu leur nombre. Leur flotte bloquerait le ravitaillement du port et l'armée celui de la ville. Comme ils ne voulaient pas néanmoins rester à ne rien faire, Marcellus prit un tiers des troupes pour attaquer les partisans de Carthage à travers la Sicile . Cela n'empêcha pas une armée carthaginoise de libérer Agrigente en 212. Toute la Sicile grecque tombait entre les mains de Carthage. Lors de la campagne suivante, Marcellus s'empara des abords extérieurs de Syracuse. Bomilcar intervint avec 160 navires sans rien faire ; en 211, il revient avec un convoi de 700 navires de charge protégé par 130 navires de guerre mais il refusa à nouveau la bataille ; il se contenta de bloquer la forteresse de Tarente. Cette ville était occupée par Hannibal mais sa forteresse continuait à être tenue par les Romains et bloquait l'accès du port. Du coup, la même année Syracuse tomba mais Tarente tint jusqu'en 209 . Il est évident que l'important était Syracuse et que l'incurie de Bomilcar avait fait échouer cet enjeu capital.

A Syracuse, comme dans l'affaire des Macédoniens, l'absence de « sea power » des Carthaginois fut déterminante. Hannibal, qui se montrera bon marin à la bataille navale de Sidé en 190 av JC, ne pouvait pas être partout – en outre ses deux frères combattaient en Espagne – et le souvenir des desastres navals de la lère guerre punique avait tétanisé les Carthaginois.

Malgré le génie d'Archimède, le défaut structurel de Syracuse était ses remparts démesurés, ce qui permit la prise par surprise des Epipoles un soir d'orgie. Quand Hannibal marcha sur Rome pour faire lever le siège de Capoue, le vieilles murailles de Servius Tullius (les sept collines) étaient bourrées comme un œuf et gardées de toutes parts.

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NOTES

1 L'histoire des miroirs ardents sur les murs de Syracuse qu'aurait inventée Archimède relève du mythe. Ni Polybe, ni Tite Live, ni Plutarque n'y font allusion. On n'en trouve mention que chez Anthemius de Tralles, l'architecte de Sainte Sophie, au VIème siècle après J.-C., donc à une date très tardive. L'autorité de ce personnage exceptionnel est peut être la clef de la permanence de cette légende.

2 Folard était le maître à penser du maréchal de Saxe. C'est pour lui qu'il traduisit Polybe et il le poussa, au siècle des Lumières, à organiser l'armée française sur le modèle de la légion. Paradoxalement cela nous réussit parfaitement à Fontenoy, notre plus grande victoire contre les Anglais.

SOURCES

Polybe, Histoires, Livre VIII, 3 à 7
Plutarque, Vie de Marcellus, XIV-XVII
Tite Live, Histoire romaine, Livre XXV, XXIII-XXVIII

ILLUSTRATIONS

1 Portée des catapultes géantes de la grande Batterie de Syracuse construites par Archimède
2 Essai de reconstitution d'une « sambuqye » (dessin de l'auteur)
3, 4 Gravures illustrant l'édition de la traduction de Polybe par Folard
4bis Reconstitution plus exacte d'un vaisseau du siège

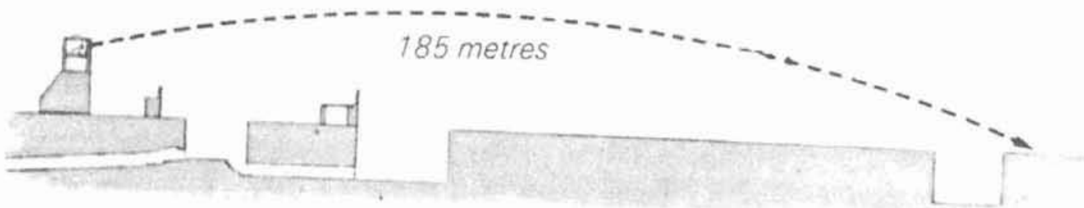

Fig. 1

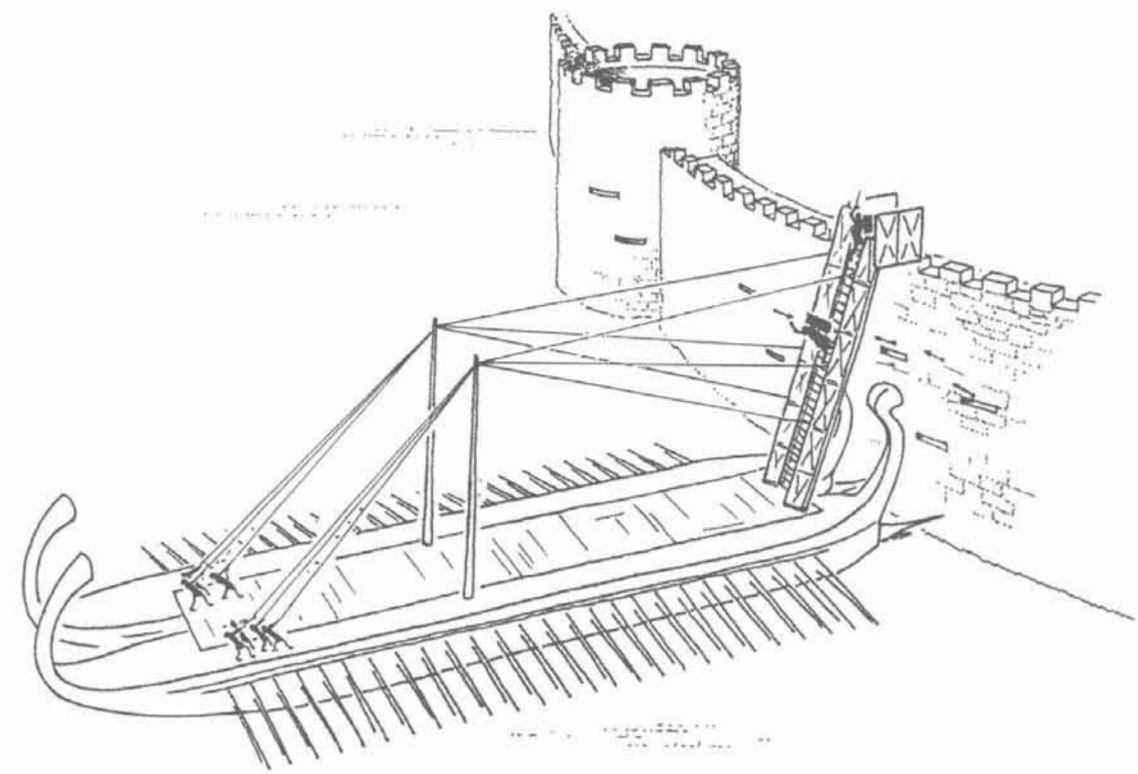

Fig. 2

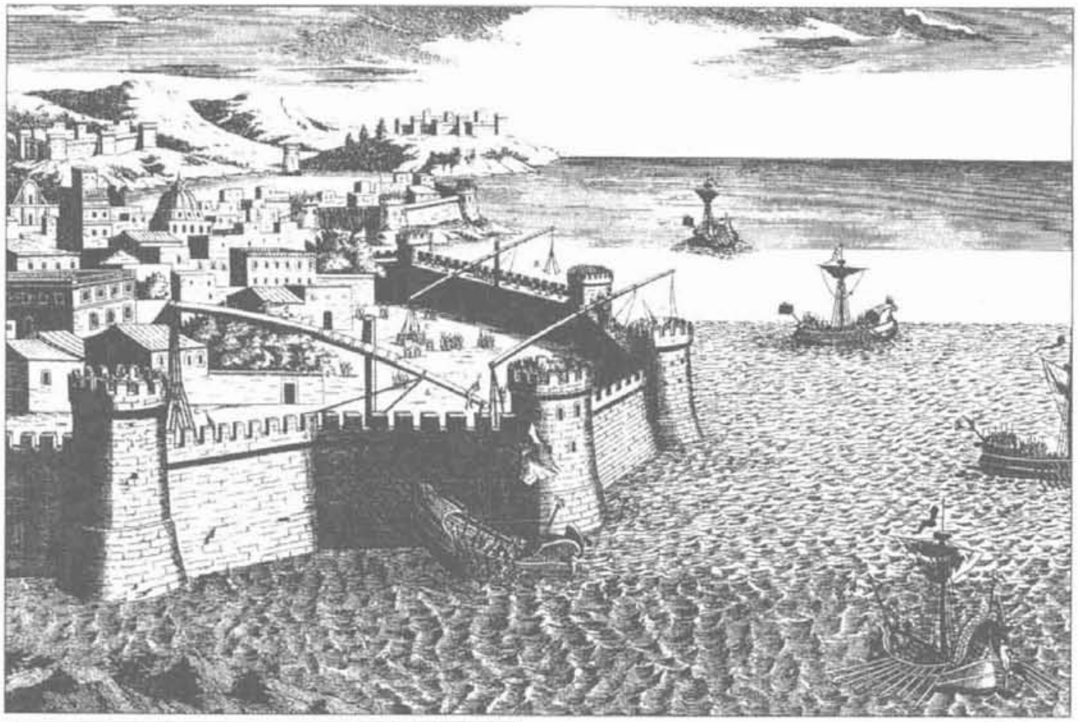

Fig. 3

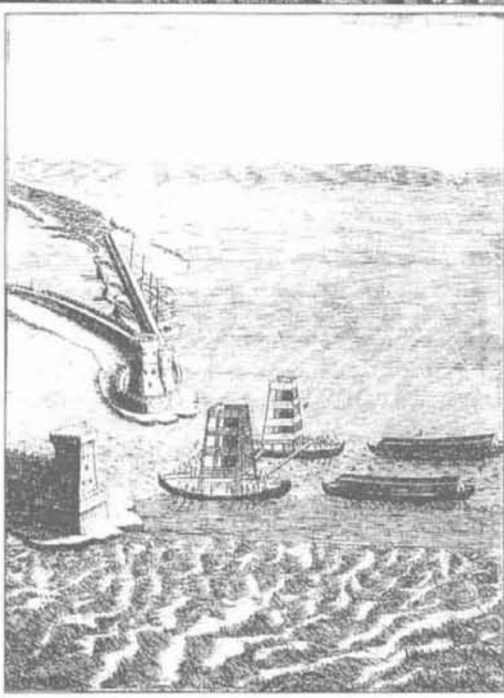

Fig. 4

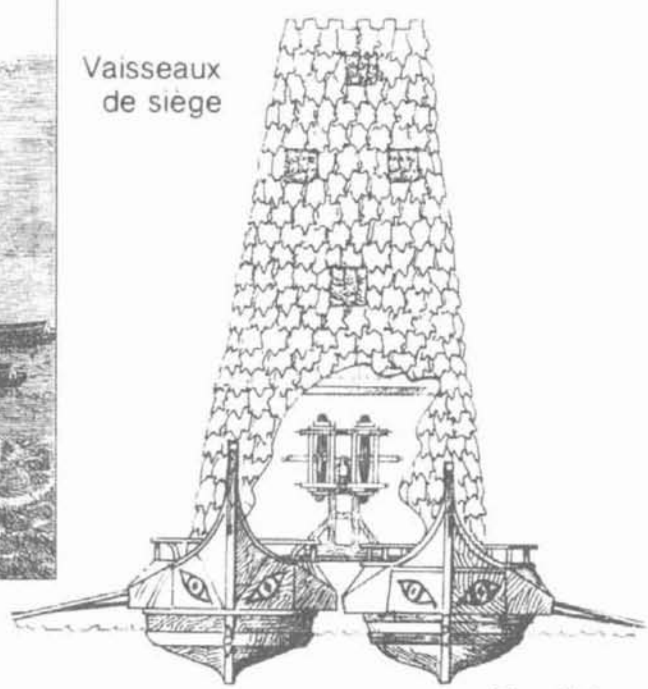

Fig. 4bis

CAMALTI BURNU I WRECK 98/99 FIELD SEASONS

Introduction

Widespread underwater archaeological remains in the eastern Mediterranean have been investigated for more than 40 years now by the Institute of Nautical Archaeology (INA). In large part due to their studies, we have an underwater map of this region and knowledge of its maritime trade and ship construction technology from the Bronze Age to the Byzantine Period. Recently, the author of this paper, who has visited every museum along the Turkish coasts from Trabzon to Antakya while writing her thesis on the Byzantine amphoras of 11th to 13th centuries[1], has realized the importance of the Marmara region and the Marmara Sea (Propontis), as a passageway between the countries of the Mediterranean and the Black Sea, and has begun an archaeological investigation of its maritime commerce. Discovering first the production place of one of the most circulated types of Byzantine amphoras at Ganos, an important monastic center in medieval times on the northwest shores of the Sea of Marmara[2], she then continued her research underwater with the aim of finding the wrecks of ships that had departed northward and soutward from Ganos[3].

The *Camaltí Burnu I* Wreck, dated to the 13th century, was one of 16 archaeological sites discovered around the Marmara Islands (**Fig. 1**). It has been chosen to be excavated for several archaeological and historical reasons. As inheritors of the Roman world, the Byzantines had the privilege of ruling over immense areas of the sea. Written sources convey plenty of information about the usage of these waters as naval or commercial routes. Compared with the written documentation, the present archaeological evidence is not as abundant. So far the only archaeological material related to Byzantine maritime activities that have been investigated and studied consists of three wrecks excavated by INA around the Anatolian coasts, namely, the *Yassíada I* (7th century), *Selimiye* (9th century) and *Serçe Limaní* (11th century) wrecks[4].

Camaltí Burnu I Wreck

The aim of this paper is to provide a brief report on the excavation seasons so far carried out on the Camaltí Burnu I Wreck, preliminary comments on the findings, and an historical context for the wreck.

The wreck is located on the northwest coast of Marmara Island in a bay approaching Cape Camaltí, just over 30 m. south of the rocky shore. The ship's cargo, spreading over an area of 44/45 meters to 17/18 meters, has settled in three pockets at depths between 20 and 32 meters on the sloping, sandy bottom. The main cargo consists of Günsenin type IV amphoras, which were among the last ceramic transport jars used in Byzantine sea trade before they were replaced by wooden barrels[5]. At about a depth of 20m. are the small-sized Type IV amphoras, while at a depth of about 25 m. there is a group of medium-sized amphoras. Further down, at about 32 m., are large amphoras, of which the location seems to be where the hull itself had come to rest. During two short field seasons of 11 September-3 October, 1998 and 22 July-19 September, 1999, our small team of volunteers established ourselves at a building at the harbor which was given to us by the Mayor of the island[6]. This building, a two-storey structure with an area of 310 square meters on either floor, was transformed into a base with diving, restoration and conservation facilities.

In two years, 510 dives (not counting visitor dives) have been made. Each dive spends 28 minutes on the site in the morning and 18 minutes in the afternoon, with 7 minutes of decompression at 3 meters.

During the first two seasons, we concentrated mostly on the deepest (largest) deposit of amphoras. A grid system was established by dividing this area into 2-meter squares, and 19 datum points were put around the site to measure the location and map objects on the wreck. In keeping with an INA tradition, the amphoras were tagged with labels reading AAA, AAB, AAC, etc. Eight location measurements have been taken for each of the amphoras: a measurement to the mouth and bottom from each of four datum points whose directional locations from the amphora differed as much as possible[7].

Ceramic findings:

Type IV amphoras constitute the main cargo of the ship. Among 64 amphoras raised, 16 of them intact, we have a wide range of the sizes (47 to 80 cm. high) and capacities, filled with water up to the base of the neck (17 to 115 lts.). The different capacities of the amphoras, (**Fig. 2**), may be multiples of some standard unit of capacity, as are the capacities of the Byzantine amphoras from Serçe Limaní, but more accurate capacity measurements must first be made before any reliable conclusions about this are possible.

Günsenin Type III amphoras have also been found (**Fig. 3**), and a number of flat bottomed-jars (**Fig. 4**), which we think also belong to the cargo but possibly carry some commodity other than the main cargo. An organic analysis of the contents of the ceramic containers, especially the amphoras, that I hope will be ready for the next *Tropis* conference, will tell us more about the nature of this trade[8]. During a brief sondage that was carried out in two squares in 1999, we started to find various ceramic wares besides those of the cargo (**Fig. 5a, Fig. 5b**)[9].

During a preliminary examination of the contents of amphoras, some fragments of broken pottery, likely stoppers, were also found. One of them that I would particularly like to mention was found inside a flat-bottom jar (a sub-type of type IV). This flat-bottomed type amphora would not have been a part of the cargo, but for the use of the crew. Seeds from this jar, grape seeds, are different from the seeds found inside the cargo amphoras. The other interesting fact is that the pottery fragment also found inside the amphora was a body fragment of a Ganos-type amphora (**Fig. 6**). These findings raise the question whether our ship made a stopover at Ganos to take some wine (although we don't have evidence of Type IV amphora production at Ganos, wine was obviously being produced at the monasteries), or had called at some port to which the Ganos amphora had been exported.

Anchors:

On this wreck have also been found, to date, four broken anchors (two visible '**Y**' shaped). About 17 m. away from the cargo amphoras and these anchors, thirty anchors, a mixture of types '**Y**' (15) and '**T**' (11) were found[10]. Prof. F. Van Doorninck Jr., who has taken a good and thougthful look at drawings of the anchors done *in situ*, has come to the following conclusions[11] :

"Since all the anchors seem to have the same type of teeth set at the same angle to the arm, it is not all likely that they have to do with an anchorage, since in that case one would expect to find at least a few anchors of an earlier or later design. It would seem, then, that they belong together and probably either to this ship or to some other vessel. The largest anchor (**Fig. 7**)[12] appears to be of the same size as most anchors on the Glass Wreck (*Serçe Limanı*). All the others (in the drawings) are definitely smaller, although we don't yet know exactly the size of the anchors lying right on the site. However, it seem pretty certain that if the ship used any of these anchors, then it probably wasn't any larger than some 30 tons capacity, and no ship of such a small size would have used anywhere near the number of anchors found. A ship of 400 to 500 tons capacity might have used around 30 anchors (including spares and heavier sheet anchors to be used in storms), but they would have been much, much larger as well. No ship would normally use such a range of sizes as are represented by the drawn anchors. The smallest-size anchor (**Fig.8**)[13] would not have worked well, if at all, since the shank is not long enough to permit the stock to be able to easily come to rest flat on the seabed thereby forcing one of the teeth into the seabed (this is known as canting). I suspect that this anchor's shank had been broken and hastily repaired with a piece of the shank missing. (There was an anchor on the Glass Wreck to which this had happened). A number of other anchors are broken. It will be interesting to see whether or not they were already broken before the shipwreck. If they were, we would have the solution to our puzzle: the ship (or some other vessel) was carrying as one of its cargoes broken anchors in a range of sizes, to be repaired or used as scrap iron"[14]. In a study of the Glass Wreck anchors in the forthcoming first volume of the final excavation report, Prof. Van Doorninck mentions Camaltí Burnu I wreck anchors and says that "It is intersting to note that some of the anchors apparently associated with this wreck are cruciform anchors that differ in design from cruciform anchors of earlier times in that their teeth are of the same general configuration and are set at the same angle relative to the shank as are those of the "**Y**" shaped anchors on the site"[15]. The new anchor findings at Camaltí Burnu I wreck, then, appears to raise the *terminus ante quem* of one type of cruciform anchor to 13th century. During the 2000 campaign we aim to recover several of the anchors, as well as excavate many of the amphoras and enlarge the sondage[16].

Historical context

We are in a period in which the thousand-year Byzantine empire, which may not have thought its end was coming, was hard pressed around Constantinople by the Slavs from the north, the Italian colonies from the west, and the Turks, who had already captured most of Anatolia, from the east. The Byzantines had already been fated to share the Mediterranean since the 7th century with the Arabs, although there was a period of resurgence and prosperity from the 9th to the 11th century. From the 12th century, however, the effective presence of Italian merchants once more diminished Byzantine maritime activity and naval power in their own waters. Thanks to the commercial privileges given by the Byzantine emperors, Italian merchants, especially the Genoese in Pera, established a sort of monopoly over shipping, including in the Black Sea through Caffa and other Black Sea ports. They were even renting their ships to Byzantines who wished to continue their own maritime commerce.

The enormous decline in the seaports occupied by Byzantines in the13th century compared with those of the 11th century shows clearly this historical trend. We hope that the Camaltí Burnu I Wreck will make a modest but important archaeological contribution to our knowledge of this period of profound change in Byzantine maritime history.

The route of the Camaltí Burnu I wreck is not clear, mainly because the production centre of Günsenin Type IV amphoras has not yet been located. Following the model of Ganos, perhaps we should look at some of the other monastic estates around the Sea of Marmara, especially those with good clay deposits on the shoreline.

The project was planned for seven years, concerning, first five years the field work, last two years, conservation and the display of the objects in the *Local Fishery Museum* at Marmara island which is in the process of being established[17].

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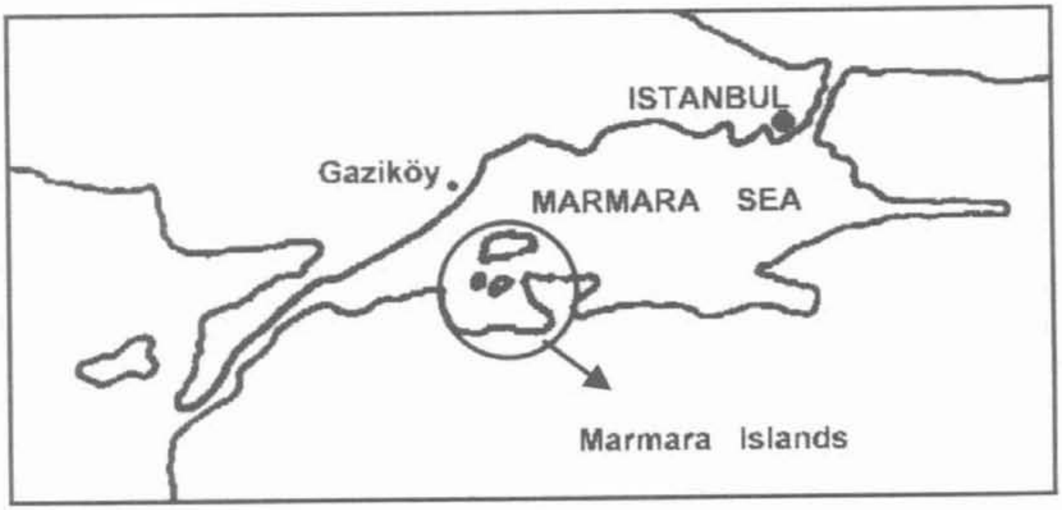
NOTES

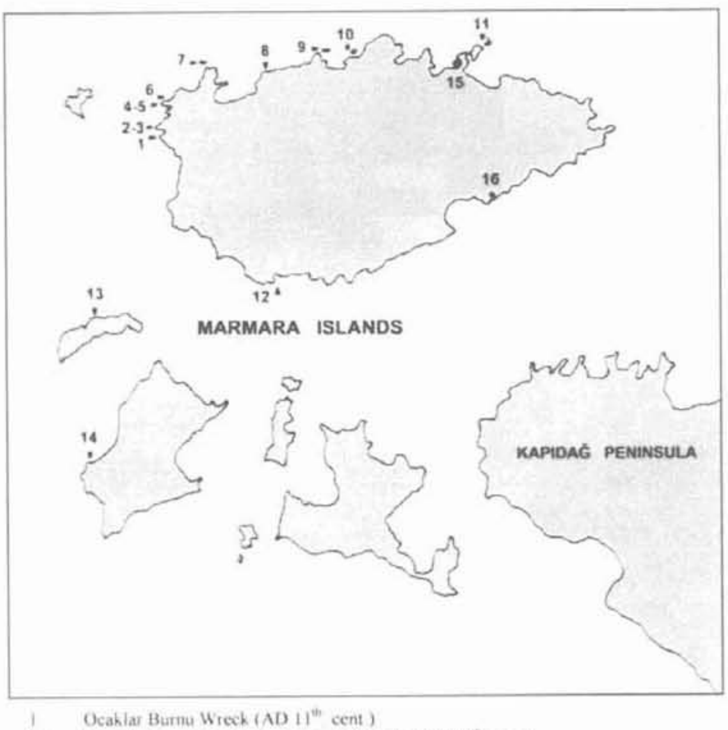
1. *Les amphores byzantines (Xe-XIIIe siècles): typologie, production, circulation d'après les collections turques*, Université Paris I (Panthéon-Sorbonne), Paris (1990), Atelier national de reproduction des thèses de Lille III.
2. About Ganos see N. Günsenin, «Ganos: Centre de Production d'Amphores à l'Epoque Byzantine» *Anatolia Antiqua II*, Paris (1993), p. 193-201; «Ganos : résultats des campagnes de 1992 et 1993», *Anatolia Antiqua III* Paris (1995), p. 165-178; P. Armstrong-N. Günsenin, «Glazed pottery production at Ganos», *Anatolia Antiqua III*, Paris (1995) p. 179-201; N.Günsenin-H. Hatcher, «Analyses Chimiques Comparatives des Amphores de Ganos, de l'île de Marmara et de l'Epave de Serçe Limaní (*Glass Wreck*)», *Anatolia Antiqua V*, Paris, (1997), p. 249-260; N. Günsenin, «Le vin de *Ganos* : les amphores *et la mer*», *Eupsychia*, Mélanges Offerts à Hélène Ahrweiler, *Byzantina Sorbonensia*, Paris, (1998), p. 281-288; «Les ateliers amphoriques de Ganos à l'époque byzantine», *Production et Commerce des Amphores Anciennes en Mer Noire*, l'Université de Provence, (1999), p. 125-128.
3. About Marmara Sea underwater research, see N. Günsenin, «Récentes découvertes sur l'ile de Marmara (Proconnèse) à l'époque byzantine : épaves et lieux de chargement», *Archaeonautica*, 14/1998, Paris, (1999), p. 309-316; «From Ganos to Serçe Limaní: Social and economic activities in the Propontis during Medieval Times, illuminated by recent archaeological and historical discoveries», *The INA Quarterly*, 26.3 (1999):18-23.
4. For the latest interpretation of the 7th-century Yassíada ship and bibliography, see F.H. van Doorninck, Jr., "Yassíada Wrecks", in *Encyclopedia of Underwater and Maritime Archaeology*, ed. J.P. Delgado, London, (1997), pp.469-471. For the Selimiye (Bozburun) Wreck, see *The INA Quarterly* 22.1 (1996): 12-14; 22.3 (1996): 16-20; 22.1 (1996): 3-8; 25.2

(1998): 12-17; and 25.4 (1998): 3-13. For most recent information and bibliography on the Serçe Limaní Wreck, see F.H. van Doorninck, Jr., "The 11th-century Byzantine Ship at Serçe Limaní: An Interim Overview", in *Sailing Ships of the Mediterranean Sea and the Arabian Gulf*, vol. 1, ed. C.G. Makrypoulias, Athens, (1998), pp.67-77.

5. For the typology of the amphoras, see «Recherches sur les Amphores Byzantines dans les Musées Turcs», V. DEROCHE et J.-M. SPIESER éd. *Recherches sur la Céramiques Byzantine* Suppl. *BCH* XVIII (1989), p. 267-276 and Günsenin, 1990.
6. We owe very much to the continuous support of the Marmara Municipality from the beginning of our underwater research at the region.
7. Starting from the 2000 field season, we are using the Web program developed by Nick Rule for the Mary Rose Project. This program allows us to derive extremely accurate three-dimensional positional information for artifacts on the sea-floor using relatively simple tools. It was used successfully at Bozburun excavation and,throught our friendship and mutual collaboration with INA, given to our team by George Bass to whom we owe much for the 2000 field season of Camaltí Burnu I excavation. For the Web program, cf. David A. Johnson & Micheal P. Scafuri, "Riding a New Wave: Digital Technology and Underwater Archaeology", *The INA Quarterly*, 22.3 (1995): p.16-20.
8. I thank Dr. Cheryl Ward on the behalf of INA who is working on this matter.
9. Pieces of wood were also found which, although not *in situ*, should belong to the ship itself.
10. Four unidentified. We are sure to find more as the anchors spread over a rocky slope and most of them were covered by big shells and starfishes of the Marmara Sea. The anchors which lie about more than 100 meters parallel to the cargo amphoras, give the impression that the ship, finding itself in difficulty, tried weigh anchors before sinking to the bottom of the sea floor.
11. I thank very much Prof. Van Doorninck for bringing his valuable knowledge on this matter.
12. Done *in situ* , till now.
13 Ibid.
14. Whatever our conclusions may be, the replication and study of these anchors will be very interesting and important. It is though an on-going mutual project with our team and Prof. F. van Doorninck Jr., on the behalf of INA, by which we hope to obtain useful results for anchor chronology and metallurgy.
15. For further details see, George F. Bass, Sheila Matthews, J. Richard Steffy & Frederick H. Van Doorninck Jr. ed al., *Serçe Limaní: An Eleventh-Century Shipwreck*, Volume I, "The Ship and its Anchorage, Crew and Passengers", Texas A&M University Press, in press.
16. A more detailed article will appear including also the 2000 field season in *Anatolía Antiqua* IX (2001). For the latest information on the continuing excavation see: www.nautarch.org.
17. The idea of this museum is to keep the archaeological findings in their original place and encourage the habitants of the island(s) to bring also their ethnological material that shows the maritime history and tradition of the region.

FIGURES





1 Ocaklar Burnu Wreck (AD 11th cent.)
2-3 Çamaltı Burnu I- Çamaltı Burnu II Wrecks (AD 13th cent.)
4-5 Tekmezar I-Tekmezar II Wrecks (AD 11th cent.)
6 Kocavemişlik Wreck (AD 11th cent.)
7 Anataş adacık (Palapetra) Wreck (AD 11th cent.)
8 Kuyu Burnu Tile Wreck (AD 7th cent.)
9 Kuçuk ada Water Pipe Wreck (AD 7th cent.)
10 Taşada (Virankoy) Wreck (AD 11th cent.)
11 Eşek adaları Wreck (AD 11th cent.)
12 Çıhlı Burnu Wreck (AD 7th cent.)
13 Ekinlik Adası Marble Wreck (AD 6th cent.)
14 Turkeli (Avşa) Adası Mound (BC 3200 – 1100)
15-16 Kiln Areas

Fig. 1

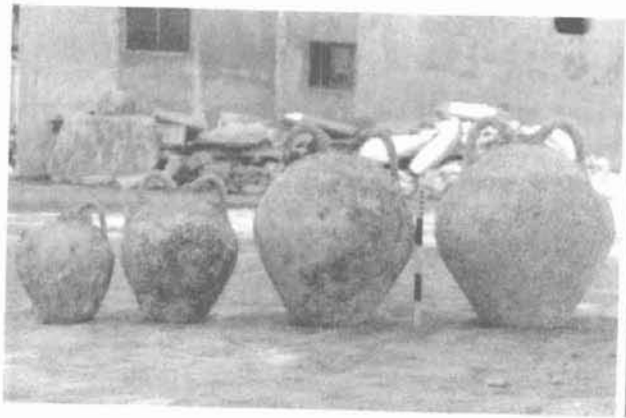


Fig. 2

Fig. 3

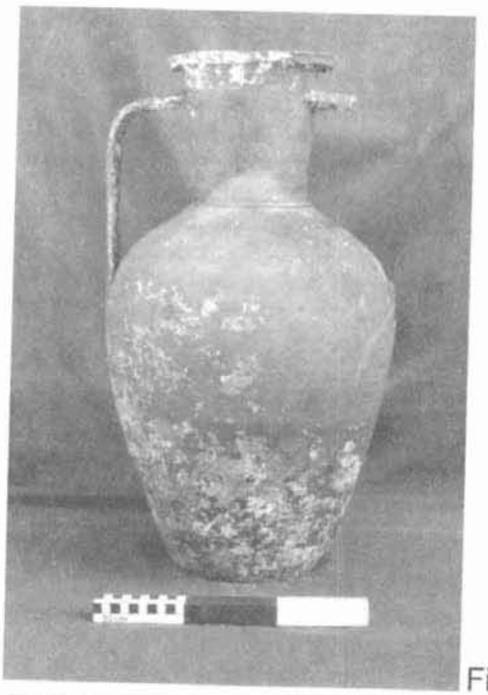


Fig. 4

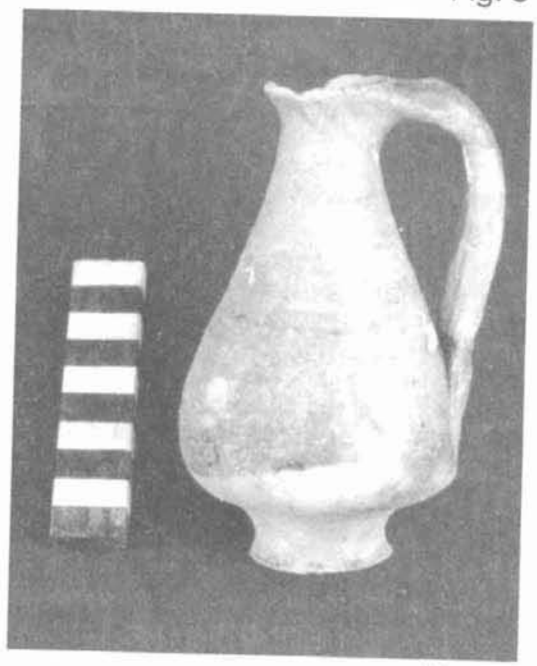


Fig. 5a

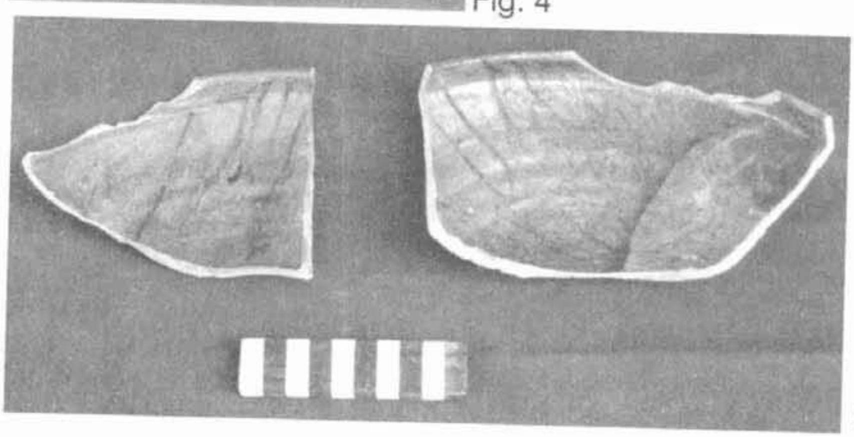


Fig. 5b

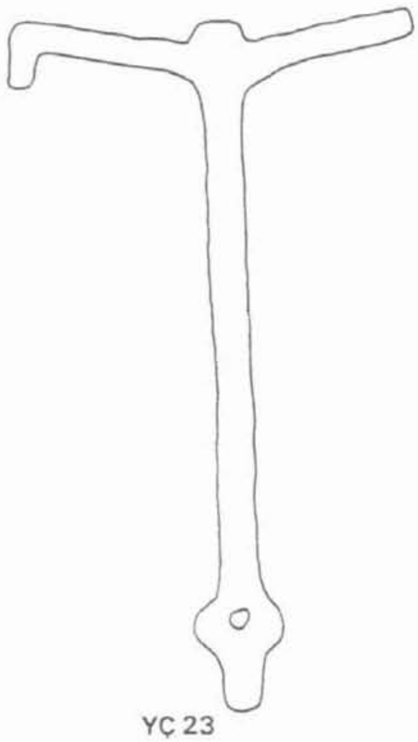


Fig. 7

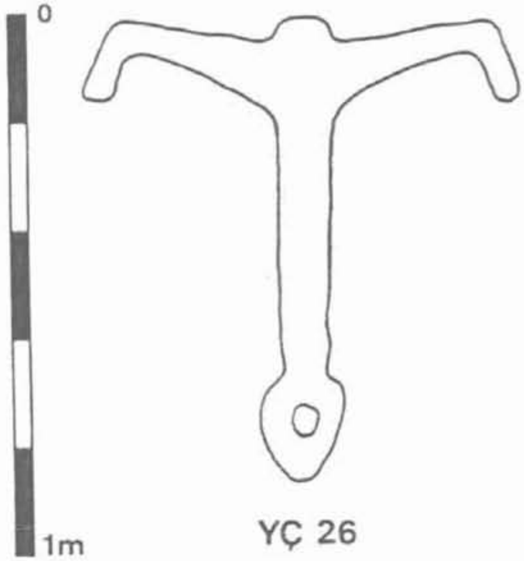


Fig. 8

Fig. 6

A PRELIMINARY REPORT ON THE 9TH-CENTURY AD HULL FOUND NEAR BOZBURUN, TURKEY

The 9th-century AD Byzantine shipwreck off the southwest coast of Turkey was shown to George Bass during the first Institute of Nautical Archaeology (INA) survey in 1973 by a sponge diver named Mehmet A'kin, from the nearby town of Bozburun (Figure 1). The gradually sloping site consisted of a low-lying amphora mound, approximately 20 m long and 8 m wide, at a depth of 26 to 36 m. The site was monitored in 1982, 1990, and finally in 1994 in preparation for the excavation that began in 1995. Although the majority of the four seasons spent on site, from 1995 to 1998, consisted primarily of the survey and recovery of approximately 900 amphorae, the first substantial hull remains were uncovered in 1996.

The remains uncovered in 1996 consisted of portions of three starboard planks, one port plank, a section of the keel, three floor timbers, a portion of the inboard stringer, ceiling, and possibly a small part of the keelson. More hull material was uncovered in the 1997 season, and the complete excavation and recovery of the hull was accomplished in 1998. All of the recovered material, which makes up approximately 30 to 40 percent of the starboard side of the hull, is currently desalinating in temporary storage tanks at the INA headquarters in Bodrum, Turkey (Figure 2). There is enough preserved material in storage to provide information concerning the design and construction of the keel, floor timbers, futtocks, planking, ceiling, two starboard stringers, and perhaps a keelson. At this time, however, only the keel, ten floor timbers, and three starboard strakes have been studied in detail; the conclusions drawn in this analysis are, therefore, based primarily on that material.

The analysis of the hull remains is currently in its initial stages. However, even prior to the hull's recovery it was evident that a detailed study of its remains would add valuable information to an understanding of shipbuilding techniques and concepts during the early Medieval period. In the four hundred years from the early 7th century AD to the early 11th century AD, distinct changes in hull construction in the eastern Mediterranean occurred. Unfortunately, there are only two completely excavated and well-documented shipwrecks that can be examined to document those changes. The first shipwreck was excavated near the island of Yassiada in western Turkey, and is dated to *ca*. AD 625[1], while the second shipwreck in southern Turkey, from Serçe Limani, dates to *ca*. AD 1025.[2] The hull from Yassiada exhibits one of the last phases of the mortise-and-tenon shipbuilding technique that was common throughout the Mediterranean for at least the previous two millennia.[3] The earlier forms of this technique employed the use of mortise-and-tenon joints in the hull planking to provide a great deal of integral strength to the planking itself, negating the need for strong framing. In later adaptations of this technique, notably on the early 4th-century AD shipwreck also recovered near Yassiada[4], the mortise-and-tenon joints in the planking played a diminished role in the overall strength of the hull.[5] By the early 7th century AD, as seen in the Yassiada wreck from *ca*. AD 625, the mortises and tenons were playing a negligible role in the strength of the hull, and were instead being used to align the planking of the ship as it was assembled prior to the completion of the framing.[6] A similar method of construction and use of mortise-and-tenon joints is also documented by the early 7th-century AD shipwreck from Fos-sur-Mer, off the south coast of France.[7] In contrast, three 10th-century AD shipwrecks off the coast of France, Agay[8], Bataguier[9] and Plane C[10], and the 11th-century AD shipwreck off the south coast of Turkey, Serçe Limani, exhibit no mortise-and-tenons joints in their construction. Additionally, in the Serçe Limani shipwreck, a method of determining the design of the ship employing the use of a linear measurement was in place.[11]

The hull material from the 9th-century AD shipwreck at Bozburun is valuable as it begins to fill a four hundred year gap in the knowledge of shipbuilding construction in the early Medieval period. Presumably, the use of mortises and tenons in the hull planking disappeared at some point in those four hundred years, and conversely, the preconceived system of assembly evident on the ship at Serçe Limani appeared. The hull material from Bozburun, as it begins to fill the technological continuum from Yassiada to Serçe Limani, may begin to answer how these changes occurred.

The keel of the Bozburun ship, made of oak, is a flanged beam keel roughly T-shaped in section[12], measuring approximately 15 cm sided on the interior face, 18 cm sided on the exterior, and 29 cm in molded depth along most of its length (Figure 3). The preserved remains of the keel are extensive. A 2.28 m long preserved portion of the stem was affixed with a keyed hook scarf to a straight keel, of which 7.2 m of an originally 7.4 m long piece was recovered. A 2.5 cm diameter bolt passed through this hook scarf, securing it in place. The remains of the after flat scarf attaching the keel to the sternpost, also secured with a 2.5 cm diameter bolt, are still evident. A nearly 3.5 m portion of the sternpost has been preserved. In addition to the two bolts passing through the forward and after scarfs, another bolt, also 2.5 cm in diameter, passes through the keel, approximately 50 cm forward of the bolt in the after scarf. No other bolts are noted in the keel, stem, or sternpost. The curves of the stem and sternpost are preserved, and, as approximately 12.25 m of the keel, stem, and sternpost assembly has been recovered, it may be estimated that the ship was 15 to 16 m in length (Figure 4).

There is no rabbet in the true sense of the term, but instead a flange along either upper edge of the keel. The garboard abuts the undersurface of this flange, and nails and treenails affix the strake to the keel. Measurements indicate that the flange was originally only 1.5 to 2.0 cm deep, and the angle between the garboard and the vertical axis of the keel appears to vary between 70 and 80 degrees (Figure 3). At no point does the garboard appear to be perpendicular to the keel.

Of the preserved remains of 32 to 33 floor timbers, floor timber 1, the midships floor timber, and floor timbers A through E were made of oak (*Quercus* sp.), while the remaining floor timbers were made of pine (*Pinus brutia*) (Figure 5). Twelve futtocks of both oak and pine were also recovered, although in some cases an oak floor timber is not paired with an oak futtock. For example, oak floor timber A appears to be associated with a pine futtock. Of the seven oak floor timbers, the three catalogued (floor timber 1, the midships floor timber, and floor timber A) averaged 14 to 15 cm molded, and were approximately 12 cm sided. The pine floor timbers varied more in dimension, primarily due to their frequent use throughout the ship. Floor timbers 9 and L, for example, were 18 cm molded and 14 to 16 cm sided, while floor timber M was 22 cm molded and 17 cm sided.

From figure 5, it appears that all of the futtocks at the midships frame and forward are arranged forward of their associated floor timber, and aft of midships, aft of their associated floor timber. However, it should be pointed out that of the approximate 32 floor timbers excavated, less than half of those had a preserved futtock. In addition, among the futtocks preserved, no fastenings or joinery occurs that would associate them to a specific floor timber. Thus, while it may be tempting to foresee a possible precursor to the framing pattern evident on later Medieval vessels, the evidence to support such a conclusion, at this point in the research, is sparse.

In general, there does not appear to be a uniform pattern in the spacing of the floor timbers along the length of the keel. In some cases, the floor timbers are approximately 30 cm apart, in other places more than 40cm apart, regardless of the floor's material or location along the keel. All of the floor timbers appear to have been affixed to the keel with only one iron nail.

Current evidence indicates that the nail shank tapers from approximately 1cm square, to 4 to 7 mm square where it penetrates the keel.

All of the surviving hull planking is oak. The strakes catalogued thus far average 2.5 to 4.0 cm in thickness regardless of their location in the hull. The garboard, with a length of 8.6 m, is the longest single plank catalogued so far. Generally, the planking appears to have been affixed to the framing both with treenails that averaged 1.3 cm in diameter, and nails that were 4 to 7 mm square. In fact, those two methods of fastening are the primary methods found throughout the hull, although a consistent pattern of their arrangement has yet to be determined. No mortise-and-tenon joints have been found in the hull planking.

The hull material from Bozburun, as it sits chronologically halfway between the Yassiada and Serçe Limani shipwrecks, does not exhibit any characteristics that diverge from the patterns established by the earlier and later wrecks. Its general design and size is comparable to both hulls, and it does not appear to employ anachronistic features in its construction. Nonetheless, during the study of this material, certain features appeared that were unexpected, and will certainly begin new lines of inquiry.

The material choice in the construction of the hull was initially the most obvious feature. The Bozburun hull was built with an oak keel, seven oak floor timbers, approximately 25 pine floor timbers, and oak planking. This widespread use of oak throughout the hull is not unique, the 4th-century AD ship Fiumincino F was reportedly built entirely of oak, as was the Contarina vessel from AD 1300.[13] What makes the Bozburun hull distinct is the contrasting use of a softwood (*Pinus brutia*) for the majority of the framing material.

Additionally, in seven locations along either edge of strake 7, oak dowels averaging 1.2 cm in diameter and 5 to 10 cm long were driven into the inner and outer edges of the strake. At present, there does not appear to be a pattern to their placement. Examining the inboard edge of strake 7 from the bow, a single dowel is located between floor timbers J and K, G and H, 3 and 4, and under floor timber 5. Along the outboard edge of strake 7, one dowel is located between floor timbers I and J, and a pair are under floor timber A (Figure 6). This is a feature reminiscent of that seen on the material from Bon Porté, where the dowels, similar to those of Bozburun, are driven into the plank perpendicular to the edge.[14] However, the Bozburun planking does not exhibit any evidence of a similar system of lacing along the plank seam.

While strake 7 does contain these seven dowels along its edges, an examination of the outboard edge of strake 6 and an initial examination of the inboard edge of strake 8, does not reveal any corresponding dowels or dowel holes. As there are no corresponding dowel holes in strakes 6 or 8, strake 7 appears to be reused. However, it may still date from the 9th century AD, and hint at the use of edge joining methods in the Mediterranean as late as that period. Two dendrochronological samples have been taken from this strake, as well as numerous others from the rest of the planking. That data should reveal the age of strake 7 as well as determine if it may be contemporaneous with the planking around it.

Finally, there may be the use of various proportions of a set linear measurement in the construction of the Bozburun ship, a system similar to that used on the Serçe Limani vessel. The set linear distance used on the Serçe Limani hull was a length of 32 cm, a close approximation of the Byzantine foot, which was multiplied or divided to determine various dimensions of the hull. In the Bozburun hull, it appears that instead of a standard length of 32 cm, a length of 34.5 cm was employed. For example, the overall length of the straight portion of the keel is 7.41 m, which divided by 34.5 cm results in 21.5 of these lengths (Figure 4). The length of 34.5 cm may appear to be a common denominator, but there are two other pieces of evidence that may indicate the use of a set length to achieve a preconceived hull design.

First, in a system similar to that documented on Serçe Limani, the aft face of the midships frame in the Bozburun hull was located at a point that was equidistant from either end of the straight portion of the keel (Figure 4). Second, on the bow face of the midships floor timber, there is a vertical scribe mark located where the hollow for the garboard ends. The distance between that scribe mark and the beginning of the turn of the bilge is approximately 1.03 m, a distance when divided by 34.5 cm, results in three of these set lengths. (Figure 7).

Although it seems that the 34.5 cm length is a set measurement in use for certain characteristics of the ship, more work remains before the extent of its use will be understood. For example, it is still unclear how the angle at the turn of the bilge was determined, and whether other floor timbers also exhibit a use of the 34.5 cm length. Moreover, although this ship is between the antiquated tradition of edge joining in hull planking, and the more modern method of mensuration evident on Serçe Limani, this material is not necessarily a confluence of two traditions. As the origins of this hull are presently unknown, and the factors that led to its design and construction are unclear, it may be assumed that it represents a link in the evolution of hull construction in the eastern Mediterranean. Unfortunately, until more research is accomplished, the complexity of that evolution will not be clear.

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NOTES

1 Bass and Van Doorninck 1982: 311.
2 Bass and Van Doorninck 1978: 126.
3 Pulak 1999: 213.
4 Bass and Van Doorninck 1971: 31.
5 Steffy 1994: 84.
6 Bass and Van Doorninck 1982: 56.
7 Jezegou 1985: 354.
8 Darmoul 1985: 154.
9 Parker 1992: 70.
10 Parker 1992: 314.
11 Steffy 1994: 85.
12 McKee 1983: 80.
13 For Fiumincino F, see Parker 1992: 179. For the Contarina vessel, see Steffy 1994: 93.
14 Jestin and Carrazé 1980: 70.

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ILLUSTRATIONS

Fig. 1 The location of the site along the Southwestern Turkish Coast. -by Brian Jordan

Fig. 2 The hull fragments *in situ*. -by Dr. Fred Hocker, Kendra Quinn, and Matthew Harpster

Fig. 3 The midships section at floor timber 1. Although only the keel, floor timber, garboard, and strakes 6 and 7 have been catalogued, the treenails found in the floor timber presumably pass through all of the planking. The dashed lines indicate missing or questionable material. -by Matthew Harpster

Fig. 4 The keel. The upper view is of the interior face of the keel and the interior face of the midships floor timber, to illustrate the placement of the midships frame. The lower view is of the starboard face of the keel, the fore and aft scarfs, and the three bolts passing through the keel. -by Matthew Harpster

Fig. 5 The floor timbers and the keel. Only the keel, and floor timbers 18, 16, 15, 14, 9, 1, midships, A, L, and M have been catalogued. -by Matthew Harpster

Fig. 6 Two of the seven dowels driven into the edges of strake 7. These two are located on the exterior edge under floor timber A. -by Matthew Harpster

Fig. 7 The midships floor timber, illustrating the location of the scribe mark on the bow face. -by Matthew Harpster

* The site is presently dated by amphora typologies. I would like to acknowledge the generosity of Dr. Fred Hocker, for trusting me with all this material, and Sheila Matthews, Marion Feildel, Don Frey, Robin Piercy, and Mustafa and Muneva Babacik, at INA in Bodrum for their help and patience (especially with my incompetent Turkish). Esra Altinanit-Goksu was a big help in taking care of the wood lab prior to my arrival, and she put up with my impatience and mess for two months. I would like to thank Oôuz Alpozen, the director of the Bodrum Museum of Underwater Archaeology, for allowing me to work with this material, and acknowledge Kathy Hall, the hardest working conservator this side of Lake Van. I would like to thank Mr. and Mrs. Ray H. Siegfried II, who provided the fellowship that allowed me to spend six months researching this material, and Ay'e Atauz, Nancy DeBono, Sam Lin, Meghan Ryan, and Travis Mason for their great assistance in a marathon inventory of 2500 fragments. Erika Laanela, Felipe Viera de Castro, Kroum Bachvarov, Sara Brigadier and Dr. Cemal Pulak were extremely helpful in the final editing of this paper. I would finally like to thank Harry Tzalas for his generosity, Dr. Cemal Pulak for agreeing to chair this research to a coherent conclusion, and all the staff and students of the 1998 season at Selimiye.

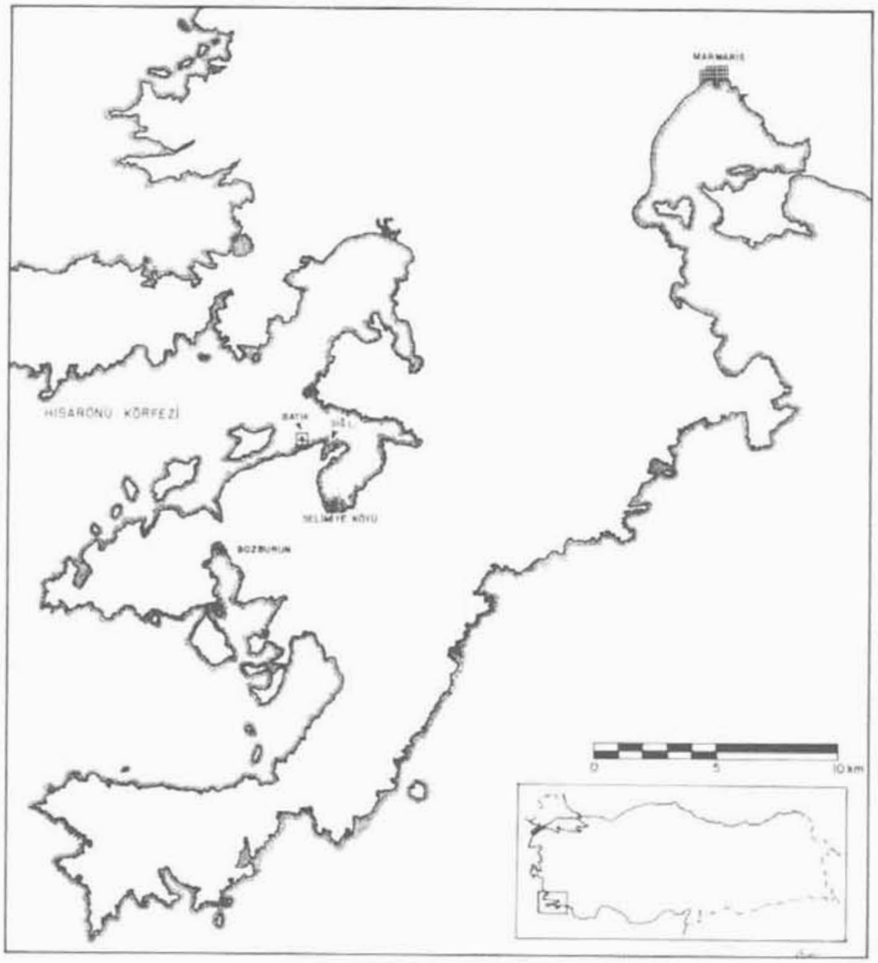

Fig. 1

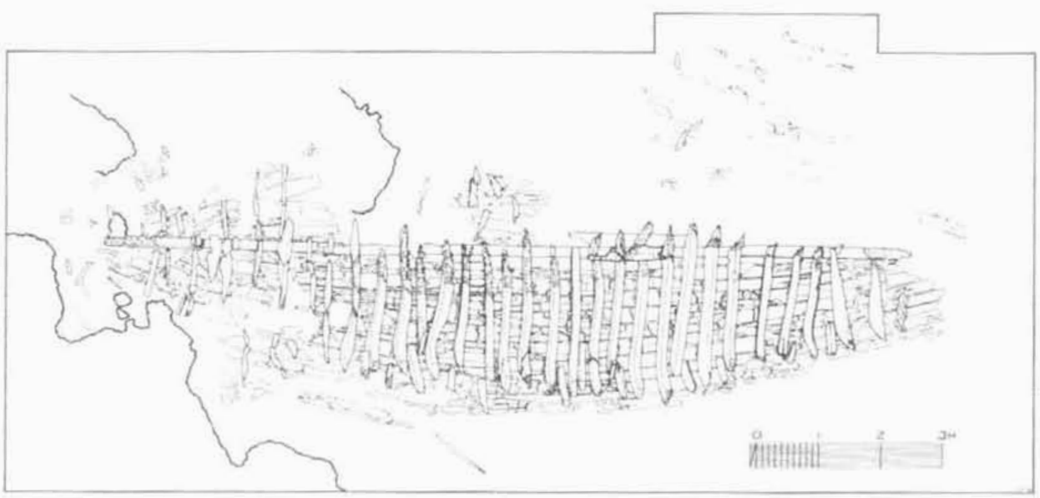

Fig. 2

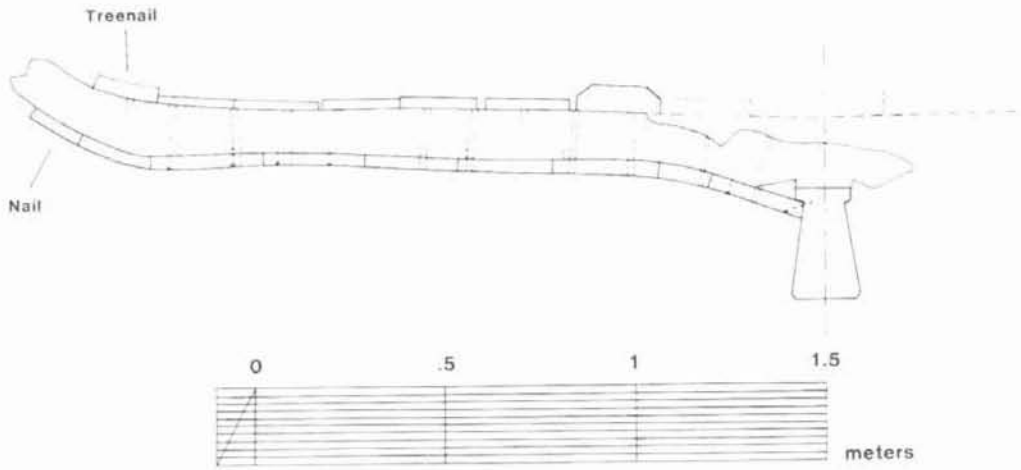

Fig. 3

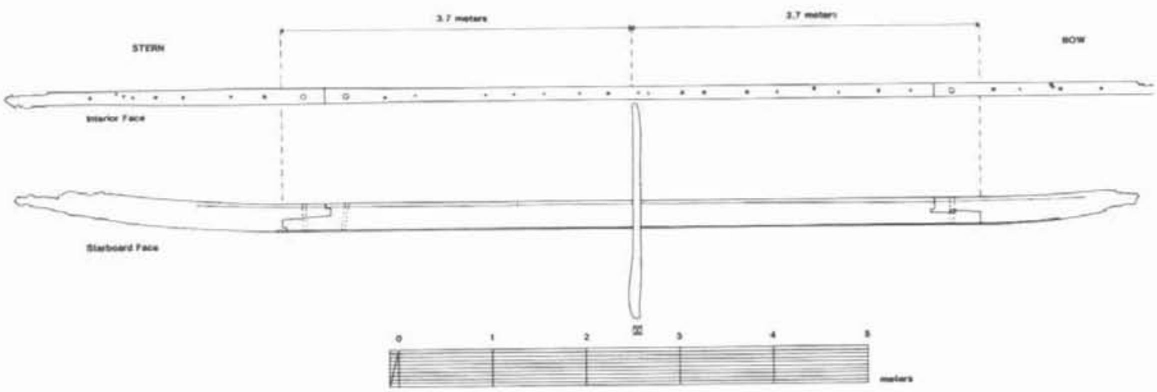

Fig. 4

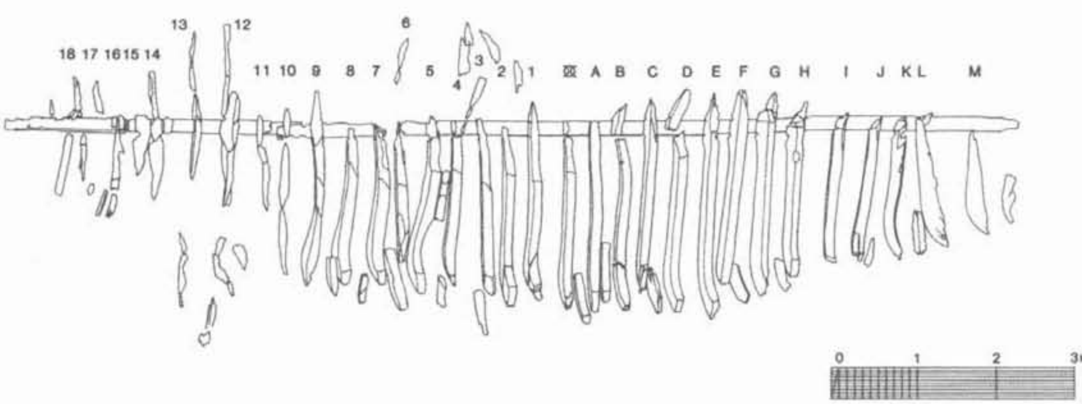

Fig. 5

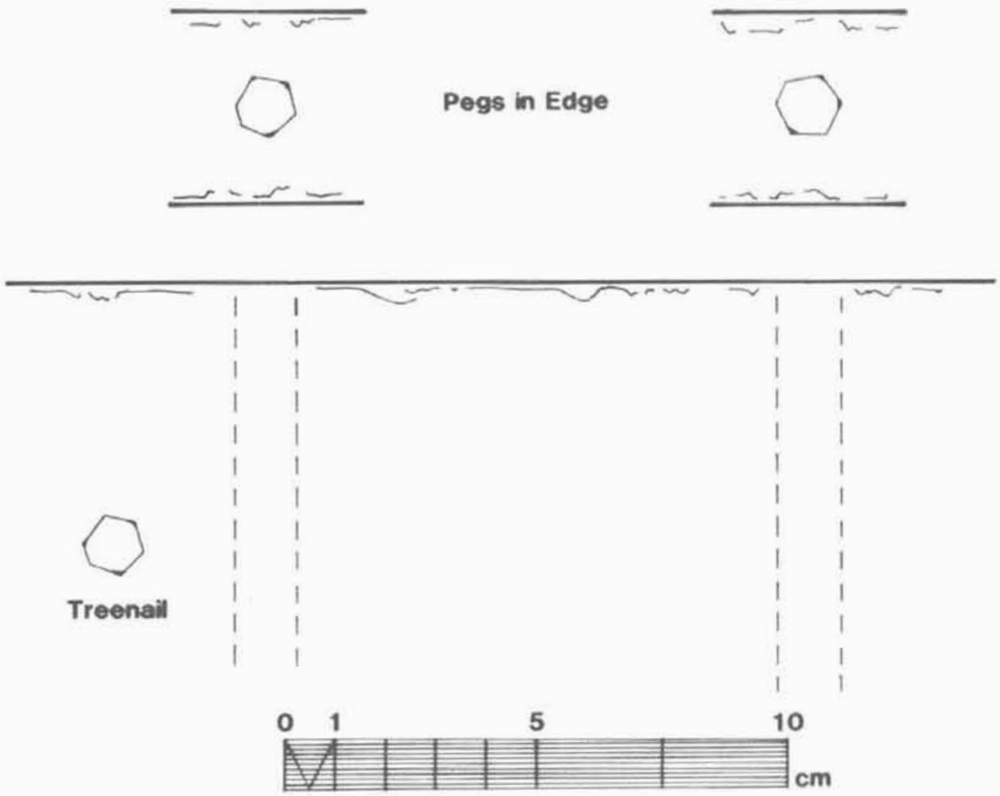

Fig. 6

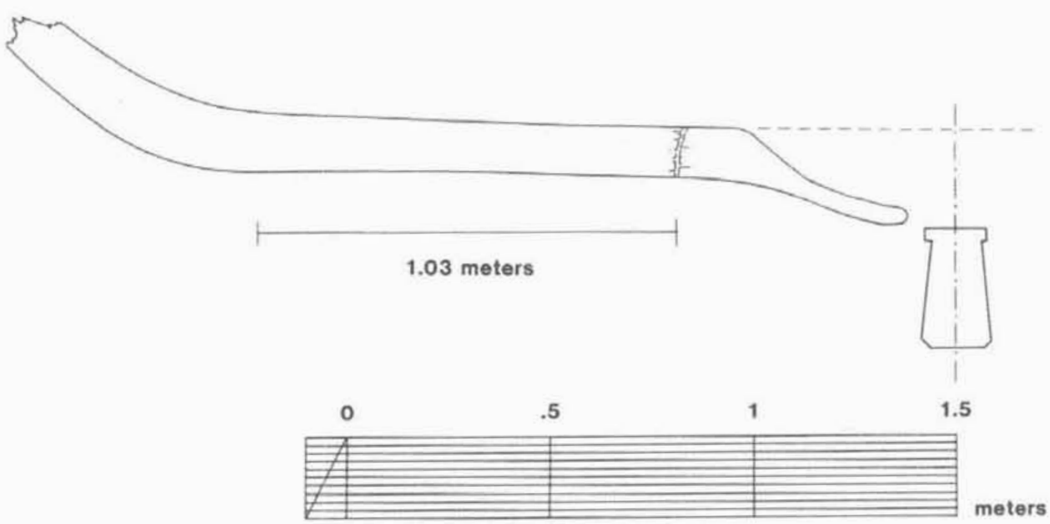

Fig. 7

STERN RAMS IN ANTIQUITY ?

It is generally accepted that ancient vessels built or temporarily commandeered for fighting at sea, as a rule were equipped with a ram, which is a rather general term. [1] In its strict sense it should, and will here be applied only for bronze weapons meant for piercing or crushing the hull of an enemy vessel, calling wooden projections at the bow and eventually the stern, "spurs". As to the construction of ancient rams, there are accounts of remarkably expensive "chalkomata" (literally, "brazens") in the Athenian naval records of the 4th century BC,[2] a contemporaneous find of a huge bronze ram with three horizontal prongs, from the sea off Athlit in Israel,[3] a few later finds of the three-pronged type or in the shape of animals' heads, the latter ones likely to have crowned upper rams (proembolia)[4], and a multitude of Greek and Roman representations showing two- or, predominantly, three-pronged, or blunt "box-like" bronze rams.[5] The former type generally ceasing in the 1st century AD.data, however, only is imbedded into a wide field of representations in several media, stretching from c. 1200 BC through to the end of Roman Antiquity, in the 5th century AD. Rams or spurs, excepting the "Liburnian ram",[6] frequently are shown as straight extensions of the keel at the bow.[7]

The pictorial evidence makes us think that the origin of the ram proper have been extensions of the keels at the bow, without specially shaped or reinforced ends, and hardly meant for attacking other ships. Such representations already are to be found in Mycenaean vase paintings,[8] and on two of the Sea Peoples' ships in the Ramses III relief from Medinet Habu in Egypt, celebrating his victory in 1186 BC (Fig. 1,2).[9] On one Sea People ship the diminutive "keel extension" is situated in the stern. This might have been inspired by massive extensions at either end of Late Bronze Age warships in the Levant, as can be deduced from an earlier terracotta model from Byblos in Lebanon (fig. 1,1).[10] Here, however, it seems uncertain if the projections emerge from the ends of a straight keel clearly indicated on the inside of the floor, or if they are peripherally fastened to a keel rounded all over. In spite of this doubtful construction, the massive extensions with vertical ends, already might have been meant for attacking other vessels, by crushing rather than piercing their sides. A Late Assyrian fresco from Til Barsip, dated to the 8th century BC, finally shows the earliest unambiguous ram.[11] This is a straight keel extension sheathed with bronze. Its end not being preserved leaves open to conjecture if its "working edge" was equipped with chisel-like prongs for piercing an enemy hull.

Most sources refer to bow rams, or predominantly, spurs. But there also are pictorial ones indicating what seem to have been similar projections at the stern. There are a few representations from the Bronze Age but they all refer to cutwaters or similar appurtenances rather than ramming devices.[12]

In the 8th century BC, short keel extensions are shown on two terracotta models of slender oared boats from Etruria (Fig. 1,4).[13] Their high stemposts crowned by what seem to be birds' heads, remotely recall the Sea Peoples' boats (Fig. 1,2). This calls to mind the old question still unresolved if the Tursha tribe among the Sea Peoples, may be the ancestors of the Tyrsenoi = the Etruscans. We are on safer ground when recollecting that Pliny (n.h. VII,56.209) calls the ram an Etruscan invention. The later pictorial evidence is somewhat ambiguous, but this should not distract from the fact that both early Etruscan (Villanovan) models, which on account of their sleek proportions, and oarports in their sides, can be identified as warships, at either end feature some element which might have formed ramming devices.

From then on there exist more representations of what, in my opinion, may positively be considered stern spurs unless rams, or chins. Aegaean Greece until now contributes only one late 6th century Attic black-figure vase painting of a stern spur.[14]

Another early source is the engraving on an Illyrian bronze vessel of the 5th century BC, from Nesactium on the peninsula of Istria in the northernmost Adriatic (Fig. 1,5).[15] However badly preserved it is, it is obvious that the engraving shows an oared warship (likely an Illyrian pirate vessel) engaged in close combat with an opponent now missing, to the right of it. Javelins are flying to and fro, and warriors on a deck unless it is a narrow central corridor, run toward the bow, of which only some isolated fragments are preserved, for boarding the enemy vessel. At the stern (left) there is preserved a vertical line aft of the rounded sternpost which implies the existence of a stern chin, showing, in my opinion, that the vessel was capable of attacking its opponent by its stern.

Taking into consideration that skirmishes among Illyrian pirates and Etruscan ships will have been commonplace in the Adriatic, there is a chance that the Nesactium boat's vertical stern (?) ultimately derives from Etruscan stern-spur ships, in a modified tradition of the early models (Fig. 1,4). Alternatively, the uncertain outline of its stern might relate to the transom sterns of the earlier Picene logboats shown on stelae from Novilara (note 15), but this appears less likely in view of the keel/stern outline being shown curving upward in the Greco-Punic way.

Leaving this open, the Nesactium drawing certainly renders an Illyrian vessel of the northern Adriatic. After a lacuna of 300 years, in the southern Adriatic there turn up Illyrian tribal coins of the Daorsoi and other tribes, succinctly depicting small warships with their oars arranged at one level of oarports, the keels of which either protrude at both ends from under the stemposts and sternposts (Fig. 1,6),[16] or such an extension at the bow is combined with a protruding angular chin at the stern which eventually could double as a ram.[17] Alternatively, William Murray in an oral communication suggested that chins and wooden spurs without a metal ram might have functioned in a defensive manner for keeping attackers at a distance which would impede boarding. We shall come back to this question later.

These Illyrian vessels may be thought to have been identical with, or similar to, the warship type of liburnian, which by its name is related to the Illyrian pirates' tribe of the Liburni.[18]

While the Illyrian coins never depict anything but blunt keel extensions, an Etruscan relief on a cinerary urn from Volterra in Tuscany, also dated to the 2nd century BC, shows a bronze ram with three prongs of the type predominant among the reliefs from Volterra (Fig. 1,3).[19] Only one end of the hull, with a rudder and the helmsman facing away from the high sternpost, is represented, which at a first glance might make us think that a bow with a bow rudder is shown. There indeed are a few representations of bow rudders on Volterran urns, but there the bow helsmen face toward the bows, thus making sure that Fig. 1,3 actually shows a stern.[20] The three-pronged ram issuing from the curved sternpost is therefore a stern ram. Most of the other features of the vessel, however, conform to late Etruscan warships of what may be called the "Volterra type".

At the same time unless somewhat earlier, the relief on a pottery mug from Pontic-Greek Phanagoria on the north coast of the Black Sea shows a two- and a three-prongued ram at the ends of an oared vessel, implying that such offensive weapons were not then confined to the Etruscans.[21]

Taking into consideration that all urn reliefs from Volterra refer to Greek mythology, and a few clearly embody fantastic traits apparently added by sculptors who seem to have thought them appropriate for ships of a mythical past, the source value of Fig. 1,3 might be doubted. On the other hand, the stern ram recalls the keel extensions at the stern of the models of the late 8th century BC, presented earlier, making us think that this very feature in the much later Volterra relief is better than mere artist's fancy.

When looking for eventual sources, more than one offer themselves. To start with, J.W. Hagy puts forward that two 4th century representations of Etruscan or Italiote-Greek trieres, seem to show rams attached to their sterns.[22] The pictorial evidence, however, is inconclusive. If trieres in Italy had been equipped with stern rams this would imply that in Italian waters trieres applied battle tactics different from those in the Greek, and eastern Mediterranean world, as to which any written evidence is wanting.

There may be added a fine Siciliote-Greek terracotta model from a mid-3rd century burial at Milazzo in NE Sicily (Fig. 1,8). [23] It features a short keel extension at the bow and what seems to be a small somewhat triangular stern projection peripherally fitted (in what may be called the Etruscan fashion) to the keel which bends upward for forming the sternpost in the traditional Greek (and later, Roman) way. Both lines of evidence seem to imply that stern rams were known to the Italiote and Siciliote Greek from the 3rd century BC onward. There are, however, no firm arguments yet for discerning if the tactic of ramming by the stern had been induced by Illyrian models, which may have become known to the Siciliote Greek by Syracuse's naval activities in the Adriatic, or had been transmitted by the Etruscans, or formed an independent invention.

I prefer to think that Fig. 1,3 testifies to some direct information about Illyrian stern-ram ships. It either may have reached Volterra via one of the Etruscan seaports on the Adriatic, or been caused by the Romans' eventual use of liburnians already in the 3rd century BC.[24] There exists a relief of a vessel with a massive box-like ram at the bow, and a rounded chin at the stern, on a votive altar commemorating the transfer of the goddess Cybele from Asia Minor to Rome, in the 3rd century BC (Fig. 1,7).[25] The relief however, was executed in the 1st century AD, and it is unknown if it faithfully reproduces an earlier original or was independently conceived by its artist. The latter idea is supported by a round-roofed hut for the helsman being shown, which is a feature unknown in the 3rd century BC but well attested during the Imperial Age, and the square shape of the ram. What is certain is that the vessel carrying the enthroned goddess, miraculously being hauled upstream by the priestess Claudia all on her own, for its stern chin is similar to those interpreted as liburnians, on some Illyrian coins (Fig. 1, 6) while differing from the Siciliote-Greek terracotta model (Fig. 1,8), and Roman standard warships of the time. It might give an idea of how Octavian/Augustus' liburnians at Actium had looked (see below).

The same perhaps applies to a mosaic of an unmasted boat with one blunt and one pointed spur at its ends, at a villa of the 1st half of the 4th century AD on the river Tellaro in Sicily.[26] It cannot be excluded, however, that it combines the example of contemporaneous warships with symmetric concave stems (see below), with traditional Roman types of spurs.

Unambiguous evidence of liburnians in Roman navies is first presented in the written accounts of the Civil Wars of the later 1st century BC, but never is it stated that they had rams at both ends.[27] Their day of glory was the battle of Actium in 31 BC, in which Caesar's heir Octavian, the later emperor Augustus, and his friend, Agrippa, made admiral already at Naulochus in 36 BC, routed the combined fleets of Antony and his spouse the queen of Egypt, Cleopatra. Octavian is said to have favoured the light Illyrian vessels, as opposed to his opponents' predilection for large battleships of Hellenistic tradition. As to their ramming potential, the liburnians' skippers were unwilling to ram for fear of breaking their ships' rams or spurs on the stout hulls of the enemy's battleships. [28] This on the one hand suggests the Actium liburnians' rams or spurs were as weakly constructed as those on the Illyrian coins, and on the other confirm that the latter in principle were meant for scuttling enemy ships in spite of not being armed with bronze rams. The source, however, leaves open if they also had been stern rams or chins.

There may now be summed up that there exists a pictorial tradition of warships featuring either thin keel extensions at both ends or one at the bow, and an angular stern, in the 2nd century BC. The bulk of these sources is connected with Illyrian tribes, and is likely to refer to liburnians. The latter type was introduced into the Roman navy in 36 BC, at the latest.

The battle of Actium put an end to war at sea in the Mediterranean until AD 323. The Imperial fleets stationed at Misenum and Ravenna, however, continued to exist, and were augmented by a growing number of Provincial fleets.[29] The latter regularly consisted of liburnians which in the Imperial fleets also were well represented. The type became as prominent as to lend its very name to warships in general.[30] But intriguingly enough, among the countless warships e.g. on Hadrian's coins, there is not a single unambiguous one featuring a stern ram or chin. [31] This might be caused by the fact that at that time Roman fleets in the Mediterranean had no opponents more serious than pirates. If these vessels were called by the name of liburnians, as appears likely, the type was modified at the expense of its earlier Illyrian traits. The number of pictorial sources for the latter is restricted in comparison, some documents as e.g., a glass seal (Fig. 2,1) being of indifferent quality.[32] But the Illyrian component nevertheless survives for long.

A warship with short "keel extensions" is shown on a coin by Domitian (Fig. 2,2).[33] Its heraldic composition will at a first glance cause a bit of hesitation if it actually means a ship, but the goddess Minerva on its deck, with her sacred animal the owl in front of her, makes sure that the peculiar image does not show a two-handled drinking bowl but rather, a warship. Symmetry of both ends extends to the long upper spurs, making sure that a stern spur of Illyrian type is shown. The image is particularly noteworthy for having been issued by the Imperial mint at Rome, giving it an official character. So, there seem still to have existed liburnians of the original Illyrian type, in an Imperial or some Provincial fleet, besides the ubiquitous "modified" version with its traditional Roman appearance. The concept of symmetric stems still being alive at this time is testified to also by a pleasure craft shown near a villa, in a fresco of the Villa San Marco near Stabiae. [34]

As to provincial contexts, there exists a local coin issued by the city of Dor in Israel for the empress Iulia Domna in c. AD 217 (Fig. 2,3). [35] It is remarkable for clearly showing a long keel extension at the stern, supporting the notion of the original Illyrian version of the liburnian still existing in local ambients in the Eastern Mediterranean.

Later, in c. AD 296 coins by the Britannic usurper emperor Allectus (Fig. 2,4-5; cf. note 35) show vertical sterns which might be taken to come rather close to the angular chins of the much earlier boats on Illyrian coins (Fig. 1,6), the votive relief for the priestess Claudia, from Rome (Fig. 1,7), or a 1st century glass seal (Fig. 2,1). Such vertical sterns, however, would not have been capable of piercing an opponent ship's hull. Taking into consideration that Allectus had to defend Britannia against the inroads of Saxon pirates most of whom will have assaulted England in large logboats [36] it can be thought that vertical sterns had proved efficient in toppling such primitive vessels. A genetic connection with the much earlier boat from San

Marco appears unlikely.

Another coin image of Allectus (Fig. 2,6) presents a marked horizontal projection issueing from the stern which bends upward in the traditional fashion of Mediterranean warships. This image, in a way, might demonstrate even more clearly than the other ones, that Allectus seems to have been conscious of one or the other way of giving warship sterns a potential of serving as ramming devices, if need arose. This projection is too high above the water-line for having been efficient against logboats. It rather might have been directed against Roman warships. Constantius I indeed managed to invade Allectus' realm in Britannia (only by chance without a sea battle against Allectus' fleet), and to re-incorporate it into the Late Roman Empire.

The 4th century produced several images of stern-chin warships on coins celebrating real or pretended naval feats of Late Roman emperors or empresses (Fig. 2,7-9).[37] The vessels as a rule are somewhat stylised but there can be no doubt that they thoroughly differ from e.g., Hadrian's "modified liburnians" with their elaborate bows, and sterns raised in elegant curves. As opposed to them, on the late coins the keels and gunwales are strictly horizontal. Stemposts as well as sternposts tend to being straight, rising at an obtuse angle. Stylised animal or birds' heads may be found either in the bow, or at both ends. A single boat (Fig. 2,8) displays long straight keel extensions as on the coin from Dor (Fig. 2,3). On another vessel (Fig. 2,9) the emperor Constans, holding the Christian Chi-Rho standard the labarum, and a phenix, has himself steered by a winged Victory. The motif is common at the time, but it is singular that the vessel has a short pointed spur in the stern, which must not be confused with Victory's steering oar. Both images suggest that the tradition of Illyrian stern spurs still was alive unless reviving in the 4th century.

In some cases the high stems form gentle concave curves at either end.[38] In other words their lower ends slightly turn outward, eventually allowing their being used for ramming in spite of the absence of real metal rams. Stems and sterns being strictly symmetrical might make us ask if not mere symmetry as a pictorial principle was intended. But this may be dismissed for the reason that in most images the rudders are unambiguously shown, at the sterns.

These concave stems hardly can directly be derived from the early liburnians' thin keel extensions, whereas there exists some connection with the angular stern chins of some. As to the general features of these Late

Roman warships, their type seems ultimately to go back to vessels depicted on coins of the Gaulish usurper emperor Postumus, and in particular, the Britannic rival emperors Carausius and Allectus, of the late 3rd century AD (note 35) which feature similar straight keels and gunwales, and thin stems and sterns. Kienast suggested that Constantine I owed his victory over the old-fashioned triremes of his opponent Licinius at the Dardanelles, in AD 323, to his using the battle-proven North Sea type.[39]

Some late coin images of the 4th century (Fig. 2,7), commemorating Constantine (note 35), establish this connection just as well as the examples presented before. However peculiar they look, the indication of oars makes sure that warships are shown. In view of this, their exotic twin vertical "stemposts", horizontal railings intersected by angular lines, and protruding square ramming devices come remarkably close to such features of the boats on countless coins of the Gallic usurper Postumus, struck at Cologne by c. AD 260.[40]

Two late Roman representations stem from Christian contexts. The first is a mosaic from a church of the 5th or 6th century at Hülümen in E Turkey, showing a boat with a sail, oarports, a straight keel, and symmetric high stems and pointed chins at both ends. [41] Pekary calls the boat a camara, which was a Black Sea type the rudder of which could alternatively be set at the stern or the bow. Since no details are indicated there cannot be stated more than a rather general resemblance of the earlier concave-stem boats on coins (note 35).

For the sake of completeness there is to be mentioned that Tacitus (Germ. XLIX, 2) relates that the Teutonic tribe of the Suiones, on the Baltic, had paddled warships with "prows for landing at both ends", as also may have been the diagnostic feature of the Black Sea camara. We may imagine the Suionic vessels were more or less like the Iron Age boat from Hjortspring in Denmark featuring at its ends not ramming devices but a kind of projecting runners for pulling it onto the shore.

The other Christian image, a fresco in the burial vault of lady Vibia at Rome, is markedly different both from the mosaic in Turkey and all coin images.[42] Both ends again are symmetric but they incorporate prominent pointed spurs which merge with the curved stemposts. In spite of its martial appearance, the boat is a fishing craft since two men are busy hauling in a net. But there should be noted that some fishing craft in late Roman mosaics from North Africa also feature pointed bows, like warships.[43] This invites us to think that the shape of the boat in Vibia's vault also might reflect the one of contemporaneous warships, but I do not know any parallel from coins. In spite of this the fresco confirms that symmetric rams at either end were known at Rome not only in the heroic context of Imperial propaganda as expressed by coin images, but also in the peaceful ambience of Christian iconography. The motif seems to have been widely known, and understood.

At the same time, two ships in the 'world map' mosaic from Madaba in Jordania display angular sterns.[44] Both unambiguously are merchantmen, implying that at that time stern projections formed a common feature.

This calls to mind that the Romans credited the goddess Minerva (Greek Athena) for inventing the "two-prowed ship" (navis biprora).[45] In my opinion, it is more likely to have been a vessel with spurs at both ends rather than a catamaran with two prows and sterns side by side[46]. Anyway the source makes think that such vessels were more numerous in the Roman world than the relatively few pictorial sources suggest.

Concave stems in the bows and the sterns, understood as blending features of spurs, and chins, becoming more numerous than before, in the 4th century, suggest that their introduction was caused by some special combat tactic against specific opponents. In the case of the stern chins on warships of the British usurper Allectus, in the late 3rd century, and again in the 4th century, they may be thought to have been large logboats of Germanic raiders which could be foundered rather than sunk by metal 'piercing rams' (note 37). The classic battle formation of line abreast seems likely to have been replaced by the concept of an irregular mêlée in which the option of attacking by the stern would have formed an advantage, even if it might have been directed against Roman warships (fig. 2,6). The same is already suggested by Illyrian liburnians of the Hellenistic period featuring stern rams, or chins. At any rate it seems to be significant that both kinds of specially shaped sterns date from periods which saw active, however informal, fighting at sea, as opposed to Hadrian's many images of warships, from a peaceful period.

This makes us think that stern projections on warships may be accepted as having been conceived as weapons, either offensive or defensive, no matter if they really can be called rams, spurs, or chins (note 1). From this point of view the accounts of the battle at Actium deserve special attention for making sure that lightly constructed bow spurs (at Actium perhaps armed with bronze rams) were meant for ramming. This makes us think that similar stern projections were conceived for the same purpose, as the few earlier pictorial documents of metal rams at the sterns suggest. At the same time it is seen that this very model of warships specialised for combat in an informal mêlée against primitive opponents, now and then also was transferred to contemporaneous merchantmen, on which they might have served as mimicking weapons for deterring pirates.

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NOTES

1 There might be distinction between real bronze rams with three (rarely, two) prongs, or box-like without any prongs, and wooden spurs without metal heads.

2 Morrison & Williams 1968, 280.- Casson 1971, 85 note 5.43.

3 Raban 1981, 290 fig. 5.- Casson, Steffy et al. 1991 *passim*.- Höckmann 1985, 108 fig. 84.- Morrison & Coates 1996, 222 no. 22 + fig.- Baatz & Bockius 1997, 26 fig.

4 Three-pronged: "From North Africa", Fitzwilliam Mus., Cambridge (Nicholls 1970-71, 85 fig. 14.- Göttlicher 1978, 82 no. 491a; pl. 39, 491a.- Basch 1987, 408 fig. 866).- Provenance unknown, Deutsches Schiffahrtsmuseum, Bremerhaven (Murray & Petsas 1987, 104 fig. 58).- "From the sea off the Corinthian Gulf", Archaeological Mus., Piraeus (Steinhauer, this volume, 709 sq.).- Prov. unknown, British Mus., London (Brailsford 1966, 71 fig. 37,1).- Bronze model, prov. unknown, Berlin (Moll 1929, pl. B IX 26).- Boar's head apparently for a ram, Genua (Frost 1975, 226 fig. 37).- Shark-like monster, "From the sea off the Corinthian Gulf": Kalligas 1991/6.

5 (e.g.) Basch 1987, 355 fig. 734-736; 387 ff. fig. 808 A.D-F.H; fig. 809-812; fig. 814-818; 419 f. fig. 900-902; 427 ff. fig. 960-963. - Roman, c. AD 40, Mainz-Weisenau: Höckmann 1997, 200 fig. 5,2. This seems to be the latest well-dated source known for three-pronged rams on contemporaneous Roman warships.- The very latest representation is a relief on a stela of AD 141/2 from Athens (Athens 1989, 194 sq. no. 86 + fig.). Since it refers to an ephebes' boat race practiced since the 5th century BC, the old-fashioned ram of the boat may be inspired by the hallowed traditional character of the event, unless even being an old object preserved for being fitted to each generation of the later raceboats (for the re-use of rams on new warships cf the Attic arsenal files [note 2].

6 To quote some instructive examples: Punic 'Sister Ship' sunk in the battle of the Aegatian Islands near W Sicily in 241 BC (Basch 1975 *passim*; Frost 1975 *passim*; Frost et al. 1976/81, 265 sq.; Basch 1987, 413 fig. 886-887).- Etruscan tomb relief from Bologna, 5th century BC (Höckmann 1985, 50 fig. 35; 1997, 199 fig. 4,1).- Reliefs of Danube warships on Trajan's column at Rome, AD 113 (Casson 1971, fig. 127-128; Basch 1987, 446 sq. fig. 978 sq.; Höckmann 1985, 120 fig. 108; 1997, 200 sq. fig. 5,4; 6,1; Morrison & Coates 1996, 248 no. 45 + fig.).- Gem, 1st century AD (Höckmann 1997, 198 fig. 3,5).- Silver model by Kerdon, Levant, AD 120/1 (Basch 1987, 456 fig. 1011).- Coin of Hadrian (Höckmann 1997,

198 fig. 3,3).- Relief of trireme 'Sol' from Frencq, N France, 3rd century AD (loc.cit. 203 fig. 7,2.- Pekary 1999, 72 F-12).- Coin of Constantine the Great (Höckmann 1985, 120 fig. 105).

7 To review the wide chronological, and geographic range of known specimens (cf. Basch 1991/6) by quoting a few: Relief from Karatepe, SE Turkey, c. 700 BC (Casson 1971, fig. 79.- Basch 1987, 249 fig. 526).- Gold pendant, Saitic Egypt (Basch 1987, 335 fig. 719-720).- Archaic Greece (Göttlicher 1978, 37 sq no. 172; pl. 39: 172; 66 no. 351; pl. 26: 351; 68 no. 362-363; pl. 27: 362-363.- Basch 1987, 221 fig. 460. - I think that a large terracotta model found in the sea off Sparta's naval base at Gytheion, by Basch presented as Imperial Roman, should in my opinion be dated Archaic: Basch 1969; 1987, 432 sq fig. 936 sq.- Höckmann 1985, 97 fig. 67.- Morrison & Coates 1996, 238 no. 37.- Bronze model serving as a lamp, from the Erechtheion on the Acropolis of Athens, 4th century BC [?] (Höckmann 1983, 408 fig. 6.- Basch 1987, 229 sq. fig. 477).- Imperial Rome: Casson 1971, 146.- Frost 1975, 213 sq.- Relief on tombstone from Cologne, 1st century AD (e.g. Höckmann 1983, pl.87,2; 1986, pl. 51,3; 1997, 200 fig. 5,3; Pekary 1999, 28 Dk-49).- Later amber relief from Cologne (Höckmann 1997, 201 fig. 6,2). - In a Berlin private collection there is being kept a bronze ram casing with a flat vertical edge, similar in its silhouette to the Cologne relief, of unknown provenance but likely to have been found somewhere in SE Europe, to be published by me.- Tiritaka, Crimea, 5th-6th century AD (Emetz 1995, 137 fig. 5).

8 Casson 1971, fig. 28-29.- Höckmann 1985, 42 fig. 16.18-20.- Basch 1987, 142 sq fig. 298 A-C. 309; 150 sq. fig. 315.317.- Wachsmann 1995, 29 fig. above.

9 Casson 1971, fig. 61: 'N. 1'.- Höckmann 1985, 45 fig. 21.- Basch 1987, 68 fig. 124-126.- Wachsmann 1995, 29 fig. below; 30 both figs.

10 Höckmann 1985, 45 fig. 22.- Basch 1987, 67 fig. 122.

11 Bass 1972, 56 fig. 9.- Höckmann 1985, 108 fig. 81.- Basch 1987, 308 fig. 649.

12 The feature is first shown on an Early Minoan terracotta model from Crete, later 3rd millennium BC (Basch 1987, 123 fig. 276). Basch (68 fig. 124.126) recognised it on one of the Sea Peoples' ships in the Medinet Habu reliefs. Since the home of the Sea Peoples seems to have been somewhere around the Adriatic (Lehmann 1985, 45), this eventually might be the earliest source for Adriatic stern ram ships (cf. notes 14-16). It however, precedes their later, trustworthy sources so far as to make me leave them aside in the present paper.

13 Model (a): e.g. Göttlicher 1978, pl. 35,469: Hagy 1986, 224 fig. 3 K; Basch 1987, 401 fig. 843. - Model (b): Nastasi 1992, 77 + fig.; Jannot 1995, 785 fig. 5.

14 Dakoronia, this volume p. 279 sq.

15 Mihovilic 1993 *passim*.- Höckmann 1997, 193 fig. 1,1.- As to the Picene boats from Novilara: Bonino 1975, 14 fig. 3.- Höckmann 1985, 49 fig. 30.- Basch 1987, 405 fig. 860.

16 Bonino 1975, 17 fig. 6 B.- Kozlicic 1980/81, 174 fig. 3,1; 4,1.- Jurisic 1983, 11 fig. 7 a.c.- Höckmann 1985, 117 fig. 101; 1997, 193 fig. 1,2.

17 Kozlicic 1980/81, 174 fig. 3,2; 176 fig. 6,1.3.- Höckmann 1997, 193 fig. 1,3.

18 Casson 1971, 142.- Frost 1975, 215.- Höckmann 1997, 194.

19 Brunn 1870, pl. LXXXVII,3.- Moll 1929, pl. B IIIb,26.- Höckmann 1985, 51 fig. 36; 1997, 203 fig. 7,1.- Basch 1987, 410 fig. 874 C (calling the image an artist's mistake).- Pekary 1999, 310 I-V 26.

20 Moll 1929, pl. B IIIa, 12; B IIIb, 24.- Berlin 1988, 335 sq. no. D 5.26. On six other Volterran urns are seen men with a shouldered rudder, in the position of the bow which itself is concealed by persons standing in front.

21 Peters 1982, no. 12.- Koselenko-Kruglikova-Dolgorukov 1984, 257 pl. 85 no. 5.- Pekary 1999, 336 RUS-1.

22 Hagy 1985, 244; 247 fig. 40.

23 Venezia 1996, 661 no. 3 I-V.

24 Panciera 1956, 132 sq.- Frost 1975, 215.- Murray & Petsas 1987, 134 sq.- Morrison 1995,

134 sq.

25 Naumann 1983, 286 sq.- Höckmann 1985, 117 fig. 102; 1997, 195 fig. 2,1.- Pekary 1999, 274 Rom-M 5.

26 Voza 1973, 176 sq., pl. 59.- Pekary 1999, 302 I-T 6. I did not manage to identify the boat in the over-all photograph of the mosaic, nor is it mentioned in Voza's description.

27 Morrison & Coates 1996, 171.- Höckmann 1997, 196 sq.

28 Murray & Petsas 1987, 134 sq.- Höckmann 1997, 202 sq.

29 Starr 1941 *passim*.- Casson 1971, 141. As to liburnians in both Imperial fleets see Casson 1971 (in the 1986 ed.), 356.451.- Morrison & Coates 1996, 172 sq.

30 (Vegetius, chapter 37): Baatz & Bockius 1997, 15 (Baatz); 41 (Bockius).

31 Coins of the type RIC 113 might eventually show a vertical angular stern, but the evidence is inconclusive.

32 AGD I-2 (1968), 224 no. 2114.

33 Ringel 1984, 32 no. 26.- Höckmann 1997, 193 fig. 1,5.6; 195 fig. 2,2.

34 Croisille 1969, pl. 54 fig. 7.- Pekary 1999, 300 I-S 3.

35 Sources for Fig. 2: 1 cf. note 30.- 2 Ringel 1984, 32 no. 26.- 3 RIC 55 var.; Münzzentrum Köln, Aukt. 47, 1983, no. 1316.- 4 Münzzentrum no. 1316.- 5 Robertson 1978, pl. 64,62.- 6 Meshorer 1985, 16 fig. 23; Stern 1994, 265 fig. 182.- 7 Robertson 1982, pl. 65, P.R. 1.- 8 Bernhart 1926, pl. 22,5.- 9 Robertson 1982, pl. 65,34.

36 As to such logboats: Hirte 1989.

37 Bernhart 1926, pl. 22,5 (Helena).- Bastien 1967, 159 no. 106-111 (Magnentius, struck at Trier).- Robertson 1982, pl. 65, 10.15.18 (Constans Aug., AD 337-340, Trier); pl. 65,34 (same, Rome); 65, P.R. 1.3 (Populus Romanus, after Constantine's death [highly informative for showing vertical stems on top of squarish 'box-like' rams like the bow rams of countless emissions by Postumus in AD 260, at Cologne, so connecting the 4th century coins with earlier Rhenish types], Constantinople); 66,51 (Constans Aug., Siscia c. 348-350); 67,8 (Constantius II Aug., Trier 348-350); 67,25 [?] (Constantius II Aug., Arles 337-340); 67,34 [?] (same, Rome 347-8); 68,53 [?] (same, Siscia 347-8); 74, C.G. 2 (Constantius Gallus, Rome 351-49); 84,39 [?] (Valentinian II, Constantinople 378-384); 84,41 [?] (same, Nikomedeia 378-383); 84,46 (same, Nikomedeia 378-383 [to be noted, the bow is round !); 86,55 (Theodosius I, Antioch 379-383).- Ringel 1984, 82 no. 119 (Constans).- Höckmann 1997, 207 note 18.

38 (e.g.) Robertson 1982, pl. 65,15.22.26.34; 66,51; 67,8; 68,45.53; 72,12 (to quote clear examples only).

39 Kienast 1966, 138 sq.- Höckmann 1983, 431; 1985, 133 (etc.).

40 (e.g.) Höckmann 1983, pl. 92,3; 1985, 120 fig. 107; 1986, pl. 52,4.- Basch 1987, 491 fig. 1126. Allectus (e.g.): Höckmann 1983, 426 (literature), pl. 93,7-8; 1985, 116 fig. 98.- Basch 1987, 491 fig. 1128.

41 Pek_ry 1985, 123 fig. 19; 1999, 374 TR-12.

42 Ferrua 1971, 50 fig. 11.

43 (e.g.) Casson 1971, pl. 137, 10.11.15-17.- Pekary 1984.- Höckmann 1985, 63 fig. 52, 10.11.15-17; 73 fig. 65.- Basch 1987, 488 f. fig. 1112 sq.- Pekary 1999, 96 GB-9.10.11; 280 Rom-M 28; 344 ff. TN-1b.21c.26.31.35.36.38.52.70.72. - In a mosaic from Constantine/Tunisia an erote hauls a harpooned large fish towards a warship with sail unfurled and a concave stempost, which according to its oars being arranged in groups of three, is a trireme (Gauckler 1910, pl. 26.- Pekary 1999, 84 F-59 ["myoparo ?"]).

44 Donner 1977, 82 fig. 50; 136 fig. 102. - Another masted merchantman (?) with a peculiar pointed bow and a low stern chin is shown on a 2nd century AD tombstone from Bari (de Iuliis 1983, 150 no. 4, pl. 99,2.- Pekary 1999, 152 I-B 1).

45 Hyginus, fab. 168,2; 277,5. My thanks are due to H. Konen for pointing out the source to me.

46 Abstractly there might exist some connection with accounts of Late Roman "twin-stern" vessels (ploia diaprymna; a?phipry?nos [?]) on the Lower Danube, which Romanian scholars suppose to have been rounded at either end (Zahariade & Bounegru 1991/4, 37.- Bounegru & Zahariade 1996, 69). In my opinion this also might refer to prams with symmetric ramp-like bows and sterns. An interpretation as catamarans, though, cannot positively be dismissed. The type had been invented in the Hellenistic period for constructing huge battleships, as Casson found out, and also seems to have been applied in building a 'floating palace' on the Nile for Ptolemaios IV (Caspari 1916).

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* Abbreviations: JdI, plus individual additions

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FIGURE CAPTIONS

Fig. 1 Earlier representations of stern rams. 1 Model from Byblos, Lebanon (ca. 1200 BC).- 2 Relief, victory of the pharaoh Ramses III over the Sea Peoples, from Medinet Habu, Egypt (after 1186 BC).- 3 Urn relief from Volterra, Etruria (2nd cent. BC).- 4 Model from Tarquinia, Etruria (8th cent.BC).- 5 Engraving on Illyrian bronze vessel from Nesactium, Croatia (5th cent.BC).- 6 Tribal coin of the Illyrian Daorsoi (2nd cent. BC.- 7 Votive relief from Rome, the priestess Claudia hauling the ship of Cybele up the Tiber (executed in the 1st cent. AD but possibly basing itself on earlier originals now lost).- 8 Siciliote-Greek model from Milazzo, Sicily (3rd cent. BC). Not to scale.

Fig. 2 Roman Empire: Stern rams or chins on a Late Republican seal and Imperial coins. 1 Glass seal, prov. unknown (1st cent. BC). 2-9 Coins: 2 Domitian (AD 89/90).- 3-5 Allectus (London, c. AD 296).- 6 City coin of Dor, Israel, for Iulia Domna (AD 217).- 7 Memorial issue for Constantine I (Constantinople, AD 330).- 8 Helena the wife of Julian the Apostate (Rome, c. AD 360).- 9 Constans (Constantinople, AD 348-350). Not to scale.

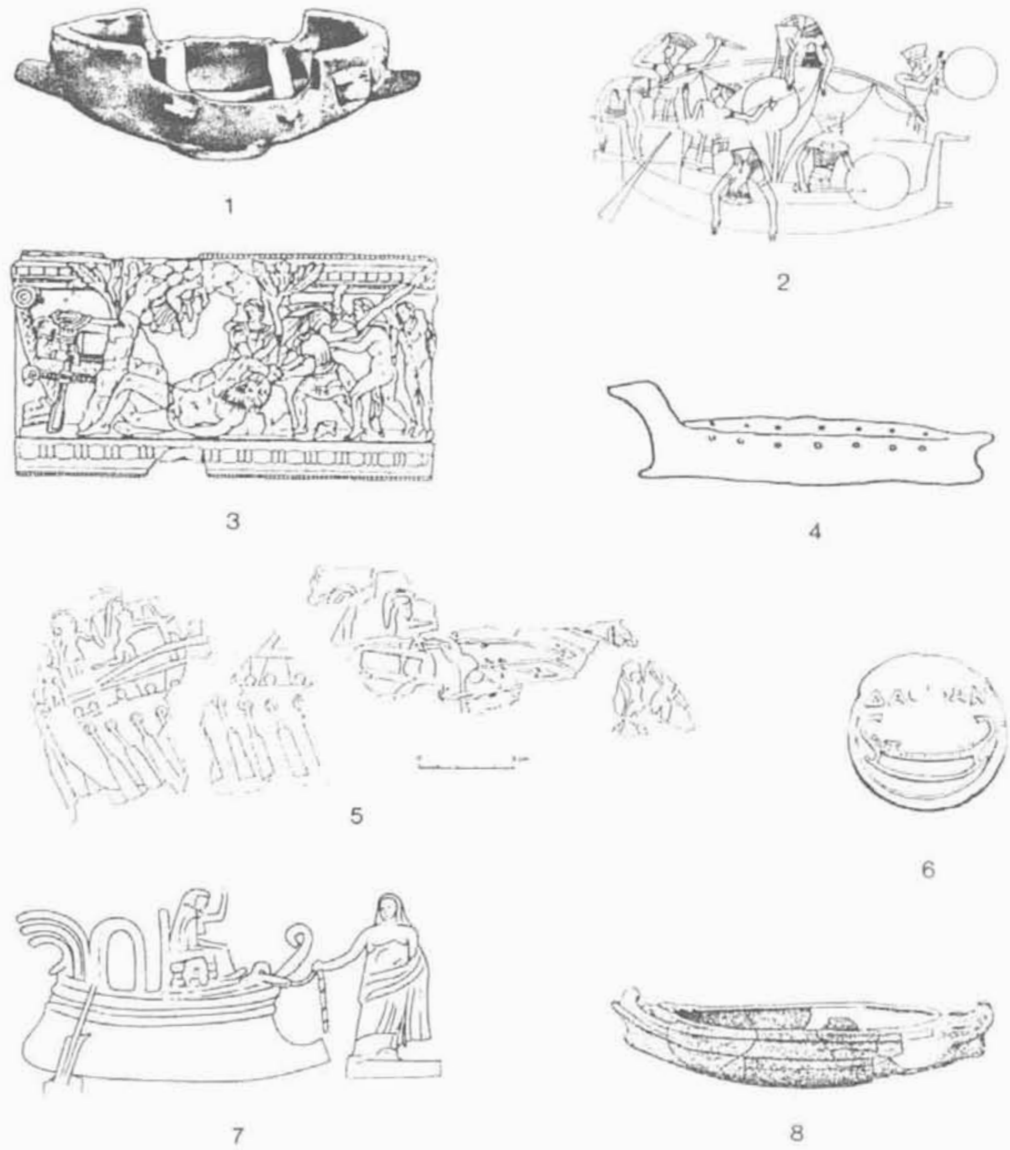

Fig. 1 Earlier representations of stern rams. 1 Model from Byblos, Lebanon (ca. 1200 BC).- 2 Relief, the pharaoh Ramses' III victory over the Sea Peoples, from Medinet Habu, Egypt (after 1186 BC).- 3 Urn relief from Volterra, Etruria (2nd cent.BC).- 4 Model from Tarquinia, Etruria (8th cent.BC).- 5 Engraving on Illyrian bronze vessel from Nesactium, Croatia (5th cent.BC).- 6 Tribal coin of the Illyrian Daorsoi (2nd cent.BC.- 7 Votive relief from Rome, the priestess Claudia hauling the ship of Cybele up the Tiber (executed in the 1st cent.AD but possibly basing itself on earlier originals now lost).- 8 Siciliote-Greek model from Milazzo, Sicily (3rd cent.BC). Not to scale.

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THE SEWING SYSTEM IN THE MA'AGAN MIKHAEL SHIP

Introduction

The following paper summarizes the results of a research on the sewing technology that was employed in the hull construction of the ancient ship from Ma'agan Mikhael. The shipwreck was found in 1985, 70 meters from the shoreline off Kibbutz Ma'agan Mikhael, which is located 30 km south of Haifa, Israel. It was buried under the sand in shallow water. C^{14} and ceramic analysis date the ship to about 400 BC. It was a small merchantman, approximately 13.5 meters long (Linder 1992; Linder and Rosloff 1995; Kahanov 1996).

The ship was constructed shell first, using mortise and tenon joints. After the hull was completed, full frames were attached to the hull by means of double clenched copper nails (Kahanov et al. 1999). In addition to these two methods of joinery, a third system of fastening hull components was applied – sewing. The ship was sewn at its bow and stern as evidenced by the archaeological finds (Steffy 1994: 40-42; Kahanov 1999). Sewing was used to tighten the planks to the central elements. This was apparently an additional means of reinforcement and not a method used to connect the planks or frames. At the edges of the sewing assemblage towards amidships, the garboards were sewn to the keel and the knees. The second strakes were sewn only to the knees. The third strakes were sewn to the knees and their outward edges to the end posts (see figure 1).

Figure 1. The sewing system at the bow (drawing J. Rosloff).

The archaeological evidence

Analysis of the nearly 400 sewing holes found in about 30 components of the vessel's hull remains revealed the following information.

Tetrahedral recesses that appear as triangles on the surfaces were chiseled along the upper margins of the central components (the keel at its two edges, the knees, and the end-posts) and in the planks on the opposite side of the seam with the central elements. The bases of these triangles were parallel to the seam. The recesses were used as guides through which the sewing holes were drilled. They were carried out in vertical pairs: the lower hole in a pair through the central structural element and the outer plank, while the upper hole in a pair, through the plank alone.

The two hole cavities met each other in a > or < shaped pattern, as one views the vertical aspect, with an average angle of 24° (see figs 2 and 3).

Figure 2. The pairs of sewing holes on the internal plank surface.

Figure 3. Schematic sketch of the sewing pattern in the vertical aspect.

The meeting point of the holes was usually within the thickness of the plank itself. If, however, the holes were exposed as separate drillings on the outer surface, a low groove was made in the plank to keep the ropes recessed below the surface (see fig. 4).

Figure 4. External surface of a sewn plank.

The average relevant dimensions were as follows:

The side length of the triangles: 1.65cm.
The diameter of the sewing holes: 6.26mm.
The distance of the triangle bases from the seam: 1.1cm.
The distances between the centers of adjacent holes: 4.5cm. (see fig 5).

Figure 5. Average sewing tetrahedral recess dimensions.

Remnants of sewing ropes were found, but no complete pattern survived. The ropes were twisted from Ruscus fibers. Their diameter was about 3.5mm. Wherever the sewing ropes were preserved, two ropes were identified in the holes.

The knees

The knees were apparently connected after completion of the shell, before the frames were installed. They were connected to the end posts and the keel by means of (only) two copper nails. Although it would seem logical to do so, the end-post scarfs were not reinforced by the knees. The planks were sewn at the bow and the stern, with the knees serving as the main component of the sewing system (see fig. 6).

Figure 6. The knee and sewing rope remnants (photo I. Grinberg).

The sewing pattern

As no complete sewing pattern survived, there are a few technical details which are as yet difficult to ascertain. They are:

1. The exact pattern of sewing.
2. Whether or not there was any kind of bandage or lath between the ropes and the wood.
3. To what height or to which strake the sewing system extended upwards along the end posts.

Based on parallels found in the Mediterranean, and combined with the archaeological evidence, we suggest that the sewing pattern exhibited a double X ("XX") pattern when looking from above, while four hidden ropes reinforced the components laterally (see fig. 7).

Figure 7. Suggested sewing pattern (drawing: C. Brandon).

The ropes were threaded through the cavities, tightened and secured in place by tapered pegs. The pegs sealed the sewing holes and locked the ropes in place to avoid unraveling, thereby minimizing any possible abrasion and allowing the ropes' burden to be increased as well. The breaking strength of such a rope is approximately 70 kg. Four ropes that formed the system, had a total breaking strength of about 265 kg (considering the angle). This load is similar to the shearing strength of the oak treenails that secured the tenons, which is about 275 kg. Thus the ropes had a significant role in the reinforcement of the ship structure.

Evidence of sewing in the end posts survived up to the edge of the timber remains, which corresponded to a height of three strakes. From the strakes remains there is evidence that the fourth strake to port side was also sewn, but only to the end post. Thus, the archaeological evidence does not provide sufficient information to determine whether all the strakes, or only the first three or four, were sewn to the end posts. Based on these clues, combined with parallels from similar wrecks, we may cautiously conclude that all the strakes in the Ma'agan Mikhael ship were sewn at their extremities to the end posts.

Based on other examples from antiquity, where the sewing system survived, as well as similar examples from modern vessels, it may be suggested that the sewing was done above a band or longitudinal laths. Since no such remnant was found on this wreck, this cannot be confirmed.

The purpose of sewing

The sewing holes were drilled into the hull through tenons, damaged treenails, crossed seams and connections (see fig. 8).

Figure 8. Sewing holes in a tenon.

The same is so in the tetrahedral recesses that continued over seams and damaged treenails. The impression left is that the work was accomplished while ignoring the existing hull construction. The hundreds of holes that penetrated the shell, significantly increased the danger of leakage. All this was done in the most vulnerable parts of the ship – the bow and the stern. When trying to understand the logic behind the sewing system and in the craftsmen's minds, it may be assumed that this technique would never have been employed if the shipwrights had not been convinced that these risks and subsequent damage would be well compensated for by the increases realized in the ship's integrity and strength.

Parallels

Sewing traditions from all periods and from all over the globe are evident from archaeological finds, existing vessels, and from written and iconographical material, as well. Similarities to the sewing system that survived in shipwrecks of the Mediterranean exist in the Arabian Sea, Africa, and the Indian Ocean.

Six shipwrecks with sewing techniques and other elements similar to the Ma'agan Mikhael ship have been found in the Mediterranean. Two, almost identical, were found in Marseille: Place Jules-Verne 7; and Place Villeneuve-Bargemon 1 (César 1). They were sewn at the bow and stern, using the tetrahedral holes technique, and all the strakes were sewn at their edges to the end posts (Pomey 1995, 1999). The other four are: Gela, Jules-Verne-9, Bon Porté, and Giglio (Panvini and Riccardi 1993; Freschi 1991; Bound 1985, 1991; Joncheray 1976; Pomey 1981). All were sewn by the tetrahedral holes technique, but the sewing had a broader function in those hulls. The archaeological evidence of these sewn ships points to a special shipbuilding tradition that spread in the Mediterranean during the 6th through the 5th centuries BC. Evolution of the tradition, its stages of development, as well as that of specific constructional elements, can be well identified.

The construction tradition

P. Pomey, the director of the Marseille wreck research, who bases his arguments on the archaeology and history of Marseille, concluded that the ships were constructed in a Greek tradition, that originated in the Aegean Sea. Both the investigators of the Giglio and Gela ships support like theories. Pomey further suggests that the origin of the Marseille ships was in the shipbuilding tradition of the Phocaeans who established Marseille. The close similarities between the Ma'agan Mikhael ship and the Place Jules-Verne 7 and Place Villeneuve-Bargemon 1 (César 1) ships suggest that the Ma'agan Mikhael ship was constructed according to the same tradition. Additional evidence supporting the Eastern Greek shipbuilding tradition can be assumed by the close similarities in construction between the Ma'agan Mikhael Ship and the Greek ship from Kyrenia (Steffy 1994: 43, note 22).

Despite the additional information about the source of the construction tradition, we are still searching for the origin of the Ma'agan Mikhael ship and her ports of call.

Another question that may be asked regarding the shipbuilding tradition of the Phoenicians is whether it may have had any influence on our subject, and if so, what that influence might have been. Other wrecks that will hopefully be discovered in the future will contribute to solving these questions.

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ILLUSTRATIONS

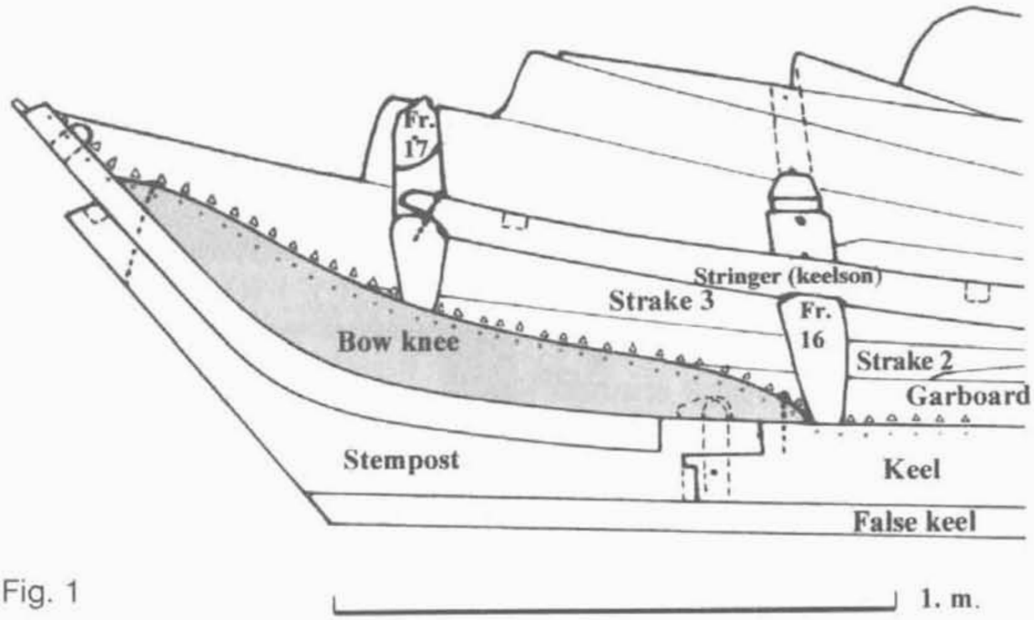

Fig. 1

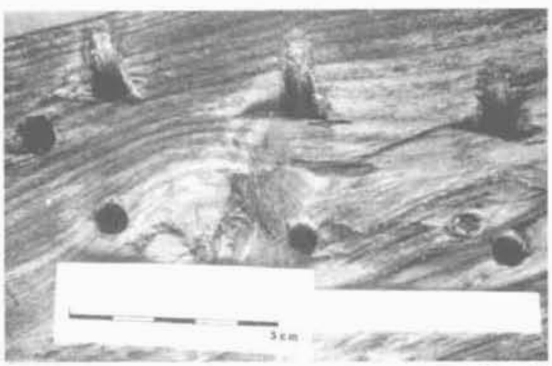

Fig. 2

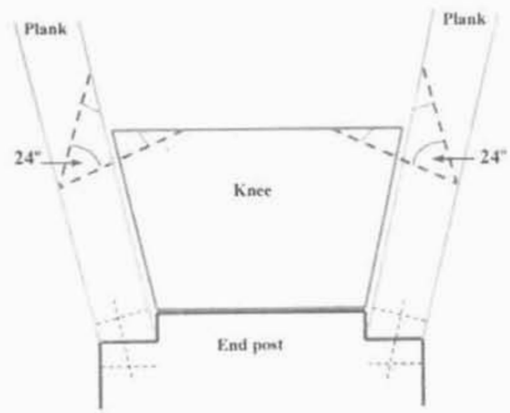

Fig. 3

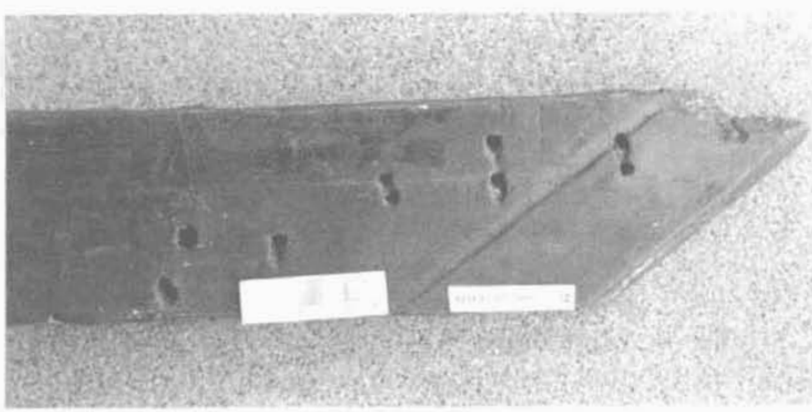

Fig. 4

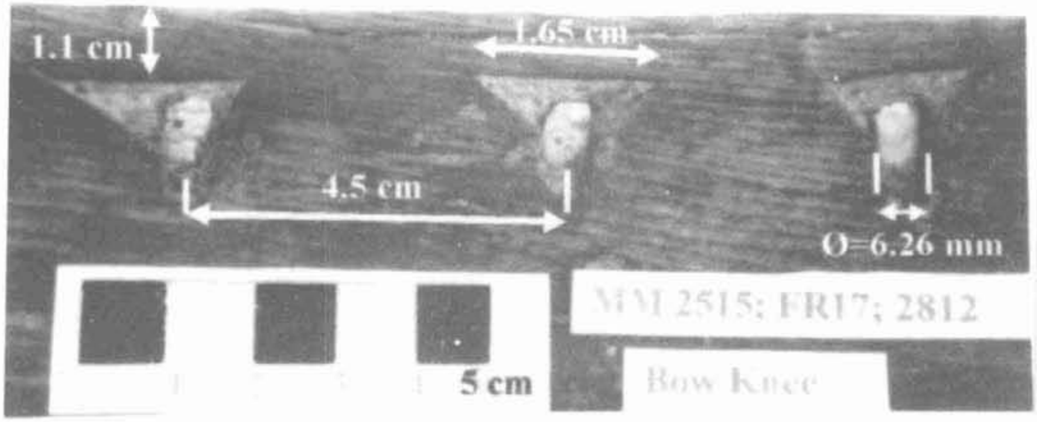

Fig. 5

Fig. 6

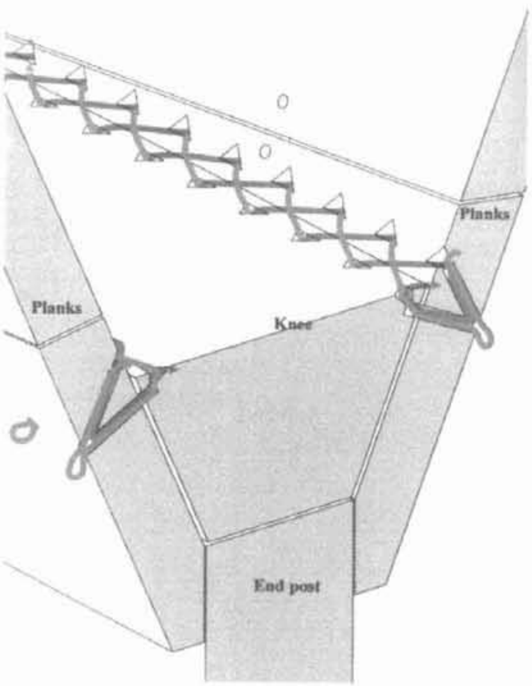

Fig. 7

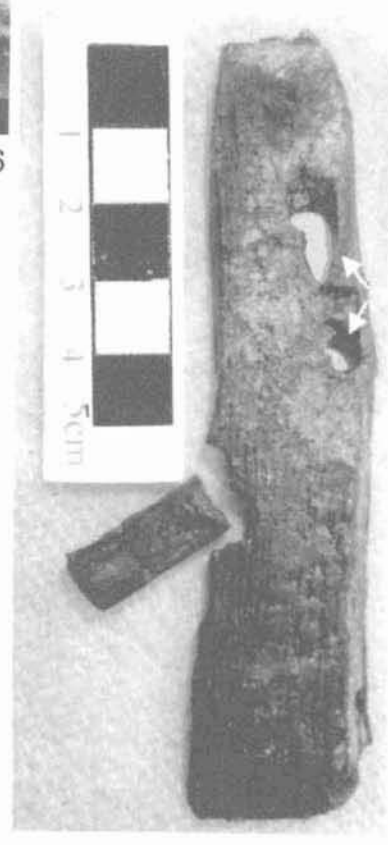

Fig. 8

ON THE FORM OF MYCENAEAN SHIPS

Knowing that according to the Homeric Epic ships from our home town in Korinthia have sailed to Troy under Agamemnon (B574-577), we were motivated to form an interdisciplinary team in order to study Mycenaean ships. We soon found out that more information could be derived from the available data than it was widely believed, but still many questions remained open. So despite the lack of an excavated wreck, we came to the idea of the reconstruction of a Mycenaean ship (eikosoros). We realized that the study, with the prospect of constructing a vessel that will be able to sail to Troy and the shipbuilding process itself, can illuminate more aspects of our subject, can lead to safer conclusions and can integrate our up to date knowledge about Mycenaean ships.

The aim of this paper is to present the methodology and the results of the research on the form and the types of the Mycenaean ships of the LHIIIC period. The sources of information are representations of ships, mainly the LHIIIC and B vase paintings, models and engravings, but also the Geometric and the earlier Bronze Age and written data: that is the Linear B tablets, the Homeric poems and later texts.

The research has addressed the serious problems of the sufficiency and reliability of the available data. Thus for the study of the ship representations the following methodology was employed:

1. The thorough study of the general pattern of the Mycenaean ship representations and of every single part of them in order to determine their characteristic form.
2. Technical studies and experiments in order to clarify the form as well as the function of certain elements of the ships.
3. The comparison between the LHIIIC representations and the earlier (Early Cycladic, Theran, Minoan) and the later, Geometric, ones for the same reason.

For the study of the written data the process was the following:

The Homeric epic is the main written source of information on the ships that participated in the Trojan War, though the question arises whether the epic refers to Mycenaean or to Geometric ships. The content analysis of the epic lead to the taxonomy of the information, of which the consistency was first examined through internal checks. This was followed by the etymological analysis of the terms and the comparative study of the relevant references in the Linear B and the later texts. This whole process resulted in the synthesis of the form and the function of the parts of the Homeric ships. These results were then compared with the information that derives from the Mycenaean and the Geometric representations in order to test to which ships they refer.

The most essential results on the form of the significant elements of the Mycenaean ships will be presented briefly within the comparative schema: Mycenaean representations, Homeric epic, Geometric representations.[1]

THE KEEL

The Mycenaean representations show that the ships had a keel. On the models (Kynos A,B, Fig. 20,21) the keel is indicated with a painted line or a clay zone along the internal bottom of the hull or with a protrusion on the external surface of the bottom of the model (Mycenae, Fig. 23).[2] In the Homeric poems the existence of the keel is mentioned many times (ε130, η252, μ421, μ422, τ278) and in the Geometric representations there is also a keel.

On some Mycenaean representations there is a protrusion at the stem as an extension of the keel. We believe that this is not a fighting ram for the following reasons:[3]

a. It doesn't occur in the ships that are recognized as warships, like the ships represented on the Kynos sherds (Fig. 2,3) and the Enkomi crater (Fig. 22).
b. The upper end of the stem that extends forward above the sea excludes its use as a fighting ram.
c. The length of this protrusion is too short for ramming.

A ram is not mentioned in the Homeric epic.

On the contrary in the Geometric representations there is a longer and more massive protrusion being thus more proper for a ram or for its predecessor. It has to be investigated whether the presence of this protrusion on the Mycenaean ship representations unified with the bow (Late Cypriot askoi, Akropolis, Kynos models and vase paintings, Fig. 13,12,20,21,2,3) or not (depictions from Tragana, Asine and Gazi, Fig. 1,5,19) is due to constructional reasons, as one of the major problems of ancient shipbuilding was the stable connection of the bow to the keel and/or is due to the improvement of the seaworthiness of the vessel.

THE BOW

In the Mycenaean representations the stem post is rendered almost vertical to the keel, wide and big. The Homeric word «στείρη» (β427-428, στερεός: solid, stable) can refer to this characteristic stem post. Due to the massive ram the stem of the Geometric ships doesn't have the same shape but the stem post is still vertical to the keel.

In the Mycenaean representations the upper end of the stempost protrudes above and in front of the cutwater bow. Its shape is complex, convex and concave with or without an internal bow and has been characterized as bird head. In all the vase paintings it has a row of small protrusions on its upper surface and in the models zones of lines. The scholars have made many assumptions for its interpretation.[4] G. Korres has shown that the akrostolion is clearly distinguished from the bird insignia, which are present on the bows of the Enkomi, the Tragana ships (Fig. 22,1) and on some Geometric and later ship representations.[5]

In the Homeric poems there are no references to animal-shaped ends. The epithets that refer to the ends of the bow and of the stern are «ορθοκραιρά-ων» (with standing horns, Σ3, Τ344), «κορωνισι» (with curved upper ends, 17 references) and probably «αμφιελισσών» (with curved ends, 19 references), On the Geometric representations there is a similar but lighter construction, turned to the inside of the ship, that also corresponds to the Homeric epithets.

The interpretation of this part of the ship is rather puzzling. What is derived from the representations are its huge dimensions (very wide 5% of the length of the ships and high as the examples of Kynos, Tragana, Asine, Skyros vase paintings show, Fig. 2,3,7,1,54) and its V-formed shape with the *edge at the bow (akrostolion from Kynos, Kynos A, Oropos, Mycenae, Asine* models, Fig. 7,8,9,11). The height, the position and the form (even the position of the dotted row) are remarkably similar on the Tragana, the Kynos and the Skyros representations (Fig. 1,6,4). Regarding the major problem of the stability of such a high stem, whose end protrudes in front of the vessel, when confronted with the strong Aegean winds, we assumed that apart from its aesthetic formation, it should in no way hinder the sailing but rather facilitate it.[6]

This raised bow construction can be traced back to the Early Cycladic representations. It has been a question for decades whether this is a bow or a stern and it seems that the data alone cannot give the answer.[7] S. Bisiotis and C. Govotsos of our team using the aid of the technical studies and the modeling experiments concluded that:

1. According to the laws of physics, when the wind blows, a raised construction on the one side of an object tends to turn it, so that the high

end always stands at the front side of it and the wind blows behind it. The raised construction of both the Early Cycladic and the Mycenaean ships, no matter which side of the ship is placed (bow or stern), turns the ship so that it always stands at the bow, while the wind blows behind it.

2. The resting moment arm is increased in the Mycenaean ships by the V-shaped raised bow construction and the protruding vertical surface at its top (the akrostolion). The same effect is achieved in the Early Cycladic by the raised bow construction and the stern protrusion.
3. The raised bow construction alone propels the ship taking the position of a jib, given the fact that the sail could not be used with a relatively strong wind (over 4-5 Beaufort).
4. If there was not this high bow, the wind would turn the boat so that the hull lies parallel to the waves. Then the waves would overflow it and it would be in the danger of sinking.[8]

These rules of aerodynamics have a wide application in sailing even today, by the use of the jib, the butterfly setting jibs and the rotating mast that pull the boats.

This bow construction could be in the position of the Homeric «ξεστόν εφόλκαιον». In the relevant topic (ξ350) a prisoner escapes from the «εφόλκαιον» of the beached ships, while the crew was dining at the beach. As the ships were beached stern first, the best way to escape was the bow. The word «εφόλκαιον» etymologically means pull behind, which is exactly its function in the Mycenaean ships.[9]

Consequently, apart from its aesthetic form (may be animal head) the raised bow construction had a very significant use, absolutely essential for navigation in the Aegean waters.

THE STERN

In the Mycenaean representations the curved sternpost raises to a lower height than that of the stem. In the epic it is mentioned that during a fight at the Greek ships ashore Hector held the «άφλαστον» twice with his hands and he tried to cut the «άκρα κόρυμβα» (upper decoration) (O704, O716-717). Consequently the height from the keel to the upper sternpost can be determined at about 2 meters.[10]

Similar forms of the sternpost occur in the Geometric representations.

THE IKRIA

In the Mycenaean representations the ships have a fore and aft platform with balustrades above the level of the gunwale. The aft deck is the position of the helmsman and of the handlers of the brails (as it is shown on the Tragana and the Kynos A depictions, Fig.1,2) and the fore deck for the warriors (Kynos ship representations, Fig. 2,3,6) and the anchors (Tragana depiction, Fig.1).

The warriors on the Kynos paintings stand at a different level than that of the oarsmen. Do they stand on a full deck? This assumption cannot be supported. In the Homeric poems the bow and stern ikria are mentioned many times (μ229, ν73-75, β415, o285, μ414) but never full decked ships. This is compatible with the information from Thucydides (A10) about the absence of full decked ships at the time of the Trojan War.

As the possible central or lateral corridors are not depicted on the side view of the ship representations, their probable existence has to be concluded from other indications. It has been suggested that the semicircles represent the torso of the oarsmen. If their heads are hidden behind the screen, then the warriors can only stand on a central and not on lateral corridors. We believe that they do not render human beings[11]. Lacking any indications of the human character, these semicirculars repeat the shape of the side view of the shields. We have come to the conclusion that there were side corridors because of two different references in the epic: the woman that was struck by Artemis (o478-479) and the sails during a storm (μ410-411) fell directly into the bilge. This wouldn't be possible if there was a central corridor. The side corridors are necessary for the handling of the brails, particularly when the loose-footed brailsail is used. They also facilitate the movement of the crew from bow to stern.

In the epic the stern ikria, that should be wide enough for Odysseus to sleep on (ν73-75), is the position of the captain (μ414).

In the Geometric representations there are also ikria at the bow and the stern. There are also similarities in the position of the warriors.

THE HULL

The hull of the Mycenaean oared ships is elongated[12] and characterized by a zone of vertical and horizontal lines between the bow and the stern. This has been interpreted as:

1. Oars. However in the representations the oars are clearly distinguished from these vertical lines with oblique parallel lines that transect the hull (as the examples of Kynos A and C, Phylakopi vase paintings show, Fig. 2,3,15).
2. Crossbeams and rowing thwarts. This converges with the Mycenaean pictorial style where the side and the overview are not shown together.[13]
3. Stanchions. They are necessary for the support of the gunwale and the side corridors and they also have the role of interscalmia. On the Kynos vase paintings, where the rendering of the ships is more realistic, the hull, the zone of the stanchions where the oars are attached (also

tholepins?) and the screens are clearly distinguished.[14]
In the epic the ships are often characterized as «πολυκληισι» (with many tholepins, υ382, B74,175, H88, Θ239, N742, O63, Ψ248) which corresponds to their characteristic picture.
In the Geometric representations the zone of the vertical lines exists.

THE ROWING EQUIPMENT

The number of oars in the Mycenaean representations (9-26) can correspond to 20/oared (α280, δ778, β212, δ669, A309) and 50/oared galleys (B719, θ37) of the Homeric poems. The double decked or two-banked ships first occur in the Geometric depictions.

The rowing thwarts are not shown in the Mycenaean vase paintings and cannot be recognized with certainty in the models. In the Homeric poems the word «ζυγά», which is used for the rowing thwarts (ι99, ν21-22) means the connection between two parts, thus showing that the thwarts connected both sides of the hull as crossbeams. According to the epic they should leave enough space for a fastened prisoner underneath (ι99).
In some Geometric representations the oarsmen, the benches and the supporting stanchions are depicted.

THE STEERING OAR

In the Mycenaean representations a large oar with a triangular end is positioned at the stern and angled to the back.

Were there one or two steering oars? In the vase paintings only one is shown. But this could be due to the Mycenaean pictorial style, where only one of a pair of similar is represented or a small part of the hidden second (probably on the Asine ship, Fig. 5).[15] The two zig-zag lines behind the ships (Tragana, Gazi depictions, Fig. 1,191) could mean the traces of the steering oars in the water[16]. The existing mechanism for their manipulation has to be further investigated.
In the Homeric poems the existence of a steering oar is assured with the words «πηδάλιον», «κώπη», «πηδόν» (ε255, ε270, γ281), «οιήιον» (ι483, ι540), «οιήια» (μ217, T43). Although in most cases the singular is used, the crucial verse where the use of plural indicates the existence of two steering oars is the μ217.[17]
In the Geometric representations both one and two steering oars occur.

THE MAST

In the Mycenaean representations (Tragana, Kynos, Asine, Skyros vase paintings, Enkomi engraving, Fig. 1,2,5,4,14) a single mast almost amidships that raises a little higher than the stem is depicted. It has a circular

brail at its top, is embedded in a maststep and is supported by fore and back stays. In the Homeric epic there is also a single mast, standing in an «ιστοπέδη» (maststep, μ50-51, μ162, μ179) and «μεσόδμη» (β424, o289), supported by «επίτονο» (backstay, μ423) και «προτόνους» (fore stays β425, o290, A434) and recumbened in an «ιστοδόκη» (A434). The reference that when it fell it struck the captain's head (μ409-412), gives a height of, at least, half the length of the ship.
The Geometric representations give the same evidence.

THE SAIL

On the ship representations (Asine, Kynos, Phylakopi vase paintings, Encomi engraving, Fig. 5,18,17,14) the sail is rectangular, made from many pieces and hanging from a crossjack yard. It is the type of the loose footed brailsail, different than the boom-footed of the Minoan and the Theran ships[18]. In the epic the words «επίκριον» (crossjack yard, ε254, ε318), «υπέραι» (halyards, ε260 that are also indicated on the Tragana and the Kynos A depictions), «κάλως» (sailropes ε260), «πόδες» (sheets, κ32, ε260, b426, o291) assure the existence of the loose footed brailsail, that also continues in the Geometric period.

CONCLUSIONS

The thorough and comparative research of the sources supported by technical studies and experiments leads to the following conclusions:

A. According to the ship representations:

Obviously they are not accurate representations, but they are a description of the characteristic parts of the ships and a narration of their action (ships sailing, fighting, parading). Thus the artist had to render the essential characteristics of the ship in order to be recognized by the viewers. Consequently the study has shown that, although they come from different sites and different artistic styles or represent different types of ships, there are clear similarities in the general pattern and in the rendering of the essential parts of the ships (in most cases and in their analogies-dimensions), that also distinguish them from the earlier and the later ships. Most of the representations concern oared vessels, warships that are easily recognized[19]. Although there are obviously many types of ships, due to the lack of data it is not easy at the moment to support a further systematic taxonomy of the Mycenaean ships in more types.

B. According to the written data:

The study came to the conclusion that the information on the ships from the Homeric epic, as far as it can be tested by the archaeological data (LHIIIC and Geometric) is compatible with the LHIIIC ship representations.

Is it also compatible with the picture of the Geometric ships, given the similarities?

The criterion is the reference to the innovative elements of the Geometric shipbuilding in the Homeric epic: that is, the ram, the steps at the bow and the stern, the so-called "eyes" at the bow, the double decked or double banked ships. These are not mentioned in the epic. Either due to a systematic effort to avoid the reference of the Geometric innovations or due to the reliability of the oral tradition for the communication of the history at a time when writing was not widely practiced, the above conclusion remains.

C. According to the technical studies and experiments:

They clarified the form and the function of particularly significant parts of the ships and their continuity from the Early Cycladic period. They also proved the necessity of an interdisciplinary approach to this subject and of the continuation of the research through further experimenting and constructing. The study of the archaeological and the philological data by also determining the dimensions lead to the designing of a 20/oared Mycenaean warship and to the construction of an 1/10 scale model for navigational experiments.

We intend to proceed in the construction of a Mycenaean ship in full scale, capable to sail to Troy. This will not be a replica or a copy. It will be the product of a SYNTHESIS of the available data supported by relevant technical studies and experiments, the reliability of which will be constantly controlled by:

1. The consistency to the archaeological and to the philological data.
2. The use of LHIIIC tools and shipbuilding techniques or at least principles.
3. The endurance and the seaworthiness of the ship under construction.

We believe that this process will give answers or possible alternatives to some of the remaining open questions.

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* We thank Prof. S Wachsmann, Dr. O. Hoeckmann, Prof. Y. Kahanov and Dr. M. Wedde for their comments and particularly Prof. J. Morrison who accomplished his last visit to Greece, in Xylokastro, and spent some days discussing these matters with us.

The abbreviations follow the system of the American Journal of Archaeology. Since new evidence has answered old problems and has changed views, the references focus on the contradictory views of the recent writings and not on the earlier ones.

NOTES

1 The Mycenaean ship representations that are mentioned in this paper are to be found in the list below of the LHIIIB and C ship representations. The Geometric representations are to be found in the known relevant publications (Kirk 1949, Basch 1987, Morrison /Williams 1968 etc.)

2 The chronological parallels of the Egyptian ship representations show the introduction of the keel at a time synchronous to the Mycenaean (Landstroem 1970:70) and the Ulu-Burun wreck has revealed the remains of a keel/protokeel (Pulak 1999: 216-217, 223-224).

3 Although earlier studies (Morrison/Williams 1968: 7) supported the existence of a ram on Mycenaean ships, the revealing of new evidence threw more light on this question and the more recent literature excludes the use of the protrusion as a fighting ram (S. Wachsmann 1998: 157-158, L. Casson 1994: 51, F. Dakoronia 1987: 120, Korres 1985: 179, Palaeologou 1985: 222).

4 Some scholars (Wachsmann 1996: 539-573) recognize an animal head (bird head) figure at the upper protruding end of the stempost, for which there are archaeological parallels in the Greek art (Sakellarakis 1971). F. Dakoronia (1987:118-120) believes that the dotted row indicates a leather cover of the stem and G. Korres (1985: 187) investigates whether this is a rotating part, whose evolution can be traced in the LHIIIB and C ship representations and whether it is a boat, ladder or it is related to the Homeric "efolkaion".

5 Korres,1985: 180-181

6 As Steffy (1998:23) states "Ships and boats were always the means to an end, and usually that end was profit, convenience, security or victory. It is important that we understand this practical explanation for the existence of watercraft. Far too often they are placed on historical pedestals that tend to segregate them from fact, which clouds accurate interpretations of their true value to society. Ships and boats were merely objects used to accomplish specific ventures-nothing more, nothing less."

7 Since Tsountas (1899:91) first published the "frying pan" vases and claimed that the high extremity is the stempost, the discussion went on through the two different views. This is clearly shown in Johnstone's article (1973) and in Basch (1987: 87-89).

8 The role of the steering oar/s in the Mycenaean and of the oars in the Early Cycladic ships under these conditions has to be further investigated, since the optimum would be to avoid sinking, to continue sailing and above all to the desired direction.

9 We are tracing this origin in the word «φάλκης», an element that according to Polydeukis (Onomastikon A85-93) is adapted to the bow, of uncertain etymology for the scholars till now. We thank Prof. Mary Lefkowitz for her comments.

10 Morrison and Williams(1968:47), based on the same evidence, also estimate it to 7 feet.

11 The principles of abstraction in Mycenaean art and the personal stylistic preferences of the Kynos crater artist have to be taken into account when interpreting the scene. The aim of the abstraction of the forms in ancient Greek art is to simplify the details of the narration and to limit them to the most essential and indicative so that the viewer recognizes the object and reads the story. Although this is the probable position of the oarsmen, as the oars are attached to the stanchions, the semicircles lack any indication of their suggested

human character (Wachsmann 1998: 132, Dakoronia 1987: 119). This exaggerated curvature of the human body is not explainable. If they are oarsmen at the end of their stroke, why do not they incline backwards as it is realistic and occurs in the parallels of the geometric abstracted representations of oarsmen (see Basch 1987: fig. 338, 354, 356, 353, 357, 358, 384, 385, 386)?

But the most valid comparison is to be done with the work of the same artist. The Kynos crater artist includes in his paintings whatever is essential in order to recognize a helmsman, a warrior and their act. The most close parallel to the role and the act of the oarsmen is the helmsman (Wachsmann 1998:132, Dakoronia 1987:119). But he differs in three crucial points from the suggested oarsmen: Very short but crucial lines show the most indicative characteristic, his arms handling the steering oar. The shape of his torso inclining forward is realistic. While most semicircles of the "oarsmen" narrow and often end before the base of the stanchions, his torso narrows only a little and continues to his fleshy legs.

But the main argument against this interpretation is given by the second sherd of the same crater, showing a ship eraldic (bow) to the first (Fig. 16). The semicircles on both ships have the same direction. It is obvious that the shape of the body leaning forward and inclining backwards cannot correspond to semicircles of the same direction.

On the other hand the semicircles seem to repeat the form of the side view of the shield. There are examples of protective covers (askoi, bags, leather screens, shields) on that part of the hull. There are parallels that show shields at the sides of the ships (bireme from the palace of Senacherib, British Museum, Basch 1987: fig:379) and particularly at the position of the oarsmen (attic hydria, 6th c., Louvre E735, ivory plaque from the Temple of Orthia Artemis of Sparta, National Museum of Athens, metope from the Treasure of Sikyone, Delphi, see in Basch 1987: fig. 460, 506, 504) and under the gunwale (vase painting from the Akropolis, National Museum of Athens 251, bronze fibula from Boeotia, Berlin 31013, see Basch 1987: fig. 377, 404). But it must be noted that in all known examples the shields are rendered in front view.

12 The representations are compatible with the reference in Thucydides about the long ships of the Trojan war (A14).

13 The Mycenaean vase paintings known till now (Vermeule/Karageorgis1982) show that there is not any example of such a representation.

14 S. Wachsmann (1998: 131-132, 155) after studying the available data came to the conclusion that this zone of stanchions (that resembles a ladder lying horizontally in its side) is characteristic for the Mycenaean ships.

15 Vermeule/Karageorgis 1982, Gray 1974.

16 Korres 1985:199.

17 Since the evidence does not lead us with safety to a conclusion, we experimented with full scale traditional Greek sailboats on the use of one and of two steering oars for the steering of the vessel. Our first experiments have shown that the steering of such a vessel with one oar is possible. If this is also the case for the Mycenaean ships, the probable function of the two oars not only for the steering but for the facilitating of windward sailing has to be further investigated.

18 Wachsmann 1998: 142 fig.7.29.

19 Some scholars (Basch 1987) recognize in the Skyros and in one of the Hyria engravings merchantmen due to the shape of their hull.

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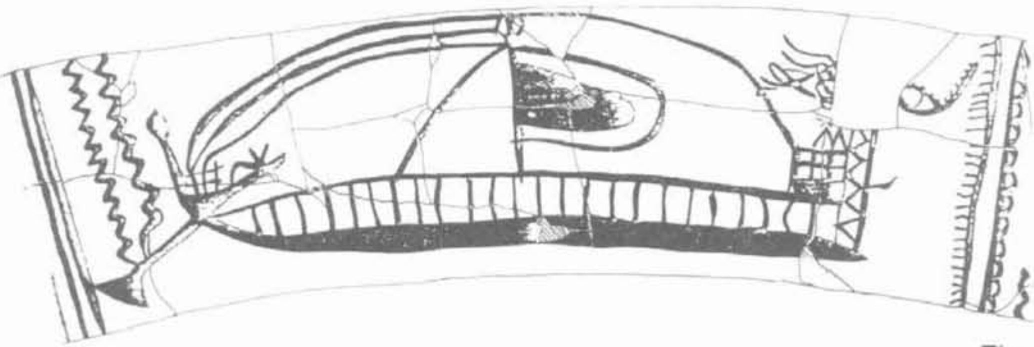

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Fig. 2

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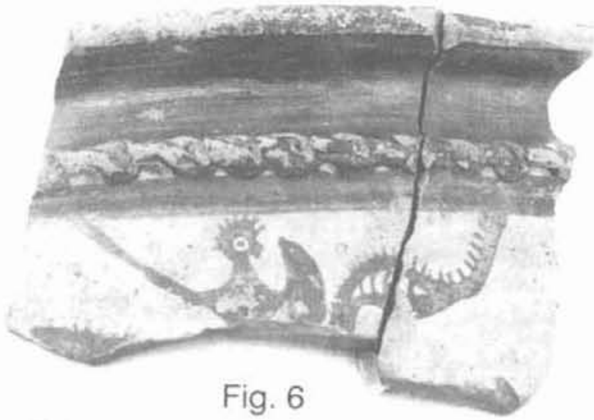

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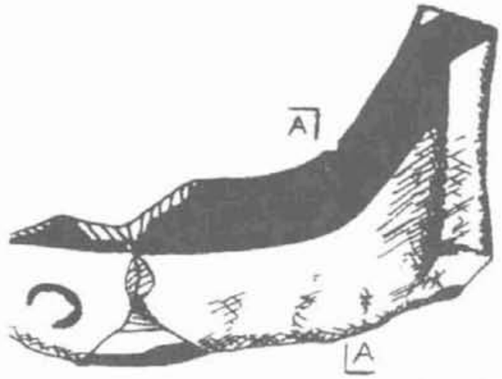

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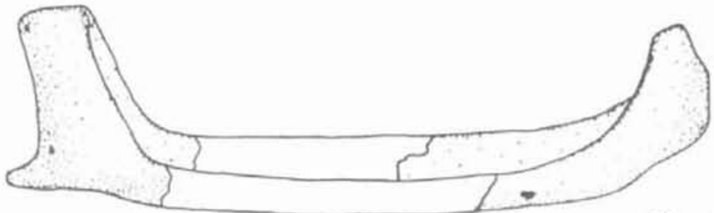

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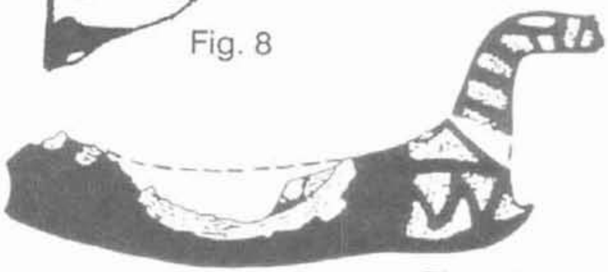

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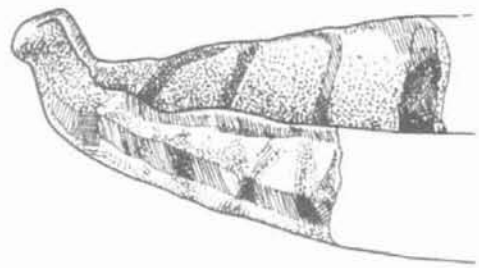

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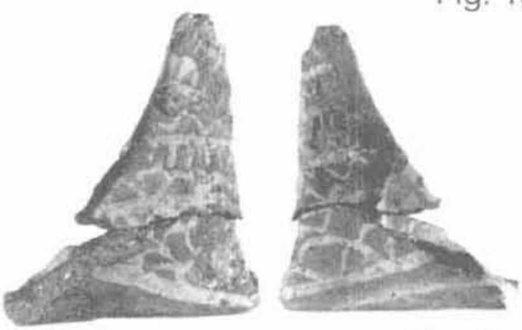

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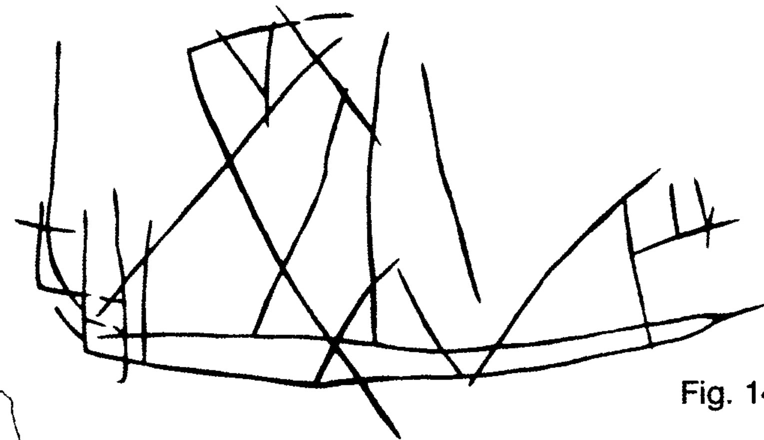

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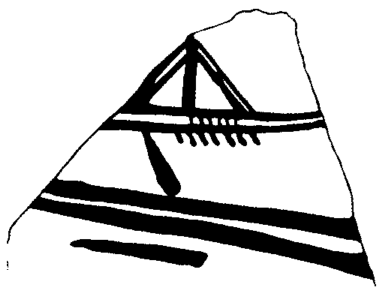

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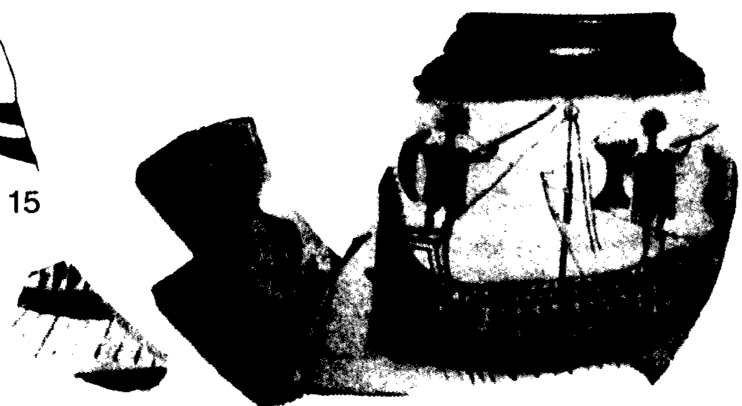

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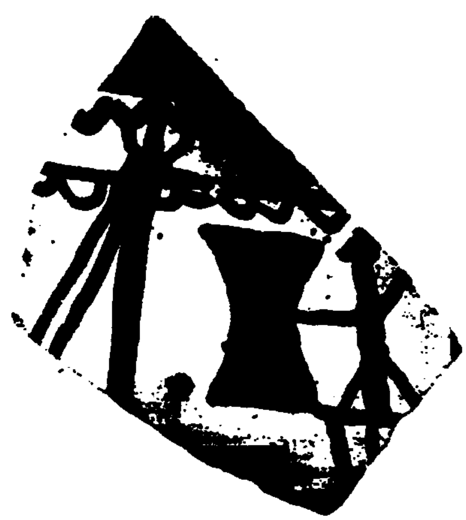

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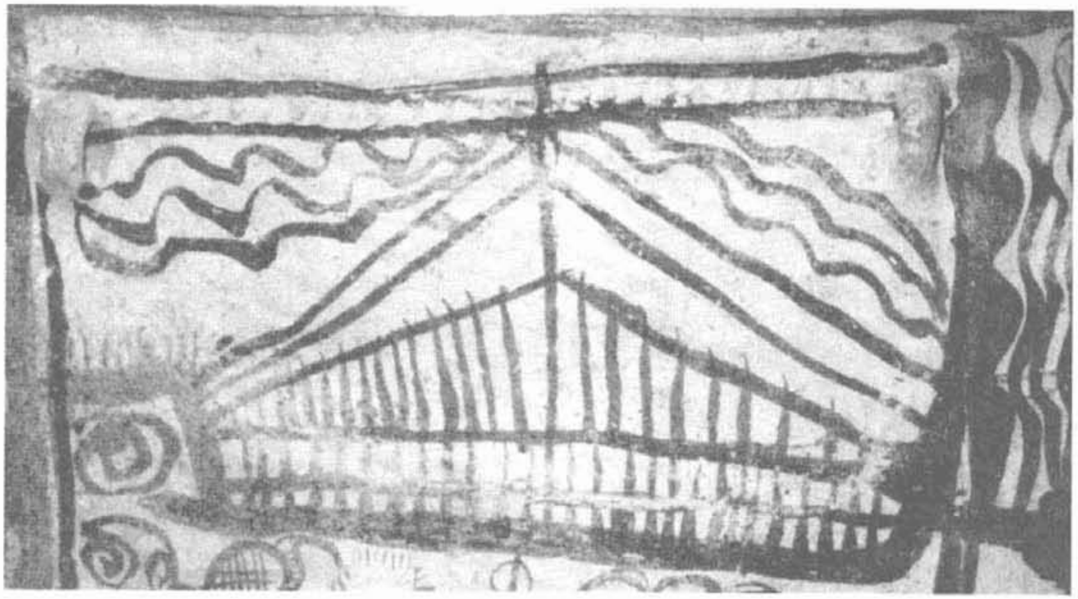

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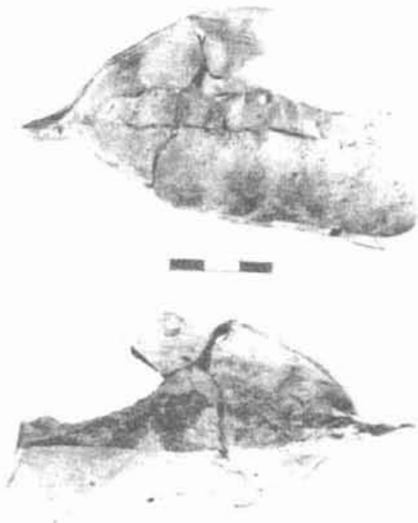

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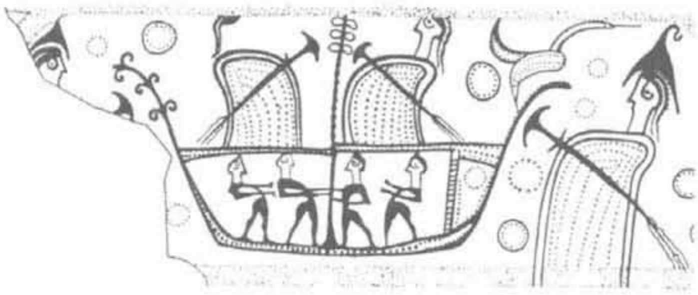

Fig. 22

Fig. 23

ROMAN BRONZE LAMPS IN THE FORM OF A SHIP FROM THE TERRITORY OF SERBIA

In the period of Roman domination navigable rivers of the Serbian Danube area were of great importance in military and economic respect. Contrary to this there is a scarce number of objects with representations of ships found in museum collections, which is doubtlessly for the most part a result of insufficient investigation of the territory, and especially of major military fortifications and city centres. Objects described in this paper do not originate from archaeologically investigated sites but represent chance finds.

From the territory of Viminacium, the largest urban settlement in Upper Moesia and an important military centre, originates the front part of a Roman ship made in the technique of casting in bronze, the preserved fragment of which is 15cm long (fig. 1). The prow is of convex shape; the top, slightly bent to the inside, ends in a realistically shaped eagle's head. Bird feathers run down to the height where two parallel horizontal ribs are visible. The ship had a rostrum, the end of which is modeled in the shape of a duck's head. Behind the duck's head, on both sides of the rostrum, there are plastic representations of Greek letters: letter L on the left side and Y on the right side of the ship. The letters could be the initials of the craftsman who made this object. The profiled upper rib of the deck is preserved only close to the prow. There is nothing on the preserved fragment of the ship to indicate that the upper surface was closed, that is, that the deck existed. From the keel the sides of the ship rise at sharp angle. An extremely narrow hull shows that it was a warship designed for quick action.

The preserved fragment has no elements to allow any definite conclusion on whether it was a lamp in the form of a ship or only a model of a ship. The object could not stand by itself because of the sharp end of the bottom, which suggests the first hypothesis that it was a lamp designed to be suspended.

The remains of the bronze ship were found on the site of Æair where, according to the authors who studied the topography of Viminacium, the central part of the civil settlement was situated[1]. Archaeological research has not been carried out, but some elements allow some hypotheses to be made with greater certainty. At the same site from which the ship originates, an altar was discovered, with the inscription mentioning nautarum quinquenalis who contributed 2000 sestertia for the restoration of Neptune's temple (restaurationem templi Neptuni)[2]. The high quality of manufacture and the dimensions (length of the ship was doubtlessly over 40cm), as well as some analogous examples[3], indicate that the object could have been connected with the remains of the temple, namely that the ship was a votive gift to the deity to which the temple was dedicated. Probably both the altar and the bronze vessel, irrespective of whether it was a model or a lamp, were situated in the temple to Neptune.

Although only partially preserved, this object shows a high quality of manufacture and solid knowledge of ship lines. On the basis of stylistic features, shape of rostrum (single pointed ram) and historical circumstances, manufacturing of this ship could be dated to the beginning of the 2nd century AD, the period of Trajan's military campaigns in the wars against the Dacians. It is the historical moment which allows and supposes navigation of a warship of the Roman fleet on the Danube, but also the happy ending for this period of turbulent events could have been the cause of placing this votive object.

From the municipal territory of classic Naissus there originates a completely preserved bronze lamp modeled in the shape of a minor vessel (fig. 2)[4]. Its lenght is 12.5cm, and its height together with the figure is 9cm. The prow is modeled in the shape of ram's head and is completely adapted to the function of a lamp. Its upper part contains a circular opening for pulling through the wick. The disc is rectangular, lined with a plastic rib, and in the middle of it there is an applied standing figure of a legionary who holds a stern oar in his right hand, and with his left hand supports a helmet at the plumage of which the remains of a ring used to hang the lamp can be traced. A rectangular opening for pouring oil is situated beside the left foot of the soldier. The stern is convex, with the top bent to the inside of the vessel. Details of the soldier's face and details on the stern are summarily modeled. On the basis of analogies with paterae the handles of which end in ram's heads, this lamp is dated to the 3rd century.

Here it would be interesting to mention the inscription on funerary stele of a navy recruit of the legiae VII CLAUDIA, also discovered in Naissus, on the basis of which the conclusion can be made that a certain number of soldiers was trained to serve on ship, namely that legionaries were recruited to serve in the fleet[5]. It is possible that the owner of this bronze lamp in the form of ship was one of them.

Workshops for manufacturing objects of metal on the municipal territory of Naissus are confirmed in historical sources in the period of the 4th century, but had doubtlessly existed even before that; it is indicated by numerous and various material with local traits from the antique necropolis of Naissus[6]. This lamp should be linked to one of these workshops.

A lamp modeled in the shape of a ship with ten fire openings was discovered by accident on the site of Mezul, on the occasion of agricultural labour, when two of its fire openings and the prow area were damaged . The lamp was cast of bronze, with the weight of 4.875kg, length of 41.5cm, width of 23cm, height of 17cm, and it could contain 0.5 litres of oil[7]. It is modeled in the shape of a ship with a wide hull and a semi-roundish keel from which convex prow and stern areas are distinguished (fig. 3). The prow ends in two plastically profiled rings, while its top is horizontally levelled in the same way as in the stern part, which is somewhat higher than the prow. On the upper surfaces of the prow and the stern there are holes which show that the ship was originally decorated with some of the traditional ornaments. The prow area is connected with the upper edges of the deck by two bars with incised paralel grooves. One of the bars is broken, while the other one preserves remains of the ring and the chain which were used for hanging the lamp. The form of merchant ship of the type «corbita» is broken by the rostrum situated too high, almost at the level of the upper edge of the deck. It is modeled in the shape of a sea-monster from whose jaws the head and torso of a man stick out. In the middle of the ship a bench is placed transversally, with the hole in the middle, through which the mast, not preserved today, protruded. The bench in the stern area of the ship is a little slanted and some elements indicate that there could have been a figure of a helmsman fixed to it. On the right external side of the ship the stern foot with a round enlargement at the upper end is preserved. On it the remains of the ring and chain for hanging can also be found. An element of probably identical shape was situated on the left side of the ship as well, but it has been broken off. Most probably the ship had no deck. Five pentagonal fire mouths are situated on both sides of the ship.

The location of the rostrum, almost at the level of the upper edge of the deck, as well as its shape, indicate that it represents an artistic detail used to present a segment of the story about the prophet Jonah. The moment in which the sea-monster cast up Jonah from its belly is accompanied by scenes with sea animals in shallow relief on the sides of the ship: dolphins devouring little fish and cuttlefish. In favour of the opinion that the lamp shows a segment of the mythological story of Jonah are two representations from relatively close territories, where the ship also represents the central element: on the plate from Podgorica[8] and on the so-called Jonah's sarcophagus discovered in Belgrade[9].

On both sides of the prow and stern area of the ship from Mezul there is the inscription: In domu dei Termogenes votum fecit. The inscription indicates that the lamp was a votive monument of private character. The letters of the text paleographically belong to the 3rd - 4th century, so the fact that the dedicator is recorded only by his first name was the result of general changes in the system of Roman nomenclature in the Late Empire[10]. The term «domus» for church occurs frequently only in Asia Minor and Syria, which probably indicates the origin of the dedicator himself[11]. The fragment of the story of Jonah and the mention of God's temple indicate the period of early Christianity and connect this lamp with cult practise of the period in which it was made.

A similar lamp from Rome, but with four fire openings, dated to the second half of the 3rd century, is also of cult character[12], while the specimen from Berlin is only roughly dated to the 4th - 5th century[13]. Ship representations of similar shape occured on tombstones and sarcophagi of the 3rd century, but also on the coins of Diocletian and Maximilian of the year 306[14]. To this approximate period, the second half of the 3rd and the very beginning of the 4th century, the lamp from Mezul can also be dated. We consider that it was manufactured in some of the workshops active on the municipal territory of nearby Viminacium[15]. The dedicator Termogenes, who ordered its manufacture, probably belonged to Syrian diaspora, the existence of which in Viminacium was assumed on the basis of epigraphic monuments[16].

Two money hoards, dated to the years 247 and 250, discovered on the same site, open the possibility that the lamp had been hidden in the time of Decius Trajan's persecutions of Christians[17]. However, the lamp could have been linked with the remains of the building, that is, the temple where it had been originally placed, since numerous remains of building material from the Roman period were discovered on this site. Nevertheless, considering that archaeological excavations have not been carried out, both hypotheses remain open.

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NOTES

1. Popović 1968: 29-49. Mirković 1968a: 58-63.
2. Inscription is dated to the end of the 2nd century A.D. Mirković 1968a: 35. Mirković 1968b: no. 61.
3. Basch 1987: 455, fig. 1011.
4. Drça 1983: no. 48.
5. Petrović 1979: no. 31.
6. Jovanović 1978: 102.
7. Pavlović 1967: 124-129.
8. *Istorija Crne Gore* I 1967: 264.
9. *Istorija Beograda* I 1974: fig. 5.
10. Popović 1970: 323-329.
11. Mirković 1976: no. 83.
12. Carolis 1982: Tav. XXVII.
13. Nikolle 1996: 276. The object (Staatliche Museum, inv. 4228, Berlin) was probably lost during the Second World War.
13. Basch 1987: no. 1081,1083,1088,1077.
14. Karović 1995: 223.
15. Mirković 1968a: 69.
16. Mirković 1976: 90.

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Popović, V. 1970 Ranohrić canska bronzana lampa iz okoline Smedereva, *Starinar* XX, Beograd.

LIST OF ILLUSTRATIONS

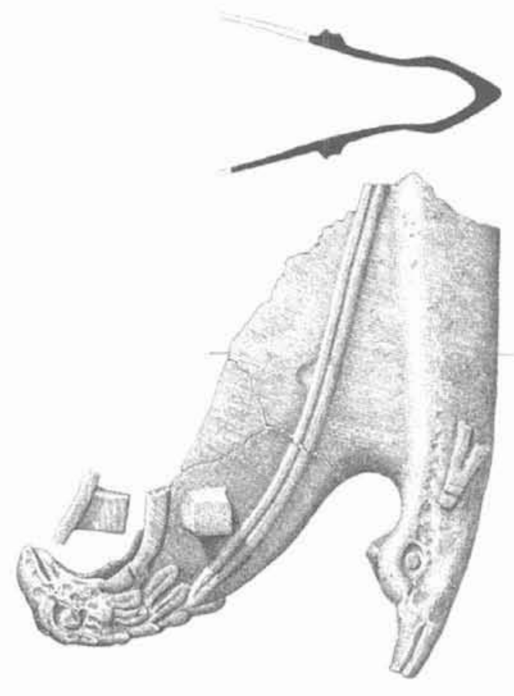

Fig. 1

Fig. 2

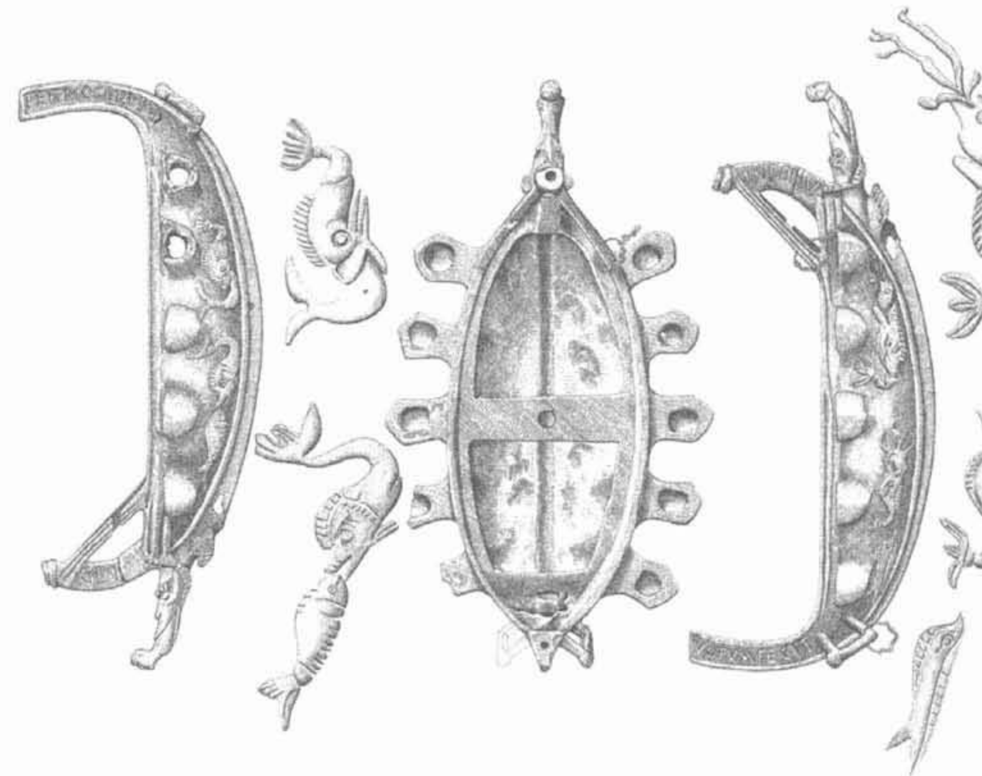

Fig. 3

SEAFARING BETWEEN JUDAEA AND ROME: JOSEPHUS FLAVIUS ON HEROD'S TRAVELS AT SEA

The Roman conquest of Palestine in 63 BCE and the creation of the province of Judaea opened for its inhabitants larger horizons also in the maritime field. Ships and navies had a growing effect on the coast of the Levant since the Hellenistic era, but their activity was mostly confined to local or regional events and conflicts. We know less than expected about seafaring in Palestine in a large, Mediterranean, context, perhaps because Greco-Roman writers were not so inclined to focus on maritime themes in the history of the country.

Information on maritime activities in Roman Judaea since the first Century BCE derives mainly from various literary sources originating from inside and outside the province. We still lack archaeological evidence on the nautical history of Palestine of the type and importance of the Athlit Ram and the Ma'agan Michael Wreck. These two major underwater discoveries of the 1980s in Israel have added fundamental knowledge on ships, trade and naval warfare between late Persian and Hellenistic periods (5^{th} to 3^{rd} Cen. BCE).

This paper deals with two specific accounts of King Herod's travels, as seen by Josephus Flavius, who remains the principal ancient source for maritime and nautical aspects of Roman Palestine. The descriptions of Josephus are examined from a historical and literary perspective: on the one hand, as information relevant to maritime routes and seafaring practiced between Palestine, Asia Minor and Italy, and on the other, as part of Josephus' style, reflecting his perceptions of King Herod and his leading role in the relations between Judaea and Rome.[1]

The two journeys discussed below belong to a period of struggle for political power during the generation that followed the conquest of Pompey. During that period, Herod became gradually convinced that personal ties with Rome were an indispensable condition for improving his own status and that of his kingdom.

The Journey to Rome (40-39 BCE):

Herod's first documented travel at sea dates to 40 BCE, and is situated by Josephus after the Parthian invasion and the dramatic family conflicts which end with the imprisonment of Hyrcanos II and Phasael, his brother. Disappointed by the unwillingness of Malchus, king of the Nabataeans, to support him financially, Herod decides to leave the country in the direction of Egypt.[2]

The main stages of his journey can be briefly outlined in their chronological order. Advancing along the southern coast of Palestine, Herod stops at Rhinocorura (modern El-Arish) and Pelusium, two coastal cities and ports situated along the continental and maritime route that connected Palestine and Egypt. Though delayed for strange reasons «by the ships anchored» in the port of Pelusium, Herod manages to embark a ship and sail to Alexandria, where even Cleopatra is not able to stop him from continuing immediately towards Rome.[3]

The preliminary stage thus contains basic nautical information on the sailing conditions between ports and sites of the «southern route» that leads to the principal part of the journey. The text says that in Alexandria Herod boards a vessel going to Asia Minor, despite being in a hurry to leave for Rome. It can be suggested that the reason for the change was simply the lack of an available and suitable ship going directly to Rome, as well as bad weather conditions in winter. This means that even the major port of Alexandria, a focal point of sailing routes, could not offer or ensure regular vessels to all destinations, including Rome. The ship in question makes its way to the Pamphilian coast,[4] where it is dramatically saved from a threatening storm and arrives at Rhodes. In the last part of the journey, Herod orders the building of a trireme for himself, crosses from Rhodes to Brundisium, and continues by land to Rome, to meet Antony.[5]

The geographical and nautical details of the itinerary brought by Josephus seem on the whole reliable, and correspond to what is generally known about routes and sailing experiences of the period.[6] However, one should remember that the main objective of Josephus is not to inform his readers about exact nautical conditions of the voyage between Judaea and Rome. He is rather concerned with showing Herod as the leader who built up his political image and career through his presence and direct contacts in Rome.

In fact, during his meeting with Antony, Herod refers to the risks and difficulties he had encountered on his way as a convincing argument of his persistence in maintaining the loyalty to Rome. More than just a courageous traveler, Herod wishes to prove himself as an ally and a future leader.[7] The visit to Rome proves a success, and brings a quick recompense: during the short stay, Herod receives the supreme recognition of the Senate and is declared King of Judaea.[8]

Josephus also makes mention of the journey back from Italy to Akko-Ptolemais, chosen as port of destination due to Herod's affairs in the Galilee. The decision to land there probably points to the predominant status of Ptolemais as the principal maritime city and port of Northern Palestine.[9]

The Journey to Asia Minor (14 BCE):

The second detailed account of Herod's sea travels[10] is set in the context of the consolidation of power and his building projects throughout Judaea, in the first place the Temple in Jerusalem. During the concluding phases of the construction of the harbor at Caesarea Maritima, Herod lives through one of the most intense moments of his career as ruler and builder.

The beginning of Book 16 of the Jewish Antiquities tells of the warm hospitality and honors bestowed by Herod on Marcus Agrippa, a close colleague. The festivities he arranges include, among others, visits to Jerusalem, Caesarea and the royal fortresses. This is a prelude to Herod's forthcoming journey, as well as to the special relationship he establishes with Agrippa's heirs and the Roman emperors several decades later.[11]

Despite his desire to stay longer and enjoy the hospitality offered by Herod, Agrippa is obliged to sail quickly to Ionia, as winter is approaching. This emphasizes Agrippa's – and other leaders' – knowledge of the limited sailing possibilities, especially during the winter journey from Palestine. Herod, on the other hand, can permit himself to postpone his departure, and prudently waits for spring.[12]

A look at Josephus' detailed account of Herod's voyage reveals several interesting facts: the journey begins at the islands of Rhodes, Kos, Lesbos, and Chios, where, delayed by the northern winds, Herod decides to use the opportunity to donate resources for public institutions. His wish to appear as supporter and benefactor to cities and populations of the Jewish Mediterranean Diaspora evidently adds a significant dimension to the entire trip.[13]

The second part of the journey leads Herod to the Northern Aegean and via the Bosphoros to the Black Sea,[14] as far as Sinope; the reason for choosing such an exceptional route is explained by Herod's desire to meet

Agrippa. For Josephus, this is yet another occasion to praise Herod for having made the effort of travelling by sea, and through this expressing his loyalty and friendship to Agrippa.

For the last part of the journey, instead of returning from Asia Minor by sea, Herod and his company decide to travel by land across the provinces of Paphlagonia, Cappadocia and Phrygia.[15] The change of itinerary is not explained and seems to be related to Herod's intervention in the problems of the civic status of the Jewish communities of Ionia.[16] The way home passes by sea from Ephesos to Samos and to then directly to Caesarea in Palestine.[17]

Josephus, Herod and the Sea

These two detailed accounts of Herod's travels at sea suggest several points of discussion concerning Herod in general, his political motivations, and his historical image, as understood and presented by Josephus.

The texts convey the relative importance attached by the historian to the maritime factor in the career of Herod, a dominant sovereign in Greco-Roman Palestine. Josephus had no particular interest in dealing with nautical affairs or with technical questions of seafaring. On the contrary, his personal experience at sea was quite traumatic, if we credit his story in *Vita (The Life)* about the shipwreck in the Adriatic from which he was saved.[18] We should recall that Josephus' expressed aim was to write about the Jewish people, and to draw the necessary moral lessons from the encounter and conflicts with its rivals. His special interest in the background and causes of the Jewish war against the Romans led Josephus, the military commander and engaged historian, to admire the personality and achievements of Herod the Great.

Indeed, Josephus saw in Herod the leading figure of his age, one who embodied the characteristics of an optimal ruler and statesman. The historian and his main hero shared a similar cultural identity: both were Jewish leaders inspired by Greek and Hellenistic values, as stated by Josephus himself in the epilogue to his major work.[19] Both also developed pro-Roman views that became a decisive element of their careers.[20]

Embarking on his trips, Herod fully experienced the challenges of sailing along the maritime routes that connected the eastern provinces of the Mediterranean, Asia Minor and Rome. For Herod, as well as for his descendants Archelaos, Marcus Agrippa and Herod Antipas,[21] travel at sea transformed the geographical and nautical adventure into a repeated practice of political engagement vis-a-vis the Roman Empire.

In effect, Josephus tried to focus attention on the success of a Jewish ruler who cleverly chose from an early stage to cooperate with Rome, the dominating power of his world. Josephus also provided an example of the opposite strategy from a later date: the fall of Jaffa (67 CE) is a famous story where the initiative to oppose Rome at sea ended in total destruction and in a large number of victims. According to Josephus, Jaffa's destiny was determined simultaneously by the forces of nature – winds, waves and rocks – and by the superiority of the Roman fleet.[22]

In conclusion, one may define the "maritime affinity" of Herod in terms of awareness of the role of shipping, seafaring, trade and transport and as part of his political, economic, and cultural attitudes. The marine motifs on the coins of the Herodian dynasty probably reflect a similar consciousness of the importance of ships and seafaring as part of political power in the Roman Mediterranean.[23]

The presentation by Josephus of *Sebastos*, the prestigious harbor of Caesarea Maritima, can be considered from a similar perspective. In size, investment, as well as in military and economic significance, *Sebastos* was an imperial project, unrivaled at least in the Eastern Mediterranean. Josephus' reliability as the unique literary source for its construction was confirmed, long ago, by the archaeological excavations in Caesarea. In the beginning of the detailed description in Jewish Antiquities, Josephus associates the dimensions of Herod's harbor with the memorable Piraeus,[24] and not with Alexandria or Ostia. Piraeus is a remote reminder, but for the Greek and Hellenized readers of Josephus it is still a model of the port that ensured the Athenian thalassocracy four centuries earlier. The harbor of *Sebastos* is essentially a technological achievement of Herod that suits his glory and contribution to the destiny of his country. Beyond that, it combines with the travels at sea to emphasize Herod's correct political and economic choices in the maritime sphere of action.

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NOTES

1 There is a vast modern literature on Josephus and Herod, see the selection of studies cited in the bibliography, especially: Stern 1974; Feldman 1984 and other works of the author; Mader, 2000.
2 *Jewish Antiquities* (hence: AJ) 14.330-373.
3 AJ 14.375-376.
4 Similar information on sailing conditions off Pamphylia and a ship from Alexandria appears in Paul's journey to Rome, *Acts* 27.5-6.
5 Ibid, 378. A unique reference for Heord's initiative to build ships; cf. his help to the naval constructions of the Rhodians, *Jewish War* (hence: BJ) 1.424.
6 J. Rougé, 1966 *Recherches sur l'organisation du commerce maritime en Méditerranée sous l'Empire romain:* 85-93 discussed the 3 main routes of the Eastern Mediterranean. For travel in general, L. Casson 1974 *Travel in the Ancient World,* London: 149-162 and Casson 1986: 270-299. On the «connectivity» in the Mediterranean see recently: P. Horden/ N. Purcell, 2000 *The Corrupting Sea. A study of Mediterranean history,* Oxford: 123-152.
7 Ibid, 380.
8 Ibid, 381-389.
9 Ibid, 394; BJ 1.290. On Ptolemais' central position, see: N. Kashtan, 1988 «Akko-Ptolemais: A Maritime Metropolis in Hellenistic and Early Roman Times, 332 BCE - 70 CE, as seen through the Literary sources», *Mediterranean Historical Review,* 3: 37-53.
10 AJ 16.16-29; 62.
11 AJ 18.155-162.
12 Similarly, Caligula's advice to Agrippa in 37/38 CE concerning his trip back from Rome to Alexandria, Philo, *In Flaccum,* 26; Casson 1986: 297-299.
13 On sources for the Jews of Asia, criticizing the evidence in Josephus: Barclay 1996: 259-281.
14 Casson 1986: 289-292 and notes 89, 93.
15 The only comparable journey by land and sea through provinces of Asia Minor is Paulus' second journey, *Acts,* 17-18.
16 Josephus devotes a long chapter for the encounter in Ionia, AJ 16. 27-61. Herod presents himself as the protector of the Jews in Asia in his report to his people in Jerusalem, Ibid, 63-65. Cf. the donations to many maritime cities of Asia Minor, BJ 1.422-425.
17 Ibid, 23; 62. The landing in Caesarea is among the indications that the harbor was already in use about 4 years before its official inauguration (10 BCE)
18 *Vita,* 13-16. Including the doubtful information on the size of the merchantman and the number of passengers (600). See Casson 1974: 156; Casson 1986: 270-273.
19 AJ 20. 259-268.
20 Josephus' literary and psychological treatment of Herod in general: Villalba I Varenda 1986: 81-88.
For ideological and historiographical aspects: Vidal-Naquet 1977: 9-30. For Josephus as a pro-Roman, Cohen 1979: 152-160.
21 Other travel accounts of Herod's descendants in Josephus: Herod Archelaos: AJ 17,219-222; BJ 2.14-18. Marcus Agrippa I: AJ 18.155-162; Herod Antipas: AJ 17.224, BJ 2.20.
22 BJ 3.419-431.
23 Jewish involvement in seafaring: N. Kashtan, 2000 «Seafaring and the Jews in Graeco-Roman Palestine: Realistic and Symbolic Dimensions» *Mediterranean Historical Review,* 15/1: 16-28.
Marine motifs on coins: A. Ben-Eli 1975, *Ships and Parts of Ships on Ancient Coins,* Haifa, nos. 38-42; Y. Meshorer 1982 *Ancient Jewish Coinage,* New York, Vol. 2, Pl.1 No. 5, Pl. 2, Nos.1722, Pl. 4 and 5 Nos.1-5, Pl.13 No.18.

24 AJ 15.332 cf. the description in BJ 1.408-415.

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ILLUSTRATION

The itinerary of King Herod's two journeys.


Rome
Italy
Sinope
Chios
Samos
Ephesus
Pamphylia
Rhodes
Ptolemais
Pelusium
First journey
Second journey

THE SHIP RENDERINGS OF THE NORDIC BRONZE AGE – DIFFERENCES AND SIMILARITIES WITH SHIP RENDERINGS OF THE MEDITERRANEAN

Bronze objects and rock carvings of the Nordic Bronze Age have yielded thousands of ship pictures, probably the largest prehistoric «ship register» of the world. Ships on rocks are found in many parts of Denmark, Sweden and Norway, though in Denmark not so numerous as in the other Nordic countries, since larger suitable rock surfaces are only found on the Baltic island of Bornholm. Elsewhere in Denmark glacial erratics were used. The number of ship renderings on bronze objects are generally much lower, in Denmark however higher than the number seen on the rocks. The ships on bronzes – for instance on razors, knifes and neck-rings – have their main distribution in Denmark, where more than 800 ships are known from 420 bronze objects (Kaul 1998). Far less numbers are known from Sweden and Northern Germany.

The ship pictures of the Nordic Bronze Age may represent a number of vessel types, from small boats to larger ships (Coles 1993). Even though the ship renderings of the Nordic Bronze Age are rather simplified or stylised, they are always seen in profile, and it seems apparent that we can speak of some basic characteristics which change through time. Since most of the ships of the Mediterranean are also shown in profile it seems possible, at least on a certain level and referring to certain features (even though the construction technique itself could have been very different), to make some comparisons between Nordic and Mediterranean ships of the Bronze Age and (early) Iron Age.

There are good reasons to conceive the Nordic ship renderings on bronze objects as divine vehicles for the transport of the sun over the heavens. We are thus dealing with pictures related to religion and cosmology (Kaul 1998). On some of the complex rock carving ships, religious rituals seems to take place, whereas more simple renderings of ships could be seen as religious and/or social symbols. It is interesting to compare the iconographic evidence for the ship's role in cosmology, religion and ritual of the North with evidence from the Mediterranean area particularly Egypt, and some basic concepts of the ship being the conveyor of the sun seems to be noticeable in larger parts of Europe during the Late Bronze Age. However, we shall here go no further along these lines, but restrict ourself to analysing the outline of the ships proper admitting that, even though we are in many cases dealing with renderings of ships related to a divine or supra-human world, these ship images still reflect a Bronze Age reality.

It is obvious that the Nordic ship renderings on bronze objects are very closely related to the renderings pecked into the rocks – the style is the same and the details are quite often identical. It is the design of the stems and the keel extension that demonstrate these basic similarities, and it is specifically the shape of these parts that forms the basis for making a chronological sequence of the Nordic ship representations (Glob 1969; Kaul 1998). The ships on bronzes – on typologically datable objects – are of crucial importance for understanding the chronological sequence of the ships; but also a few ship renderings in stone contribute positively in making up such a sequence, when being related to dateable grave finds. A chronological scheme demonstrates this development from the beginning of the Nordic Bronze Age 1700 BC till the end of this period around 500 BC, where it is the stems and keel extensions that form the basis (**fig. 1**). It should be noted, however, that the sequence was in reality not as rigid as seen in the scheme, where each period of the Bronze Age has its typical type of ship. The succession was more floating, and a certain overlap and longevity of the «types» must be considered.

A bronze sword found at Rørby on Zealand from c.1600 BC (first half of the Nordic Bronze Age period I) carries the earliest datable Bronze Age ship rendering of the North (Mathiassen 1958). The ship shape is characterised by high stems turning inwards, a horizontal and pointed keel extension fore and a «sausage-shaped» stabiliser aft (**fig. 2**). The inclining lines indicating the crew, mark the sailing direction thus distinguishing what is fore and aft. This early ship type with its characteristic horizontal (or almost horizontal) keel extension is found on the rocks in Denmark, Sweden and Norway (see fig. 1, 14-15)(Østmo 1990; Kaul 1995; Kaul 1998, 73-79), and those ships sharing this peculiarity should be placed – by analogy to the well-dated Rørby ship – in the same period, that is period I of the Nordic Bronze Age, and probably parts of period II (for absolute dates, see fig.1).

The horizontal keel extension fore soon began to turn upwards, a development completed in our Late Bronze Age (1100-500 BC) with highly raised keel extensions, sometimes higher than the decorated stems themselves, sometimes having an almost vertical upper part. The stabiliser aft does not change much through time. It continues the keel line as a very short, horizontal and often rectangular excrescence. It is seen on Late Bronze Age ships on bronzes as well as on the rocks, when the rendering is sufficiently detailed (**fig. 3**).

During the same time as the keel extension of the prow began to turn upwards, around or perhaps a bit earlier than 1300 BC, the inturned prow itself (being an extension of the gunwale line) gives way to a horse-headed prow, which continues all the way through the rest of the Bronze Age. Often the ship carries a horse head both fore and aft, but in certain cases, mostly from per. V, 900-700 BC, there is a horse head fore and an inturned spiral aft. Generally the horse head follows some stylistic changes: in the 2nd half of per. IV (1000-900 BC) the muzzle began to end in one or two curves, an «ornamental» development continuing in per. V (900-700 BC), where the horse head and its neck is curling, the muzzle itself terminating in a spiral. It is evident that the ships on the bronzes and the ships on the rocks follow the same development, and that the style is the very same. The curled horse head terminating in a spiral can be seen to be indeed very similar on the two media of art (**fig. 4 & 5**).

Around 1000 BC also bird-headed stems came into fashion, reflecting influences from the south: the bird-sun-ship (Vogel-Sonnenbarken) phenomenon detectable in Central Europe and the Mediterranean area. The aquatic bird's head on a curving neck (a swan?) became particularly popular as handle on razors of per. IV (1100-900 BC), and if considering the Nordic razor as being a symbolic image of (half) a ship, then this bird had quite some impact on the ship iconography of that time (Kaul 1995, 66-68). The aquatic bird stem seems to continue all the way through the Nordic Bronze Age, the venerable Nordic horse-headed stem thus competing with the foreign birds (perhaps both had the same symbolic values).

It is apparent that there is a chronological overlap between different stem forms, but an assessment of style and shape of the animal head, and the height of the keel extension seen on the background of a larger number of well datable ships can constitute a general chronology as shown on fig. 1. However, this does not mean that all rock carving ships can be securely dated. Many ships are simply too undistinguished in their shape, not displaying traits of chronological significance.

Some Late Bronze Age ships – as those recently found at Lensbjerg on the island of Bornholm – are not carrying an animal head on the stem, but the highly raised fore keel extension reveals a Late Bronze Age date, further documented by the similar rock carving ships from Hjortekrog in SE-Sweden (Widholm 1998, 71 ff.), intimately related to a cairn with a grave dated to per. IV of the Bronze Age (**fig. 6**).

The employment of the ship iconography (both on bronzes and rocks) terminates at the end of the Nordic Bronze Age, c. 500 BC. The ships on bronzes demonstrate that the shapes of the ships of per. V continues into the last period, per. VI (700-500 BC), though a simplification of the ship design occurs. But on a few rock carvings, mostly in Bohuslän, Western Sweden (for instance the Litsleby site, see Kaul 1998, 104-105) and in Stjørdalen, North Trøndelag, Norway (Sognnes 1993; Sognnes 1999) are seen some ship representations which display features of the shaping of the stems and the hull that fall outside the typological developmental series indicated in fig. 1 – ship representations which can not be parallelled with the well dated ship images on Bronze Age bronzes or related to grave finds. These ships display special characteristics as follows: they are symmetrical, the hull being slightly curved, the keel extension and the stem (being the extension of the gunwale line) run almost parallel with each other, and the keel extension is now only slightly raised. It seems thus possible on the basis of the ship typology that these rarely occurring rock carving ships probably belong to the time after the Bronze Age (Kaul 1998).

This seems to be confirmed by the important Pre-Roman Iron Age find at Hjortspring, Southern Jutland, though from outside the main rock carving areas. Here the Danish National Museum in 1921-22 excavated a large offering of war booty in a small bog, the largest object being a 21 m long (war) canoe, designed for a crew of about 22 armed men. We shall not discuss the many interesting technical details of this boat here (see Rosenberg 1937 & Rieck 1994), except to emphasise that its profile resembles strikingly the profile of several of the ships from Litsleby and associated rock carving ships (**fig. 7**). The many paddles found together with the Hjortspring boat show that it was propelled forward in the same way as the Bronze Age rock carving ships. On the other hand, the Hjortspring boat is equipped with a couple of steering oars and this seems to be a feature which was practically unknown among the Bronze Age rock carving ships. The Hjortspring find is dated to c. 350 BC. Some of the ships of precisely this type are actually employed with steering oars, as seen for instance in a number of cases on the recently published rock carvings of the Askum area, Bohuslän, and from Stjørdal (**fig. 8**) (Bengtson 1998; Sognnes 1993 & 1999; Coles 1993), indicating that it was after the Bronze Age (after 500 BC) that the steering oar came into use.

Quite recently a substantial work of experimental archaeology has resulted in a full scale accurate copy of the Hjortspring boat, made with «original» tools and materials, and the Danish Center of Maritime Research is currently conducting test navigations. Albeit provisionally, the observations from the boat *Tilia's* maiden voyage in the summer of 1999 could be of interest in this connection. It turned out that this boat has surprisingly excellent sailing abilities. She is easy to manoeuvre even for an unskilled crew and glides smoothly and gracefully through the waters (**fig. 9**). She accelerates rapidly, and it is possible to turn *Tilia* quickly on a very narrow perimeter. It became clear that it is primarily the crew, and the ability of the crew to follow the commands of the captain, that makes it possible to turn the ship, whereas the steering oars were secondary in manoeuvring her (just as her almost contemporary *Olympias*). Thus the steering oar seems to have a quite limited usage for turning, and was probably primarily used as a sort of stabiliser for more or less straight navigation. These observations may explain why the ship renderings of the Bronze Age show no steering oars: Such were not required when the ship had a vertical stabiliser aft, to be used for keeping the course. Since the typical ship from the centuries after 500 BC were of symmetrical design, there was no room for a particular stabiliser aft, and a steering oar became more necessary in that period as a substitute for the stabiliser. By means of experimental archaeology it is thus possible to give a reasonable explanation for the introduction of the steering oar in the North; the observations made in this respect support the chronological evidence, and we are able to extend this sequence into the Iron Age. However, it should be noted that some of the much earlier ships seen on frescoes from Akrotiri on Thera carry both a steering oar and a stabiliser aft, demonstrating that the use of these two navigational devices in the Mediterranean do not necessarily exclude each other (Marinatos 1984, 56-57; Basch 1987, fig. 257-258); a stabiliser aft seems also to appear much later, among the Bottians in the last centuries BC (Basch 1987, 129-130).

We have now shortly followed changes of ship profile through the Nordic Bronze Age and parts of the Pre-Roman Iron Age (c.1600-300 BC): from a horizontal prow (keel extension) with high and inturned stems continuing the gunwale lines, into raised almost vertical prows (keel extensions) where the gunwale lines continue into animal heads (often stems adorned with horse heads). A horizontal projection of the keel line aft was a quite common feature through the whole of the Bronze Age. In the Pre-Roman Iron Age the animal head adornments disappeared, and the gunwale line and the keel line continued into parallel protrusions. The horizontal projection aft also disappeared, and steering oars took the place of this stabiliser.

How does this Nordic sequence of ship (stem) shapes correlate with ships as depicted in the Mediterranean area. Is it possible to find or establish some basic differences or similarities? (For illustrations of early Greek ship typology/chronology, see also M. Wedde's contribution in the present volume of Tropis).

Firstly, it should be noted that in the Late Bronze Age of Scandinavia (1100-500 BC – corresponding with the Iron Age of the Eastern Mediterranean) it is the prow with its elevated keel extension which bends upwards and often marks the highest point of the ship, and it is astern that we find the horizontal projection in the waterline. In the Mediterranean the horizontal projection in the waterline is part of the prow, and it is astern that we find the highly protruding decorated parts (though the earlier ship frescoes from Akrotiri on Thera show the stem being the highest elevated part). From a superficial view of the ship renderings the profile of the ships are very much alike; however, it must be realised that it is the prow that seems easiest comparable with the aft, and that the ships in the Mediterranean – if making this comparison – «sailed backwards» when compared with Nordic ships, or *vica versa*. A fact that the leading Danish archaeologist S. Müller has commented upon as early as in 1897, when dealing with misunderstood attempts to parallel Nordic (Bronze Age) ships with Classical, Mediterranean ships and to derive the Nordic ones directly from the Mediterranean (Müller 1897, 400). When considering this, it becomes clear, that the shipshape, as documented by the ship images, is rather different in the North and in the Mediterranean: The prow is horizontally penetrating the waterline in the South, the prow is bending upwards in the North.

Apart from this backward-forward difference, basic differences are that in the North mast and sail were totally unknown, and the steering oar seems unknown until c. 500 BC (see above).

When looking at the early group of Nordic ships (as the ship on the Rørby sword) we meet the horizontal and pointed prow in the waterline, and this stem form is a characteristic feature of the Mediterranean. However, while the Nordic stems of this form seem to be restricted to the period around 1700-1400 BC, the characteristic «ram» (later fitted with a metal point becoming the most important naval weapon) is in the Mediterranean found from the 12th century BC and onwards, though some very few renderings may be earlier. In other words, the horizontal ram-like extensions in the South and in the North are not from the same period of time and are just or hardly overlapping, this feature being earlier in the North than in the Mediterranean. This ram-like extension is seen on a sarcophagus from Gazi on Crete (c. 1200 BC), on a vase from Milo (1200-1100 BC), on a pyxis from Tragara near Pylos (1200-1100 BC), on a vase from Asine near Naufplion (1200-1100 BC), and on a group of ship-shaped rhyta from Cyprus (Basch 1987, 150-151 & fig. 298, 307, 309, 313-16 & fig. 318). A picture of a ship from Anemospilia, Crete, from around 1700 BC seems to show a ship with a horizontal keel extension and an upwards turned stem (Basch 1987, 105 fig. F18). On the other hand, depictions of Mycenaen warships in battle do not show this ram stem, and the type of Mycenaen sea battle depicted does not include ramming, the ship being a platform for throwing spears or shooting arrows (Dakoronia 1999).

Later, on Geometric pottery (and later) this projection became very common. Similar extensions can be seen on ships represented on the so-called Cycladic pans, but it is uncertain whether they are at the fore-end of the ships (Basch 1987, 84-85; Vichos 1987; Wachsman 1998, 71-76). They may just as well be a kind of stabiliser at the stern. A similar projection can be seen on ships on Minoan seals, but here, too, there are problems with respect to what is fore and what is aft. Particularly the problem of the highest point of the ships being either at the prow or astern has been widely discussed as to the ships depicted on the Cycladic pans. If we accept the most elevated parts being astern, then the ram-like extension fore seems to be much earlier in the Mediterranian than in the North. However in the case of the Early Bronze Age ships seen on the Cycladic pans, I would be in favour of the highest point being the prow and the lower almost vertical end being a sort of stabiliser aft, the inclination of the strokes representing the crew demonstrating the sailing direction. Furthermore I find the straight-forward navigational arguments of Lambrou-Phillipson interesting and convincing, when considering this matter. When ships (without a substantial keel) are moving under wind power, they had to have high sterns to avoid being swamped by waves coming from astern. By contrast, when they moved against the wind under human propulsion, they had to have high prows to prevent swamping by waves coming from afore. This means that high prows are most suitable for moving under oars or paddles against the wind, while high sterns are most suitable for moving under sails with the wind (Lambrou-Phillipson 1999, 253-254). Since the ships of the 3rd millenium BC on the Cycladic pans do not show clear evidence of sails, their primary means of propulsion were by rowing or paddling, thus suggesting that it was the prow which constituted the highest part of the ship. When the sail came into common use the ship shape then quite practically «turned opposite», the highest point being astern, making a general ship building tradition along another line. Following this line of argument – this form of logic – it is also possible to explain the aforementioned difference between ship renderings around the North Sea/the Baltic Sea and ship renderings of the Mediterranean, where the ships in the Mediterranean seem to «sail backwards» when compared to Nordic ships. In the North mast and sail did not come into use in the 2nd and 1st millenium BC, and therefore it was practical and logical to have the highest part of the ship afore – just as with the earlier ships on the Cycladic pans without sails: the Nordic Bronze Age ships and the ships on the Cycladic pans share the common feature that they were propelled by rowers/paddlers and therefore they also share the high prow, low stern. In this case we can find an explanation of differences and similarities North-South not in cultural derivation, but in practical logics.

If we accept that the Anemospilia ship rendering is from around 1700 BC, then ships with ram-like extension at the prow occur at the same time in the North and in the Mediterranean, or else this feature was to be seen earlier in the North. Could there be a connection? – We might consider this type of ship to be a Nordic «invention» that spread to the Mediterranean area where it later acquired great significance, or we could see this as parallel developments, where some contacts did exist, or we can consider this as a coincidence, where there were no connections at all between two independent developments. At any rate, soon the evolution of the ship profile in the North took another path, with the upturned keel extension fore, a development which is rarely seen in the Mediterranean, though perhaps with the exception of a rock carving ship from Thera, which has been dated to the 7th century BC. Here we can see a ship with a stem with a bird's head bent backward and a keel extension that curves smoothly upwards (Basch 1987, 247 & fig. 521 B).

As mentioned above, just after 1100 BC the (aquatic) bird-headed stems came into fashion in the North, here revealing a sort of international fashion related to the iconography of the aquatic bird (of the urnfield culture). Ships with (aquatic) bird-headed stems are known from the Mediterranean on ships related to «The Sea People», but is also found on a sherd from Tiryns belonging to period LM IIIc, around 1100 BC (Matthäus 1980; Kaul 1998, 282-283; Wachsmann 1998, 163 ff), so this stem form seems to have had a «sudden» emergence all over Europe around the time of the collapse of the Mycenaen culture.

The horse-head stems is a particular feature of the ships of the Nordic Bronze Age, probably going back to c. 1300 BC, with their most pronounced appearance around 900-700 BC. The horse's head stems do not seem to occur in the Central European ship iconography. This feature thus should be regarded as a Nordic phenomenon and an expression of a Nordic tradition which would probably also have been reflected in the appearance of the ships in the real world. As early as in Scandinavia it is hard to find illustrations of ships with horse heads. The head of a pin found in a grave from Kirrha south of Delphi, dated to LH I (c. 1600 BC), is in the shape of anthitetic animal protoms which form a boat-like figure (Matthäus 1980, 320-321). It is possible that in this pin we should recognise a representation of a ship with out-turned horse heads at each end (**fig. 10**). If we assume that it is actually a rendering of a ship of this form, it is earlier than any known horse head ship in Scandinavia. A couple of small (cultic) boats from (late) Minoan seals carry horse heads astern (Basch 1987, 105, fig. F 12 & F 13; Wachsmann 1998, 112-113). The question may be asked whether the animal head that decorated the stem of a ship painted on a Minoan LM III b sarcophagus from Gazi (c.1200 BC) is necessarily a bird's head (Wachsmann 1981, 210 & fig. 18). The marked stylisation makes an identification difficult, but its shape in combination with some strokes at the top of the head which might represent a mane, led Basch to admit the possibility of it being a horse head (Basch 1987, 145). There are also a couple of pictures of ships on Late Helladic-III c pots from Phylakopi and Skyros (Wachsmann 1981, fig. 14 D & E) which may have been decorated with a horse head and an interned stern (c.1100 BC). Even though these examples may demonstrate the existence of horse heads decorating the prows, this feature is certainly not predominant among the Greeks, and the design of their ships looks very different in the pictures.

Later, at the edge of the Greek world we find a ship representation on a stele from Razlog in SW Bulgaria, whose stems and the associated pictures look quite foreign in comparison with Greek pictures and perhaps more Nordic in concept (Hänsel 1969, 63 ff.). We see a ship with animal-head stems at each end, and the animal stems have slightly forward-pointing ears, a feature familiar with Nordic representation of horses (**fig. 11**). With the ship is linked a sun-image and a zigzag-line, as well as S-shaped symbols. All these features correspond with Nordic iconography, and it might suggest some connections between the North and the Mediterranean area in a wide sense as to ship design and adornment. Unfortunately this stele is difficult to date, and the find circumstances uncertain. Hänsel suggests a dating to the 8th or 7th century BC, perhaps earlier (Hänsel 1969, 65-70). On an Italian stele of 7th century BC from Novilara on the Adriatic Sea there is a ship with a stem in the shape of a horse head (Hagy 1986, fig. 10; Hänsel 1969, Abb. 4). But the head projects far out in front of the ship, not very similar to the Nordic ships and the aft stem carries no adornment. A razor from Bologna from the 8th century BC has a ship representation with a backward-bent stem which ends in an indeterminable animal-head (Hagy 1986, 223 & fig. 6). It is significant that this stem bears two pairs of legs, just as do the few horse head stems from the Nordic Bronze Age. Here we can see an interesting point of similarity between the ship iconography of the Mediterranean area and that of Scandinavia at the same period and on the same type of object, a razor.

If we go beyond the Mediterranean, to Mesopotamia, a larger number of ships or boats with prows decorated with beautiful horse heads are known. They are seen on a part of the bronze covering of the doors of Salmanassar III's (858-824 BC) palace in Balawat, on reliefs from Sargon II's (722-705 BC) palace in Khorsabad and from Assurbanipal's (669-626 BC) palace in Kuyundjik. Some of the ships have horse heads both fore and aft, whereas others have a horse head fore and an upturned stern, not very far from the Nordic principle. Basch argues that we are not at all dealing with Assyrian ships, but with Assyrian renderings of Phoenician ships or river boats, and that these ships depicted here should be related to a Mediterranean ship building tradition, being early examples of the later well known Phoenician «Hippos» – horse-ships (Basch 1987, 305 ff.; see also A. Trakadas in this volume of *Tropis* for further discussion, and illustrations).

When the Phoenicians moved westward their «Hippos» became well known all over the Mediterranean and perhaps further, and from the West, in Spain comes a small rendering from the 7th or 6th century BC of a boat with stems terminating in a horse head (Basch 1987, 308). Phoenician transport vessels from the 3rd and 4th centuries BC had a curved bow ending in a representation of a horse head and a stern culminating in a fish-tail or an in-curving spiral (Bartolini 1988, 74). A few of the Nordic representations of horse-headed ships on razors from 900 to 600 BC are constructed in generally the same way: with a horse head adornment at the prow and an in-curved or spiral-shaped stern. Even though there seem to be a chronological overlap between the Nordic horse-ships and the Phoenician ones, and some similarities can be observed, we must realise the considerable structural differences between them (and there are no eye motifs on the Nordic ships). We should not necessarily see any link between the Phoenician ships in question and the Nordic ships, the latter seemingly having a longer tradition of horse head stem adornments than the Phoenician ones. A few glimpses of earlier horse-headed ships may however suggest a tradition of such ships in the Mediterranean area before the Phoenicians. The horse head seems to demonstrate rather independent traditions of ship building in the Baltic area and in the Mediterranean. On the other hand some connections or interactions between these areas should not be totally ruled out, as suggested by the Razlog ship, though it seems too far-fetched to suggest that the Phoenician «hippos» as such should derive from Nordic ships.

When looking at the outline of the ship, its keel extensions and stem adornments, it thus seems apparent that we are dealing with separate traditions and internal developments in the North versus the Mediterranean area. This however, should not exclude the possibility of occasionally interactions between the two areas, since more or less direct connections between the Mediterranean area and the Baltic area must have existed during larger parts of the period in question. It is also worth noting the «internationalisation» of the ships adornments as demonstrated by the occurrence of the aquatic bird heads on the stems around and after 1100 BC. When returning to the horse heads (and other traits) it is not impossible that the similarities are merely the result of chance. On the other hand we should not exclude that these ship representations produced at both ends of the European theatre may reflect some common ideas as to what a stem and a ship ought to look like in spite of differing construction traditions.

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ILLUSTRATIONS

Fig. 1: Diagram showing the chronological/typological development of Nordic ship renderings. Left, datable ships; right: ships on the rocks which can be dated by analogy to the ships (stems) shown to the left. All the ship renderings shown in the left column are from bronze objects from Denmark and Northern Germany, exept nos. 2 and 3, which are rock carvings on grave slabs related to graves to be dated to late per. II or early per. III graves (Kivik and Sagaholm, Southern Sweden). All the ship renderings in the left column are rock carvings from Denmark and Southern Norway. Drawing: Leif Hammelev, The National Museum of Denmark.

Fig. 2: The 6,7 cm long ship representation on the sword from Rørby, Western Zealand, Denmark. Note the highly elevated incurved stems, the horizontal prow, and the «sausage-like» stabiliser aft, the prov being at the left. The Rørby sword's ship image forms a fixed chrononogical basis for what a ship rendering from the earliest part of the Bronze Age looks like, photo: The National Museum of Denmark.

Fig. 3: Typical Nordic Late Bronze Age ship, from Lövåsen, Bohuslän, Sweden. Note the highly elevated keel extension fore, the very short horizontal keel extension astern and the horse headed stem. Rubbing by G. Milstreu, Tanums Hällristningsmuseum.

Fig. 4: Detail of a razor from Melby, Northern Zealand, Denmark, showing a horse headed stem, where the head is curled, the muzzle terminating into a spiral curl. Note also the vertical keel extension. Photo: F. Kaul.

Fig. 5: Detail of a rock carving ship from Bro, Bohuslän, Sweden, with a horse head of similar shape and stylisation as seen on fig 4, though here astern. Photo: F. Kaul.

Fig. 6: Ships without stems with animal heads, on a recently found rock carving at Lensgård, Bornholm, Denmark. They carry a high keel extension fore and a short horizontal keel extension aft. Photo: F.Kaul.

Fig. 7: The profile of the Hjortspring-boat and drawing of a similar ship depicted on the Litsleby rock carving, Bohuslän, Sweden. Drawing: Leif Hammelev, The National Museum of Denmark & after Marstrander 1963.

Fig. 8: Pre-Roman Iron Age boats/ships of Hjortspring type with steering oars, from Askum 15:1, Bohuslän, Sweden, and from Bjärngörd II, Stjørdal, North Trøndelag, Norway. After Bengtsson 1998 and Sognnes 1999.

Fig. 9: The exact replica of the Hjortspring-boat, *Tilia*, on her maiden voyage in June1999. Photo: F. Kaul.

Fig. 10: The head of a dress-pin from a grave at Kirrha, Greece, c. 1600 BC, may perhaps be looked upon as a rendering of a symmetrical ship. After Matthäus 1980.

Fig. 11: A 1,6 m high stele of marble from Razlog, SV-Bulgaria, carry a ship rendering with horse headed stems, which in some respects can be compared with Nordic Bronze Age ship renderings (and Nordic Bronze Age iconography). After Hänsel 1969.

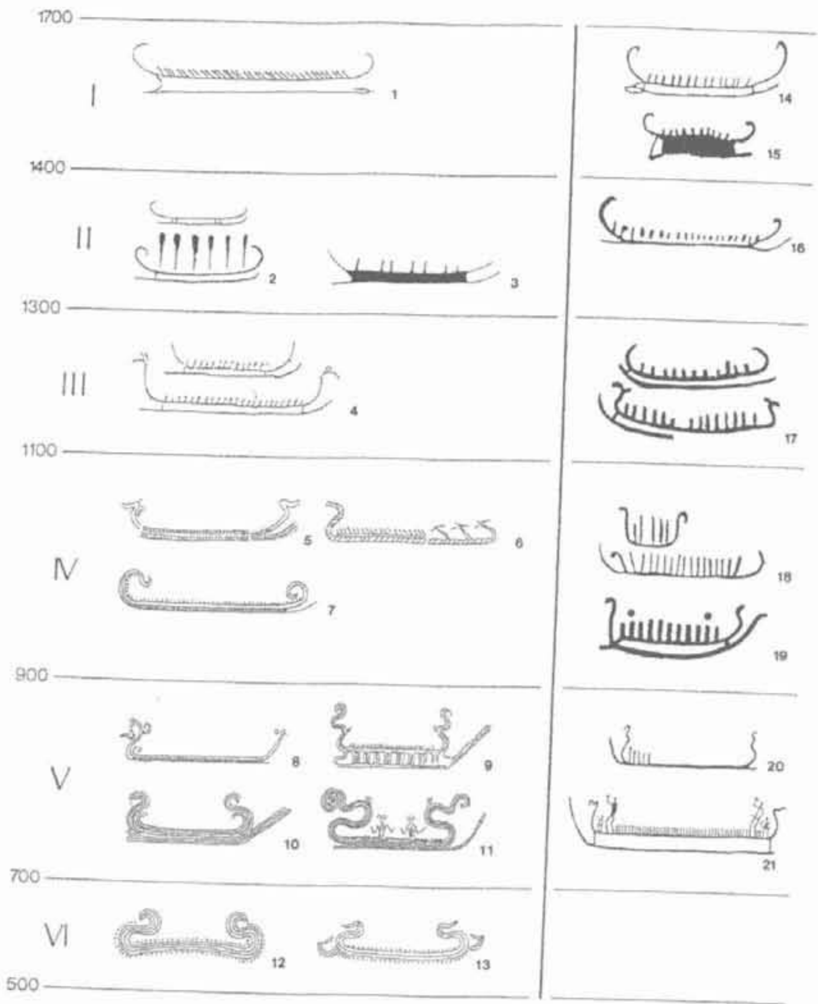
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Fig. 1

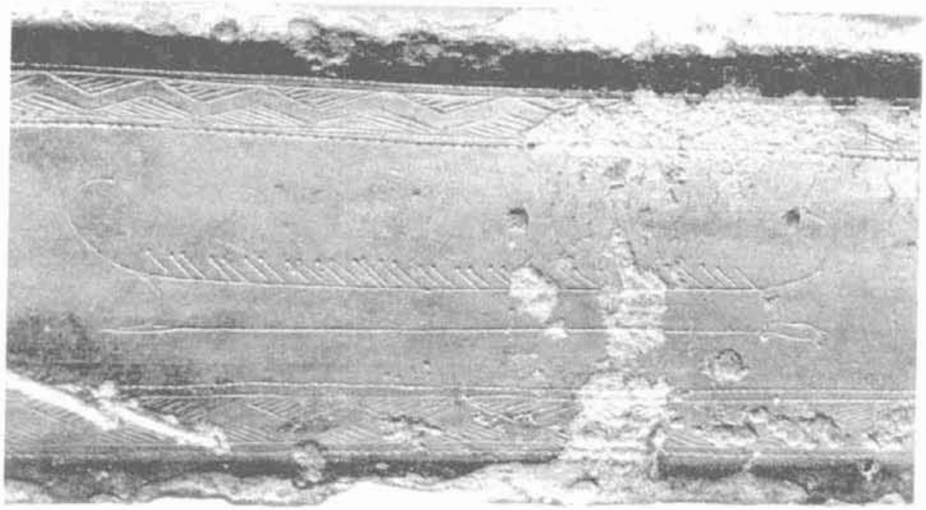
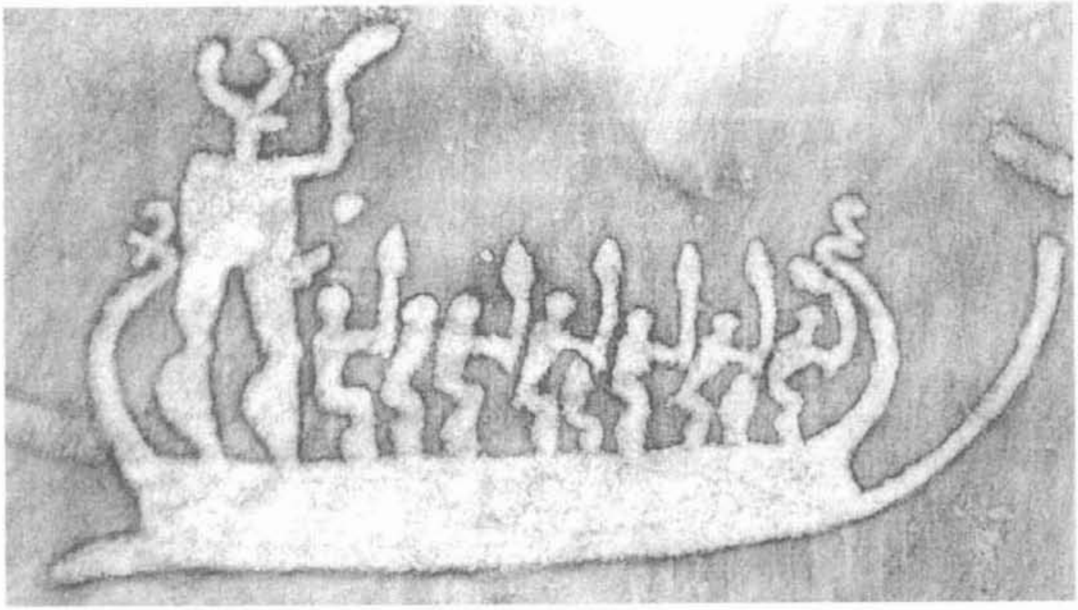


Fig. 2



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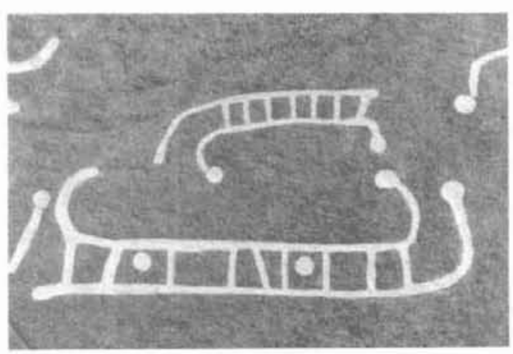

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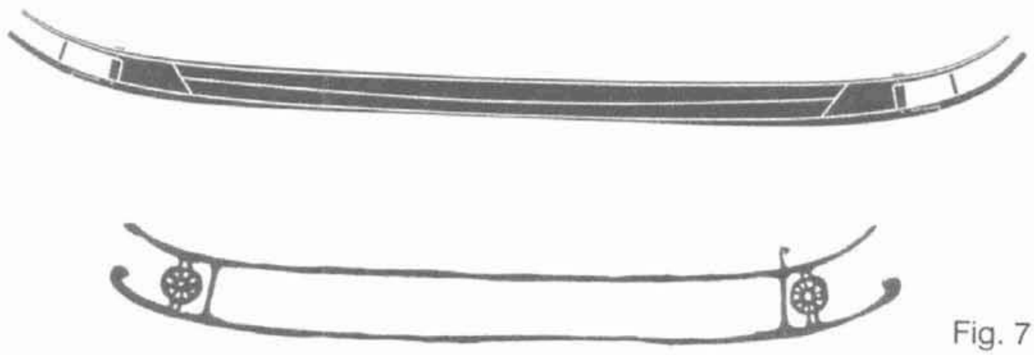

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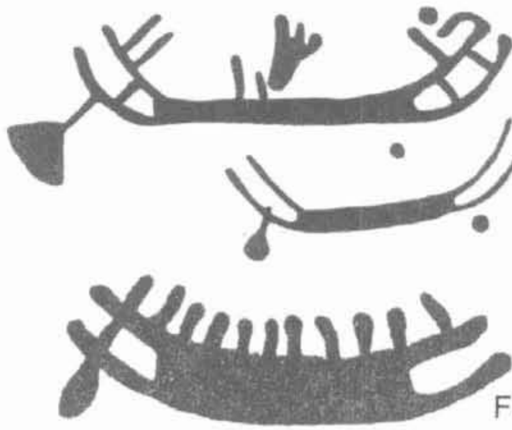

Fig. 8

Fig. 11

Η ΗΠΕΙΡΩΤΙΚΗ ΠΡΟΙΣΤΟΡΙΚΗ ΝΑΥΠΗΓΙΚΗ, ΣΑΝ ΑΦΕΤΗΡΙΑ ΤΟΥ ΑΡΧΑΙΟΥ ΕΜΒΟΛΟΦΟΡΟΥ ΠΟΛΕΜΙΚΟΥ ΠΛΟΙΟΥ

Α' ΕΙΣΑΓΩΓΗ

1.- Το γενικό σχήμα του αρχαίου εμβολοφόρου πολεμικού πλοίου, (όπως το γνωρίζουμε με τη μορφή της τριακοντόρου ή πεντηκοντόρου), μας έχει γίνει τόσο οικείο ώστε από πολλούς χαρακτηρίζεται ανεπιφύλακτα, ως εξαιρετικά κομψό και όμορφο.–Αν όμως το παρατηρήσουμε ψύχραιμα, θα διαπιστώσουμε επίσης ότι πρόκειται για ένα μάλλον περίεργο και αρκετά ασυνήθιστο σκάφος, με έντονη διαμήκη ασυμμετρία (ως προς την πλώρη και την πρύμη του) και του οποίου διαχρονικά, δεν συναντάμε κανένα παρόμοιο ναυπηγικό προηγούμενο ή επακόλουθο. (ΕΙΚ.1)

2.- Αυτή η ασύμμετρη μορφή, με την υπερυψωμένη, λεπτή, ελαφριά ουρά της πρύμης και την συμπαγή, ισχυρή, βαρειά κεφαλή της πλώρης, είναι πιθανότερο να διαμορφώθηκε σαν εξέλιξη μιάς κρίσιμης αρχικής τεχνικής αναγκαιότητας, και όχι σαν μια ελεύθερη στιγμιαία αισθητική επιλογή του προϊστορικού ναυπηγού, (ο οποίος προφανώς δεν διέθετε την άνεση ή την πολυτέλεια τέτοιων επιλογών).

3.- Εφόσον η υπόθεση αυτή είναι σωστή, θα πρέπει, μέσα από μιά αντίστροφη ερευνητική πορεία (στην ουσία μιά ερευνητική κατάδυση) προς το απώτατο τεχνολογικό παρελθόν του συγκεκριμένου τύπου πλοίου, να μπορούν να ανιχνευθούν και εντοπισθούν οι κατασκευαστικές απαρχές του (δηλαδή ο «γενάρχης» του), καθώς και οι τεχνικές ή άλλες παράμετροι, της διαμόρφωσής του.

4.- Σε μια τέτοια αναζήτηση, η έλλειψη ουσιαστικών πρωτογενών ευρημάτων, (που θα έδιναν υψηλή βεβαιότητα στα συμπεράσματά μας), καθιστά αναγκαία την επιστράτευση μιάς εναλλακτικής μεθοδολογίας εμπειρογνωμονικής προσέγγισης των όποιων διαθέσιμων στοιχείων, ώστε μέσα από στέρεα φυσικά δεδομένα να ανασυνθέσουμε το ζητούμενο. Δηλαδή την προϊστορική ναυπηγική αφετηρία, που κατέστησε αναπόφευκτη αυτή την ασύμετρη διαμόρφωση του εμβολοφόρου κωπήλατου πολεμικού πλοίου της αρχαιότητας.

Β' ΓΕΩ-ΤΕΧΝΟΛΟΓΙΚΟ ΠΕΡΙΒΑΛΛΟΝ

5.- Το "γενέθλιο περιβάλλον" του συγκεκριμένου τύπου πλοίου, πρέπει να τοποθετηθεί σε μιά εποχή, όπου η περιστασιακή χρήση από τον άνθρωπο, κάποιων τυχαίων επιπλεόντων αντικειμένων (πχ.κορμών), αντικαθίσταται έστω και διστακτικά, με μιά σκόπιμη καί συστηματική «ναυπηγική» δραστηριότητα, (στην πιό απλή καί πρωτόλεια μορφή της), όπου ο κορμός κόβεται πλέον, καθαρίζεται, καί σύρεται στο νερό, από το χρήστη του. (ΕΙΚ.2)
Αυτό πρέπει να άρχισε να συμβαίνει, κάπου στη Μεσολιθική εποχή, πολύ πρίν την 9η χιλιετία π.Χ. (όταν πλέον έχουμε διαπιστωμένη, συστηματική ναυτική δραστηριότητα, με τη μεταφορά οψιανού από τη Μήλο στο Φράχθι Αργολίδος).

6.- Ο παραπάνω προσδιορισμός, μάς θέτει και το πλαίσιο της διαθέσιμης τότε τεχνολογίας, που παρέχει στον άνθρωπο υποτυπώδη/απλά εργαλεία και βασικά/φυσικά υλικά, όπως: πέτρινες αξίνες ή πελέκεις και βαρύδια, ξυλεία και μοχλούς, δέρματα, ιμάντες ή σχοινιά, φλόγα και τίποτε περισσότερο απ' αυτά (ΕΙΚ.3).

7.- Είναι διαπιστωμένο ότι στον ευρύτερο Ελλαδικό χώρο, ανέκαθεν συναντάμε δύο αρκετά διαφορετικά (από πλευράς κλίματος και μορφολογίας) περιβάλλοντα, δηλ. ένα Ηπειρωτικό / Δασικό και ένα Νησιωτικό/Μεσογειακό. -Στο ηπειρωτικό περιβάλλον, το οποίο κυρίως μας ενδιαφέρει, επικρατούν συνθήκες σχεδόν κεντροευρωπαϊκές, με έντονες βροχοπτώσεις, ρωμαλέα δασική βλάστηση και ήρεμους / προστατευμένους υδάτινους στίβους, δηλαδή λίμνες και κόλπους. (ΕΙΚ.4)

Γ' ΕΠΙΛΟΓΕΣ

8.- Μ'αυτά λοιπόν τα υλικά κι εργαλεία και ζώντας μέσα στο συγκεκριμένο «φτωχό αφετήριο περιβάλλον», έπρεπε ο άνθρωπος να επινοήσει και δημιουργησει τα πρώτα του «πλεούμενα». Μέσα σε τόσο στενά περιθώρια, οι επιλογές του ήσαν αντίστοιχα περιορισμένες, έως «απολύτως προβλέψιμες». Ετσι, μπορούμε να θεωρήσουμε σχεδόν υποχρεωτικό, ότι οι συγκεκριμένες συνθήκες ευνόησαν ή και επέβαλαν τη διαμόρφωση ενός είδους "ηπειρωτικής ναυπηγικής σχολής", (εντελώς διαφορετικής από την αντίστοιχή της νησιωτική). Η «σχολή» αυτή έχοντας στη διάθεσή της άφθονη πρώτη ύλη από μεγάλα δασικά δένδρα, εξασφάλιζε εύκολα την «κρίσιμη πλεύσιμη μάζα» από ένα και μόνο ρωμαλαίο κορμό, (χωρίς να είναι απαραίτητο να συναρμώσει περισσότερους), ενώ επετύγχανε και επαρκή ευστάθεια για το συνήθως ήρεμο υδάτινο περιβάλλον χρήσης του πλεούμενού της. Ετσι φαίνεται πολύ πιθανή η προτίμηση από νωρίς, στην κατασκευή στενών σκαφών από συμπαγείς κορμούς, δηλαδή **Μονόξυλων**, και όχι Σχεδιών (ΕΙΚ.5).

9.- Σημαντικά στοιχεία που ενισχύουν σε μεγάλο πιστεύουμε βαθμό, την παραπάνω προσέγγιση, αποτελούν:

α) Ενα προφανές γλωσσικό κατάλοιπο, που μας διέσωσε το συναφές με τήν κατασκευή του Μονόξυλου εννοιολογικό περιεχόμενο της ονομασίας του. -Πρόκειται γιά τη λέξη, "ΣΚΑΦΟΣ" (εκ του ΕΚ-ΣΚΑΦΟΝ ή ΣΚΑΠΤΟΝ), που στο ηπειρωτικό περιβάλον χρησιμοποιεί ο Στερεοελλαδίτης Ησίοδος όταν αναφέρεται σε πλοία, περιγράφοντας έτσι τον ουσιαστικό τρόπο κατασκευής με εκσκαφή, του γενάρχη των πλοίων της Ηπειρωτικής Ναυπηγικής Σχολής. –Εδώ αξίζει νά επισημανθεί ότι ο Αιγαιοπελαγίτης Ομηρος, αποκαλεί το πλοίο: "ΝΑΥΣ", (εκ του ΝΕΩ – ΝΕΟΥΣΑ = επιπλέω-επιπλέουσα).

β) Ενα ακόμη κρίσιμο στοιχείο γιά την ίδια υπόθεση, αποτελεί η κατανόηση εκ μέρους μας,ότι στα πλαίσια μιάς πρωτόγονης κυρίως τροφοσυλλεκτικής κοινωνίας, ένα πλεούμενο δεν μπορεί να είναι είδος αναψυχής ή άθλησης αλλά μόνο όχημα μεταφοράς της κάθε είδους (κυνηγετικής ή ληστρικής), "λείας" των επιβαινόντων του, καθώς και "εργαλείο" υποστήριξης συναφών επιδρομικών δραστηριοτήτων. Σ'αυτό το ρόλο είναι αυτονόητο ότι πιό αποδοτικά μπορούσαν να είναι, μόνο τα στενά-επιμήκη γρήγορα Μονόξυλα και όχι οι βραδύπλοες Σχεδίες. (ΕΙΚ.6)

Δ' ΑΡΧΙΚΕΣ ΔΙΑΜΟΡΦΩΣΕΙΣ

10.- Ο συγκεκριμένος τύπος αρχέτυπου πλεούμενου, όσο κι άν αποτέλεσε την καταλληλότερη "αφετήρια επιλογή" γιά το περιβάλλον του, σαν πρωτόγονο κατασκευάσμα που ήταν, ενσωμάτωνε ένα πλήθος απο ανεπάρκειες και λειτουργικές αδυναμίες, με πιό σημαντική την έλλειψη προστασίας των επιβατών του, σέ κάθε είδους πλήγματα, από τον καιρό ή από τούς αντιπάλους τους. Καί όπως πάντα συμβαίνει, οι ανεπιθύμητες ή οδυνηρές καταστάσεις είναι αυτές που δίνουν κίνητρο στον άνθρωπο να βελτιώσει τη θέση του, εξελίσσοντας την τεχνολογία του. Αυτές οι αδυναμίες, αποτέλεσαν το μοναδικό ίσως σοβαρό κίνητρο, δημιουργίας πραγματικών πλοίων (ΕΙΚ.7).

11.- Η προσφορότερη λύση στο παραπάνω πρόβλημα προστασίας, τόσο από πλευράς αποτελεσματικότητας όσο καί τεχνικής ευκολίας, καταρχήν φαίνεται απίθανο να ήταν άλλη, από την εγκατάσταση ενός είδους ελαφράς πρόσθετης προστατευτικής περίφραξης, (μέχρι ένα λογικό ύψος πάνω από την κουπαστή του Μονόξυλου). Δεδομένων των περιορισμένων - έως ανύπαρκτων- δυνατοτήτων κάποιας μορφής ξυλουργικής τέχνης, είναι φυσικό να χρησιμοποιήθηκαν ως κατάλληλα / διαθέσιμα υλικά, κυρίως εύκαμπτα ξύλινα ραβδιά (πού δένονται εύκολα μεταξύ τους), επικαλυμμένα μέ δέρματα (πού αποτελούν τό αρχαιότερο αντιβαλιστικό υλικό στον κόσμο). Ενας τέτοιος "φράκτης", εκτός από σημαντική αναβάθμιση της προστασίας των επιβατών του Μονόξυλου, είναι βέβαιο ότι επέτρεπε καλύτερη διευθέτηση του χώρου, προσφέροντας ευχέρεια εξωτερικής ανακρέμανσης ορισμένων αντικειμένων, όπως πχ. όπλων. (ΕΙΚ.8)

12.- Οποιαδήποτε προστατευτική περίφραξη, εγκατεστημένη στην κουπαστή ενός μονόξυλου, δεν διαθέτει αξιόπιστη και ανθεκτική στήριξη, άν δεν αποκτήσει ισχυρά δομικά ερείσματα. Πιθανώς μέσα από τη διαδικασία δοκιμής και λάθους, έγινε κατανοητό ότι καταλληλότερες γιά στερέωση της περίφραξης αυτής, ήσαν οι ακραίες (εκτός ζώνης κωπηλατών), περιοχές της Πλώρης και της Πρύμης του μονόξυλου. Κατά την αναζήτηση κατάλληλων στηριγμάτων, είναι λογικό κάποια φορά να δοκιμάσθηκε και να υιοθετήθηκε η εξής διάταξη: (ΕΙΚ.9).

α) Στο πρωραίο -κάτω χονδρό- τμήμα του κορμού του μονόξυλου, σφηνώθηκε στέρεα, κατακόρυφη Δοκός, που εύκολα μπορεί να ταυτισθεί με τη «Στείρα», (την οποία διαθέτει κάθε ξύλινο σκαρί).

β) Στην πρύμη, δεν χρειάσθηκε κάν πρόσθήκη ξύλινου στοιχείου, αλλά η λεπτή / εύκαμπτη κορυφή του κορμού του μονόξυλου, λυγίσθηκε, πρός τα πάνω, αναλαμβάνοντας το ρόλο του γνώριμού μας «ποδοστάματος»

13.- Πλεονέκτημα της περιγραφόμενης διάταξης, αποτελεί η Προένταση της όλης κατασκευής (Prestretching),που της προσδίδει φυσική αντοχή και ελαστικότητα. Για να διατηρηθεί αυτή η προένταση, είναι απαραίτητη μεταξύ ποδοστάματος και στείρας, η ύπαρξη ενός μόνιμου σχοινένιου εντατήρα, που μπορεί να αναγνωρισθεί σάν πρόδρομος του μετέπειτα «Υποζώματος» των αρχαίων πλοίων. -Από το διαμορφωμένο μ'αυτό τον τρόπο σώμα του Μονόξυλου, την Στείρα της πλώρης, το Υπόζωμα, την προς τα πάνω κάμψη (τροπή) της πρύμης, έχουμε μιά οικεία πλευρική όψη, που μας δίνει ήδη με σαφήνεια την εικόνα των πραγμάτων που ακολούθησαν, στό σχήμα των πλοίων..

14.- Μας είναι άγνωστο, άν η εγκατάσταση της προστατευτικής περίφραξης, συνέπεσε απλώς ή μπορεί και να οδήγησε στη υποχρεωτική μεταβολή του τρόπου κωπηλασίας του μονόξυλου, όμως είναι άξιο παρατήρησης, ότι:

α) Ο παλαιότερος τρόπος κωπηλασίας, είναι κατά γενική παραδοχή αυτός της ελεύθερης ΤΑΡΣΟΠΛΟΙΑΣ (PADDLING). Και φαίνεται ότι πρίν από την προσθήκη της περίφραξης, η πρόωση των μονόξυλων εξακολουθούσε να γίνεται με τον τρόπο αυτό, αφού δεν υπήρξε κανένας σοβαρός λόγος αλλαγής του.

β) Μετά την εγκατάσταση όμως, μιάς οποιασδήποτε προστατευτικής περίφραξης στο μονόξυλο, θεωρείται αδύνατη η εξακολούθηση κωπηλασίας με τον παληό τρόπο και φαίνεται ότι μόνο η μοχλική κωπηλασία (ROWING), μπορούσε πλέον να εφαρμοσθεί αξιόπιστα και αποτελεσματικά, ανάμεσα από τα ανοίγματα της περίφραξης. –Μπορεί μάλιστα να επισημανθεί ότι σε μια τέτοια περίπτωση, οι κατακόρυφες ράβδοι της περίφραξης, πιθανώς λειτούργησαν ως Υπομόχλια Κωπηλασίας (=σκαλμοί) και διευκόλυναν ή ενθάρρυναν, την προσαρμογή του τρόπου κωπηλασίας, από PADDLING σε ROWING. (ΕΙΚ.10).

Ε' ΕΞΕΛΙΞΗ ΠΛΟΙΟΥ

15.- Την προαναφερθείσα αρχική φάση διαμόρφωσης του Μονόξυλου, υποχρεωτικά ακολούθησε κάποια στιγμή, μια επόμενη-παρατεταμένη φάση Εξέλιξής του σε κανονικό πλοίο. Με προφανές αίτιο, την αύξηση των μεγεθών της κοινωνίας που εξυπηρετούσε το πλοίο (και των αντίστοιχων βιοτικών αναγκών της), είναι βέβαιο ότι προέκυψε και η ανάγκη εκτέλεσης δυσκολότερων αποστολών από αυτό. Επομένως η βελτίωση των ικανοτήτων του στους τομείς αύξησης της χωρητικότητάς του, ενίσχυσης του πληρώματός του και αναβάθμισης της αξιοπλοίας του, αποτέλεσαν μονόδρομη επιλογή. Αυτό υποχρεωτικά οδηγεί στην τεχνητή αύξηση των διαστάσεών , καταρχήν ως προς το πλάτος και ύψος των πλευρών του, (ώστε να ξεπερασθούν οι περιορισμοί μεγέθους της κοιλότητας του μονόξυλου). Η εν τω μεταξύ βελτίωση των δυνατοτήτων της ξυλουργικής, επέτρεψε τη διαμόρφωση ξύλινων προσθηκών (μαδεριών) πάνω στο ίχνος της κουπαστής. Λόγω έλλειψης μεταλλικών καρφιών (που ήταν δυσεύρετο, πανάκριβο, μη αναλώσιμο για την εποχή υλικό), αυτές οι ξύλινες προσθήκες αρχίζουν να στερεώνονται στη θέση τους ως προέκταση του κύτους, με τη μόνη διαθέσιμη τότε μέθοδο, «Δεσίματος / Ραψίματος» τους, με σχοινιά. (ΕΙΚ.11).

16.- Αφού έγινε δυνατή η τοποθέτηση της πρώτης ξύλινης προσθήκης στην κουπαστή του μονόξυλου, δεν υπάρχει πλέον κανένα τεχνικό εμπόδιο ή αδυναμία, γιά να συνεχισθεί αυτό με όλο και περισσότερες επάλληλες προσθήκες, ώστε το κύτος να γίνεται όσο χρειάζεται κάθε φορά, βαθύτερο και πλατύτερο. -Το γεγονός ότι δέν υπήρχε κανένα είδος σκελετού στό αρχικό μονόξυλο (και επομένως δεν υπήρχε λόγος να τον επεκτείνουν εσωτερικά καί παράλληλα με τις προσθήκες των πλευρών) δημιούργησε προυποθέσεις γιά ανάπτυξη του σκάφους (HULL), μόνο με επέκταση του εξωτερικού περιβλήματος. -Αυτή ακριβώς η τεχνική αφετηρία, πιστεύουμε ότι απετέλεσε τον κύριο λόγο ανάπτυξης της ιδιότυπης κατασκευαστικής τεχνικής, που στο χώρο της αρχαίας ναυπηγικής είναι γνωστή ως "SHELL-FIRST". -Φυσικά, απο τη στιγμή πού το κύτος αρχίζει να διαμορφώνεται με ξύλινες προσθήκες, η κατασκευαστική βάση του πλοίου δηλαδή το αρχικό μονόξυλο, παραμένει μεν ως στοιχείο της δομής, αλλά υποβαθμισμένο πλέον αφού ο ρόλος του περιορίζεται σ'αυτόν της τρόπιδος (ΕΙΚ.12).

17.- Μέσα από τη συγκεκριμένη διαδικασία εξέλιξης, το σχήμα της γάστρας του πλοίου, (που είναι δεσμευμένο να αναπτυχθεί κατά μήκος και εξωτερικά του κορμού της Τρόπιδας), δέν έχει περιθώρια να διαμορφωθεί σε τίποτε άλλο, εκτός από μία δίεδρη διατομή «V». -Η άλλη, θεωρητικά ενδεχόμενη διαμόρφωση που θα άξιζε να ερευνηθεί, δηλαδή η καμπύλη διατομή"U", θεωρείται από εξαιρετικά απίθανη έως αδύνατη, γιά τους εξής λόγους:

α) Είναι ανέφικτη η διαμόρφωση αμφίπλευρα συμμετρικής διπλής καμπυλότητος της γάστρας (στον κατακόρυφο και στο διαμήκη άξονα ταυτόχρονα), χωρίς τη βοήθεια ενός σκελετού, ως οδηγού της κατασκευής.

β) Είναι αβέβαιο, ότι ήταν επιθυμητή μιά τέτοια διαμόρφωση, που θα δημιουργούσε παρενέργειες και δυσκολίες στην καθημερινή πρακτική ανέλκυσης/καθέλκυσης του πλοίου (χωρίς το ισχυρό "έλκυθρο" που προβάλει η τρόπις, στη διαμόρφωση "V").

-Η παραπάνω υπόθεση (διατομή γάστρας "V" και όχι "U"), ενισχύεται σημαντικά από το σχήμα του γνωστού λυχναριού / μοντέλλου πλοίου, της Ακρόπολης. (ΕΙΚ.13).

18. Ως τους μέσους αρχαϊκούς χρόνους, το Εμβολο υπάρχει στα πλοία, αλλά ως «κατασκευαστική δουλεία» και όχι ακόμη ως όπλο. Οι αναμετρήσεις στη θάλασσα, έχουν τη μορφή πεζομαχίας (από τα καταστρώματα). (ΕΙΚ.14). Θα μπορούσαμε να υποθέσουμε ότι ίσως χρειάσθηκε κάποιος τυχαίος/αδέξιος χειρισμός εμβολισμού, προφανώς με θεαματικές συνέπειες (βύθιση του εμβολισθέντος πλοίου). Ενα τέτοιο συμβάν, είναι βέβαιο ότι θα οδηγούσε σε συνειδητοποίηση ενός νέου ρόλου γιά το έμβολο ως

«Όπλου» και φυσικά αυτό ήταν αρκετό γιά να δρομολογήσει όλες τις τεχνικές και τακτικές εξελίξεις που μας είναι γνωστές από ιστορικά στοιχεία πλέον.

19- Κάθε τεχνοκρατική προσέγγιση, οφείλει να «αυτο – αξιολογείται». Κι αυτό μπορεί να γίνει αξιόπιστα, μόνο άν δοθούν καταφατικές απαντήσεις στό εξής κλασικό-τριπλό ερώτημα, που αφορά το πλοίο της εκδοχής μας:

α) Με δεδομένη την τεχνολογία της εποχής του, Κατασκευάζεται ;
β) Κατασκευασμένο μ'αυτό τον τρόπο, Λ ε ι τ ο υ ρ γ ε ί ;
γ) Δοκιμαζόμενο «σε ακραίες χρήσεις» Ε π ι β ι ώ ν ε ι ;

-Γιά τα δύο πρώτα ερωτήματα, χωρίς ιδιαίτερη επιχειρηματολογία, μπορούμε να έχουμε μιά ρεαλιστική καταφατική απάντηση.

20.- Το τρίτο ερώτημα όμως, αφορά τις συνέπειες πού μπορεί να επιφέρει ο εμβολισμός, όχι στο πλοίο που τον δέχεται, αλλά πάνω σ'αυτό το ίδιο που τον πραγματοποιεί. Κι αυτό γιατί το «Σόκ» μιάς τέτοιας πρόσκρουσης είναι πολύ μεγάλο και θα μπορούσε να αποβεί καταστροφικό ακόμη και για το επιτιθέμενο πλοίο. Κάτι τέτοιο όμως θα μπορούσε να ξεπεραστεί μόνο αν το έμβολο δεν αποτελούσε πρόσθετο στοιχείο, αλλά ήταν ενσωματωμένο στη συνολική δομή του πλοίου, κατά τρόπο ώστε οι δυνάμεις του εμβολισμού να διαχέονται σ'ολόκληρη την κατασκευή, και να μήν εκτονώνονται σημειακά, φορτίζοντας μόνο την περιοχή της πλώρης.
-Αυτό ακριβώς συμβαίνει, με την κατασκευαστική διάταξη του πλοίου της εκδοχής μας και αυτό το συγκεκριμένο στοιχείο, θεωρούμε ως το σημαντικότερο κριτήριο ορθότητας της όλης προσέγγισης (ΕΙΚ.15).

Πλοίαρχος Απ. Κούρτης - ΛΣ'
Κανάρη 2
Χολαργός, 155 62

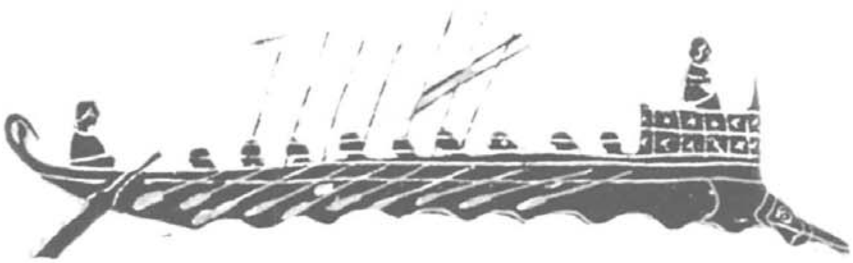

Fig. 1

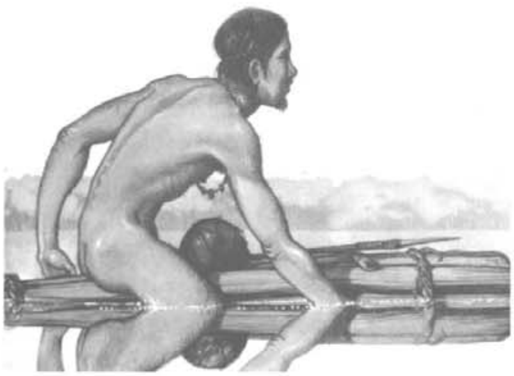

Fig. 2

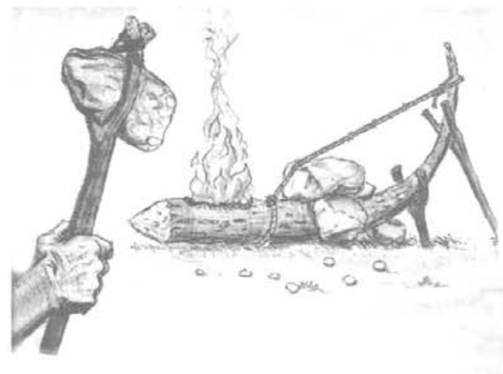

Fig. 3

Fig. 4

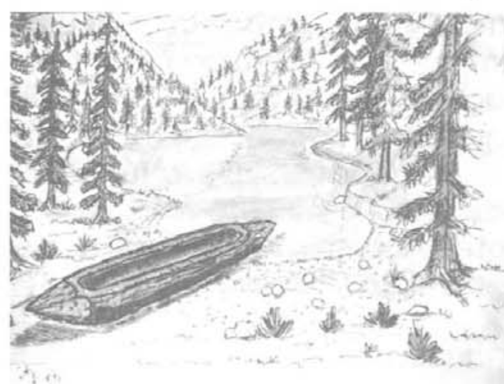

Fig. 5

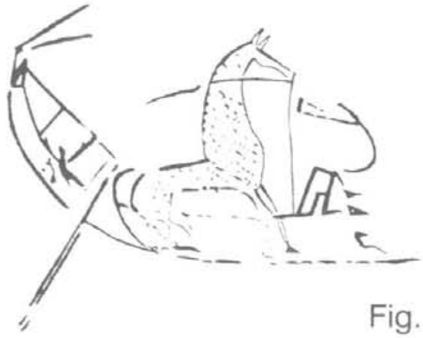

Fig. 6

Fig. 7

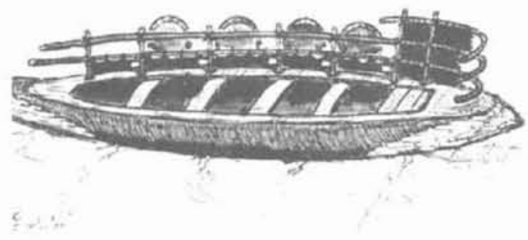

Fig. 8

Fig. 9

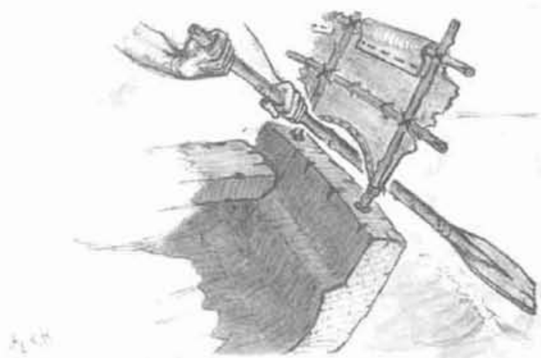

Fig. 10

Fig. 11

Fig. 12

Fig. 13

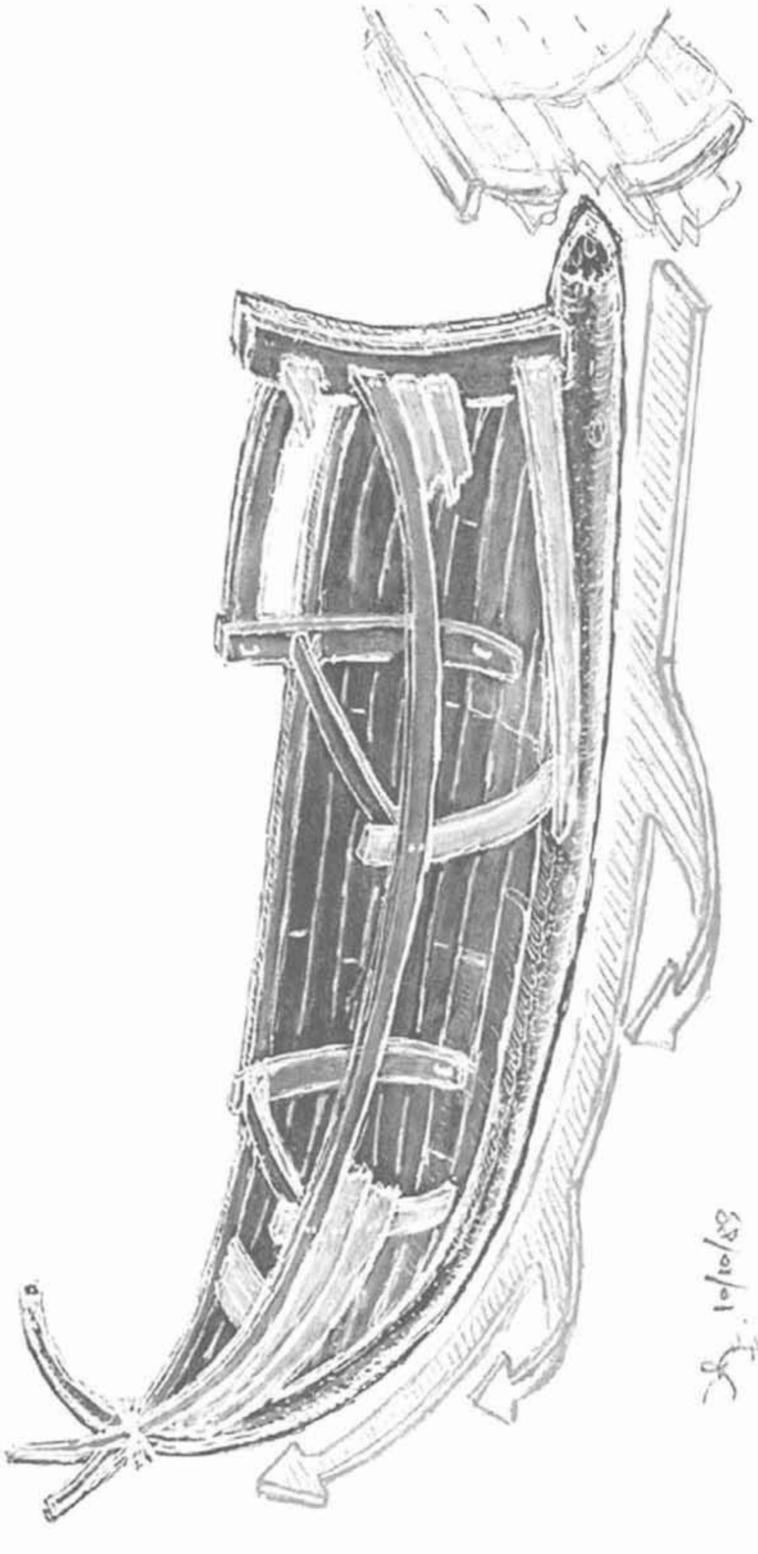

Fig. 14

AN EARLY ATTIC TRIACONTER

From Phaleron the western Attic coast extends fairly regularly in a southeasterly direction. After some 15 kilometers this regularity is broken up by a series of headlands that project into the Saronic gulf, giving the coastline a more sinuous configuration (Fig. 1). The first two headlands, Kavouri streching westward and Vouliagmeni southward into the gulf, have long been well known for their seaside resorts and marinas. Beyond Vouliagmeni three less prominent and undeveloped headlands, collectively known as Puntes, point southward into the sea. They are popular as secluded bathing spots and for the picturesque quality they add to the view out into the gulf. Λεωφόρος Ποσειδώνος, the coastal road to Sounion, passes just inland of Puntes. To the north of the highway, the ground rises gently to form the low ridge known as Bourtzi. On this ridge a group of some 20 to 30 rock-cut inscriptions, though but a very short distance from the highway, have escaped discovery until now. The total number is not certain because of the difficulty of reading the badly weathered texts. The rock is a low grade of marble that tends to outcrop as level shelves in large and small expanses. The inscriptions are carved in random places, and it was not always the best or largest outcrop that was chosen for inscribing.

In addition to the inscriptions, there are engravings of ships, persons and other objects, and it is on one of these that we shall focus today. It is located on Bourtzi, a mere three-minute walk from the highway above the middle Punta. Here a small, flat area of exposed rock carries the engraving of a ship 23 centimeters in length. In Figure 2 the patch of rock with the engraving is just right of center; the largest Punta is in the background. The engraving is quite schematic (Fig. 3)[1], showing the outlines of a long sleek hull with a straight keel and a prow ending in a boar's head ram. The boar's eye is rendered by a dot, and the ram is separated from the hull by a single line, presumably representing the edge of the bronze sheathing that covered it. The top of the stem is blunt, and there is a short parapet protecting a raised foredeck. The stern is difficult to discern. It is not clear whether it was plain or decorated. The vessel is propelled by a single row of oars with triangular blades. Twelve oars are shown on the starboard side; they are attached to tholepins sitting on top of the gunwale. Steering was done by means of a pair of long oars mounted on the stern quarters. Details such as wales, stanchions or a railing are not depicted. Nor is there any indication of rigging.

Surrounding the ship is a fragmentary inscription. The beginning, unfortunately, is not decipherable with any certainty, but the end can be read clearly as τεν τριακόντερον. Two features aid in determining the inscription's date: the layout of the text and the forms of the letters. The layout is in the boustrophedon manner. The text begins above the ship, running orthograde. As it curves around the ship's stern, the letters reverse direction to close reading retrograde. This distinctive text arrangement is commonly used in Attic inscriptions of two or more lines until around 540, after which it becomes increasingly rare (Threatte 1980: 52-57). The letter forms are also fully in accord with a date in the 6th century. Nus balance on one leg that is a high vertical, rhos have pointed loops, qoppa is used instead of kappa. The nu and rho engraved here are standard Attic forms throughout the sixth century, while qoppa becomes uncommon after 550 (Immerwahr 1992: 151, 155-157). Still, we would make two observations in urging a slightly later date for the inscription: first, it was not found in the city of Athens where the majority of texts that provide the basis for constructing a chronology were found. Inscribers living in the countryside could have been behind the times in adopting styles of writing that were evolving in Athens. Secondly, the lettering is not spidery but fairly uniform in size and coursing. This way of forming letters is much more at home in the second half of the sixth century than the first. We should thus allow the entire half century of 550-500 B.C. as the dating range for the inscription.

Whatever the specific date of the inscription, its main value lies in the fact that it names the type of ship that is depicted, a triaconter. Until its discovery, the earliest mention of triaconters in Greek occurred in Herodotos. How much farther back the history of the type extends is not known. Maritime historians generally believe that it existed well before the time of Homer and Herodotos (e.g. Casson 1974: 44-45). This is based on the dubious statements of Herodotos (4.148) that triaconters were used in the Bronze Age colonization of Thera by the Minyans, and of Plutarch (Theseus 23.1), who names the ship of Theseus as a triaconter. It is also generally held that it is only by chance that triaconters are not specifically mentioned in the Homeric poems, where fifty-oared ships occur several times. This may well be correct, though it must be stressed that mention of a 30- or 50-oared ship in an early context does not imply the early existence of the formal ship types known later as triaconter and penteconter. Furthermore, there is iconographical and textual evidence from the Bronze Age that thirty-oared ships existed at that time. A Middle Minoan seal of unknown provenience, now in the Ashmolean Museum, shows a ship with 15 oars (Basch 1987: 101, fig. C11), which implies the presence of thirty oarsmen, and a Linear B tablet from Pylos (Py An12) lists 303 rowers assigned to Pleuron which may have been the crew of one ship. We have no evidence, however, that these vessels, even if rowed with thirty oars, were already called triaconters in the Bronze Age.

The inscribed example on Bourtzi, while not providing decisive evidence for the type's earliest history, does at least show that the triaconer had a past by the time Herodotos wrote. We can now securely push back written documentation of the type by roughly a century before his time. This chronological context puts our engraving in good pictorial company among a number of ship depictions on Attic Black Figure vases of the latter 6th century that are believed to be triaconters because of the number of oars shown and the general similarities of the shape of their hulls (cf. Morrison and Williams 1974: pls. 14ff). Since these similarities now extend to a contemporary example that is labelled a triaconter, it seems safe to conclude that all these vase depictions show triaconters. Thus the new engraving from Bourtzi and the related depictions on Attic Black figure vases establish that at least by the late 6th century the triaconter had been invented as a formal ship type and was sailing the Greek seas.

A feature complicating this view of the triaconter's history is the fact that the Bourtzi ship is shown with only 12 rowing oars, not the requisite 15 for one side of a triaconter. However, variations in the number of oars are also found among the vase depictions mentioned above (cf. Oakley 1994). At times the correct number of oars is shown, but at others there are as few as 12 or as many as 17. Surplus numbers could be explained as attempts to show some of the rowers on the far side. Vessels shown with fewer than 15 oars could reflect real situations in which ships put to sea without their full crews. It must also be acknowledged that the painters may not always have painted with exactitude or were not even intending to depict a specific ship type. In the case of the Bourtzi ship, since it is specifically labelled a triaconter, inattention to ship type must be ruled out. We would conclude that the engraver either did not pay close attention to the number of oars or else intended to show a triaconter without its full crew at oar.

Finally, we consider the engraver. It is possible that he was a sailor. This section of the Attic coast is rocky but does include some sheltered coves which could have provided temporary shelter for ships during times of rough seas. Our engraver may have been a crewman from a vessel that stopped here to wait out a strom. It is also possible that the engraver was a landsman, habituated to seeing ships pass by these points. Whoever cut the depiction of the ship, he was not alone in engaging in rock-cutting activity. As mentioned earlier, a number of other ancient engravings are cut in various places on Bourtzi and Puntes. Among these are at least four other ships of different types and inscriptions which state that the inscribers were shepherds or goatherds. In no instance is a shepherd or goatherd inscription found in association with a ship, but there is at least the possibility that all the engravings, including the triaconter on Bourtzi, were made by herders who whiled away their time as their animals grazed. We would point out that this does not exclude the possibility that the Bourtzi ship engraver had some close experience with ships, since he clearly knew the hull's shape, even those parts that normally rode underwater and were not visible from land. Alternatively, he could have known theses features by simply observing other representations, since the engraved hull that he has left us is of a standard iconographic type.

Yet, was the handiwork of whoever made these engravings merely the result of passing whims? On the island of Delos, Lucien Basch had discovered dozens of ship depictions, mostly scratched into the stucco of house walls. As Delos was very much a seafaring community, Basch interprets the act of depicting ships there as expressing a wish for a safe voyage or thanks for one completed (Basch 1973; 1987: 371-382). Could our ship be explained in a similar way? This does not seem to us likely. Bourtzi is a rocky, uninhabited area of Attica suitable for the grazing of sheep and goats but not very near to any ancient habitation or sanctuary site. If our engraving were a dedication related to a sea voyage of the engraver, we would expect it to have been cut near a sanctuary rather than, as here, in the open countryside. We also believe that we can rule out the possibility that for the engraver this ship was a symbol of power, which is one of the suggestions proposed for some ship graffiti at the other end of Europe, in areas of Scandinavia (Le Bon 1995). By the late 6th century, the 30-oared ship had long been surpassed as ship-of-the-line by those with 50 oars and by trieres. Triaconters were not used simply as light dispatch vessels. They were not ships of status or power when our engraving was cut.

Our inability to read the initial part of the inscription is also an impediment to a full understanding of the engraving. If the complete text turned out to be a line of poetry, then the ship could be seen as illustrating part of a poem.[2] Or if a simple statement of fact, such as «so-and-so made the trianconter», it becomes an informal graffito, cut by one with some time to spare. With a wide panorama of sea before him, the engraver could see all manner of ships sailing the Saronic gulf. This would provide him, and others, with their subject matter. The natural rock and idle time, both in plentiful supply, would have provided the inspiration for making the engravings. Perhaps our engraver dreamed of sailing adventures. Whatever the reasons that prompted him, luck has provided us with the opportunity to glimpse an artistic predilection of someone who gazed to sea and felt the urge to cut what he saw onto the bedrock at his feet.

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NOTES

1. The drawing represents work in progress. It is hoped that further study may reveal additional details.
2. In another oral presentation of this find, we raised this possibility in suggesting that the beginning of the inscription might be a form of the verb ἀνακρούω. The text could thus refer to pushing the ship from shore. Grave uncertainties in the reading of the letter traces in the first part of the inscription force us to leave this conjecture unprinted in the present text.

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ILLUSTRATIONS

1. Map of area of Vouliagmeni/Puntes, Attica.
2. Sketch of rock-cut triaconter and inscription.

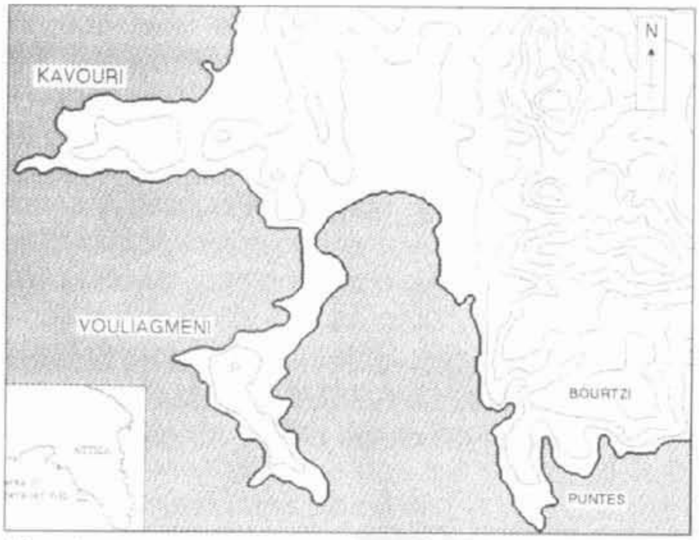

Fig. 1

Fig. 2

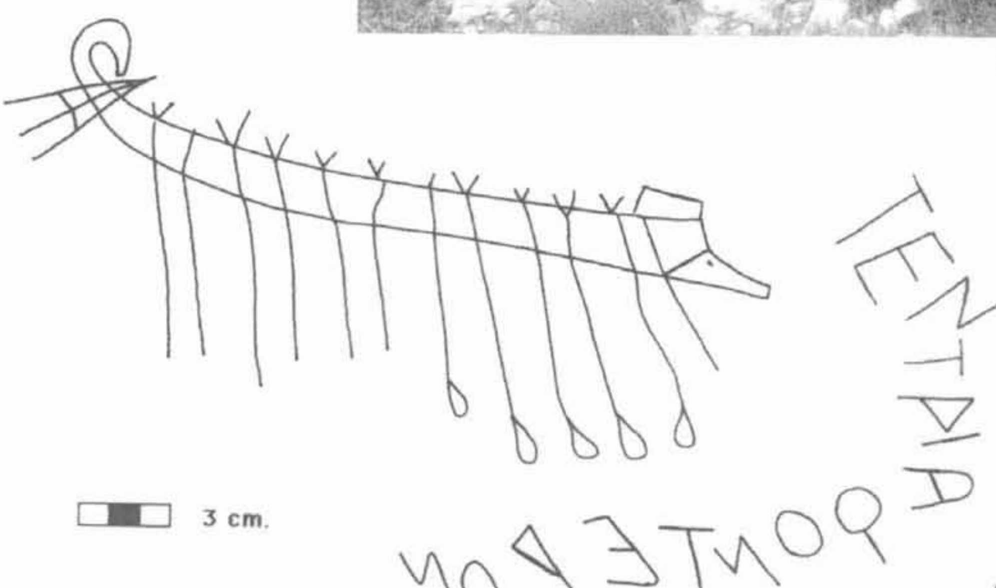

Fig. 3

A SWEDISH ΜΟΝΗΡΗΣ

Entering Statens Sjöhistoriska Museum in Stockholm, one will see two remarkable boats in the entrance-hall. They are identical but for their prows, that represent a wild boar's head and a dolphin's head. After those they are called Galten (or Vildsvinet, both words meaning: the wild boar), and Delphinen (the dolphin). They were built by the famous naval architect Frederik Henrik af Chapman (1721-1808) for King Gustav III (1746 - 1792) in 1787 (Lundström, 1966). We shall here give our attention to Galten. (fig. 1)

King Gustav III was rather unusual. He made himself, by means of a bloodless 'coup', an absolute king, waged many wars and was sometimes present at naval battles in his yacht, the 'Amphion', but he was greatly interested in the arts and wrote plays. The period of his reign is generally considered to have been one of great jollity, chiefly in consequence of the 'chronicle' songs by the unofficial Laureate Carl Michael Bellman (1740-1795), but it was also one of misery, and, as we said, war. Gustav himself was, symbolically, shot at a masked ball in 1792. This event, via the French playwright Eugène Scribe, became the plot for Verdi's opera; *Un Ballo in Maschera.* The censors in pre-Garibaldian Italy were evidently afraid that shooting at a king might give somebody ideas, and banned the libretto.

At that time the Swedish navy had several high-ranking officers that were able to do better things than fighting. The most remarkable one among them was perhaps Carl August Ehrensvärd; writer, draughtsman (might be called an early surrealist), galley-admiral, designer and a friend of Chapman's.

Galten. Length 10 m., beam 2.90 m., height stern ornament 3.20 m., height bow ornament 2.70, height from keel to top of 'deckhouse' 1.80 m. 8 oars. 4 forward, 4 aft of deckhouse. (Lundström, 1966, p. ?). The hull is rather flattened and seen from above, looks almost like a treeleaf, clinkerbuilt and quite graceful. The overall effect is rather spoiled by the thing like a roofless railway-compartment, with plush seats, probably designed to separate king and commoner. Then there is the intrusive rudder, let down through a rudder-trunk. Most striking are stern and prow, where the prolongations of the stemposts, though reinforced by iron bars, look very much like an aphlaston and an akrostolion, seen through rococo eyes. The boar's head hides the stempost and is not really a figurehead in the 'modern' sense; the nose is at about waterlevel. This resembles the way in which painters of Attic black-figured vases, around 500 b.C., showed the whole of a warship's prow as a stylised boar's head, the ram being the nose (fig. 2). This is surprising, as the interest in this art-form dates from much later. Mr. Peter von Busch, director of the Marinmuseum at Karlskrona (Busch, 1981, p. 23) and Mr. Ulf Cederlöf, chefsintendent of the Nationalmuseum (private letter) understandably points at the Roman finds known in the 18th century and the interpretations thereof (private letter). Among these, boars' heads on ships are rare. There is a relief (fig. 3) of uncertain date, showing a tripartite ram with a boar's head above it, in the place of a proembolion (Stuart-Jones, 1912, pl. 61, fig. 102). Of this there is an accurate drawing in Rafaele Fabretti's book *De Columna Traiani Syntagma* (Rome, 1683), at the bottom of page 115, with a notice that it was then to be found in the church of San Lorenzo fuori le Mura in Rome. Something very like this relief turns up, in the litteral sense of the word, in a welter of classicoid débris, painted by Louis Jean Desprez (1743-1804) to celebrate a victory of Gustav III's navy (fig. 4). The tripartite ram has become shapeless. The painting hangs in Finland's National Museum in Helsinki (Wollin, 1936, p.129, fig. 99). Mr. Cederlöf drew my attention to Montfaucon's 'reconstruction-drawing' of Duilius' column, a lost monument with ram-trophies in Rome. (Montfaucon, 1719-1722, pl. CXIII). Montfaucon's phantasies owe some things to the afore-mentioned relief and some similar ones in the Museo Capitolino (Stuart-Jones, 1912, Pl. 62. figs. 105 & 107), with other animals heads, but they are so fanciful, that it takes nothing but nautical sense not to imitate them.

If the idea of Galten came from a Greek vase, the question is, how? The king made the grand tour and showed considerable cultural curiosity while in Italy. Moreover, he took along Johan Tobias Sergel (1740-1814), a sculptor, as such rather 'smooth', after the fashion of the time, but also an original and witty draughtsman. Also he learned his trade in Italy, and he had a pupil; Johan Törnström (1743-1828), who worked full time at the naval yard in Karlskrona, sculpting many figureheads, including those of Galten and Delphinen (Busch, 1981, pp. 23-24). Mr. Cederlöf informed me that Sergel never drew a Greek vase, nor even a ship, though he designed some figureheads (Nikula, 1933, p.152). The most likely candidate is Ehrensvärd, he went on the grand tour and had read the pioneer German 'antiquary' Winckelmann (Ehrensvärd, 1916, I, p. 60). In Catania he visited the 'cabinet' of prince Biscari (I, p. 35) and he bought some 'Etruscan' vases (I, p. 36). In the British Museum Mr. Dyfri Williams showed me the huge catalogue of the Biscari collection; no boar nor ship. As to the vases Ehrensvärd bought, Mr. Cederlöf wrote to me that they are an absolute mystery; lost!

That Galten and Delphinen are meant to be 'classical' is moreover indicated by the fact that the 'compartments' were decorated with oval wooden shields, on which scenes from Greek mythology were painted (Lundström 1966). A strange modern statement is that because Chapman owned Chinese watercolours and other pictures representing Chinese ships (Busch, 1981, pp. 23, 24, 26), Galten had to be Chinese (Harris, 1989, p. 97). This is the more astonishing because Mr. von Busch had unearthed the head- and tail end, both obviously Chinese-inspired, of a third sloop, built by Chapman and Törnström (Busch, 1981, passsim, photograph on p. 25). Harris mentions this vessel on his page 103. Delphinen, with her akrostolion (not identical with Galten's) and her aphlaston, was clearly meant to be 'classical' too, though dolphins, in antiquity frequently depicted accompanying ships, never had to serve symbolizing ships, perhaps because of their negative sheer.

When a non-nautical person sets out to design a classical ship, the result can be surprising. It is certainly so in the case of the aforementioned painter and architect Desprez, who designed an antique city for Gustav III, with ships (Wollin, 1936, p.149. figs.132 & 133). Neither city nor ship (fig. 5 and 6) ever left the drawing-board.

En route to the symposion, the author visited the National Historical Museum in Athens, and noticed that the desire to provide a king with classical water-transport did not end with Chapman. In this museum the prow of a 19th century "Basilikos akatos" had been preserved. On either side it showed a three dimensional eye, and, under the figurehead, a romantic eagle, a small, decorative wooden three-pronged ram.

For help and information, the author thanks Mr. Peter von Busch, Mr. Ulf Cederlöf and Mr. Dyfri Williams.

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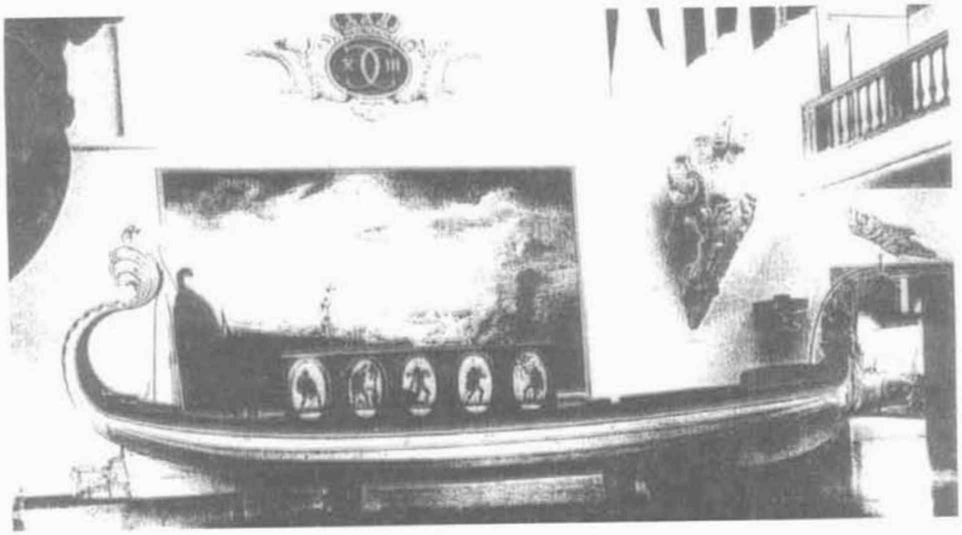

Fig. 1

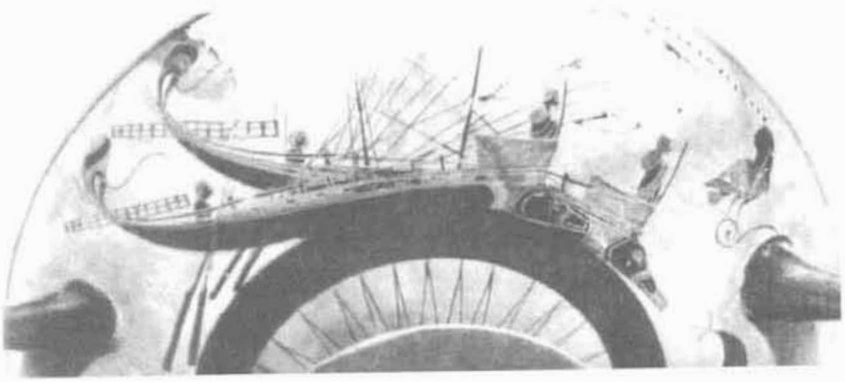

Fig. 2

Fig. 3

Fig. 4

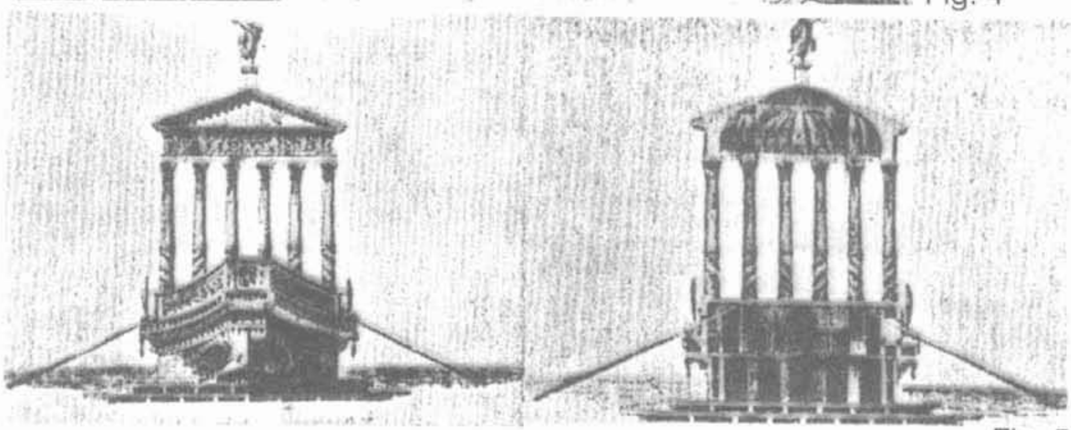

Fig. 5

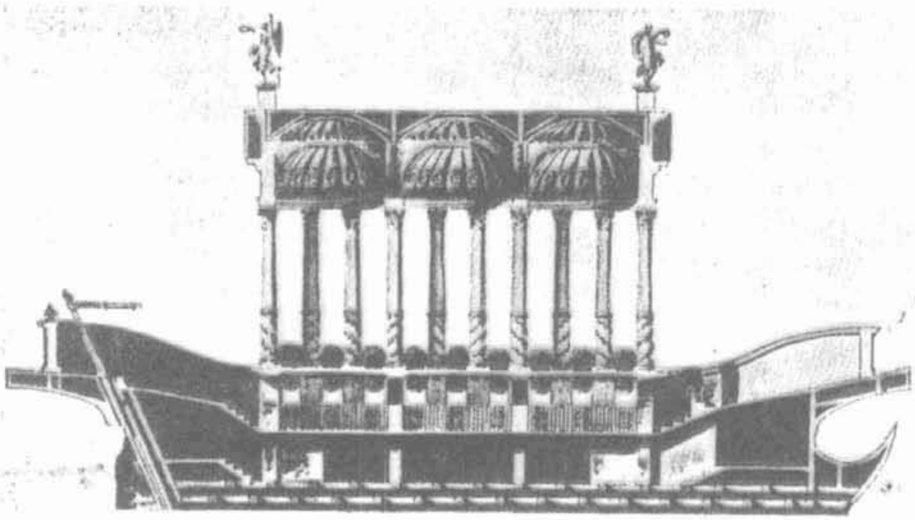

Fig. 6

THE MYRINA SHIP RE-EXAMINED

Because of its geographical location, Lemnos has always been at the crossroads of sea routes, its coasts offering many havens and landing places. Thus, it is not surprising that Lemnos was related very early to myths describing sea travels and adventures, such as the Argonauts' expedition, while material evidence attests overseas contacts since the end of the Neolithic period.[1] Besides, an important sanctuary of the Kaveiroi, who, among their other qualities, were also sea divinities, existed since the eighth century BC on the northern coast.[2] The Kaveirion is located opposite to the island of Samothrace, overlooking the sea and the route of the ships coming from the North and East

The present main port of the island's capital, Myrina, on the western coast, is a natural harbour that has been used in various periods, sheltering ships from the northern prevailing winds. The headland of Kastro, consisting of volcanic rocks (dacites), located between two bays, dominates this port (height: ca 115 m). The island's landscape consists otherwise of flat land and low hills.[3]

The Kastro also bears rock-cut features and carvings. Later structures have destroyed a large number of these features, as on the northern part of the peninsula, occupied by the Medieval castle. The area was visited at least since the Geometric period, and possibly before that. The remaining rock-cut features are located, according to a preliminary survey, on various altitudes. These features may be isolated or combined, and they consist of: 1) cavities of various dimensions, wells and conduits, 2) flights of steps, 3) rock-cut «rooms» or «platforms», 4) niches and 5) rough incisions (engravings), mostly on vertical surfaces of niches and walls or floors of «rooms»/platforms.[4]

One of the engravings, at approximately 12 metres above present sea level, has been briefly presented in the 3rd Symposium of Ship Construction in Antiquity (1989).[5] It has since been traced, photographed and studied in detail, in the framework of a broader study of the whole rock-art area, started in 1998.

The ship represented by this carving (figs. 1 and 2) is incised on the vertical surface of a rock-cut feature consisting of a stepped, double niche, and oriented towards South-East. The upper right part of the same rock, over the engraving, is also shaped in small steps. At the same time, the niche constitutes the exterior side of a rock-cut angled structure, part of a «room» resting on the flank of the hill, its open part facing the sea. The vertical carved surface is 3,60 m long and 1,02 m high (maximum dimensions), and the breadth of the horizontal surface in front of the engraved panel varies from 0,20 to 0,80 m. Because of the erosion, it is very difficult to distinguish the lines, and sometimes natural breaks or flaking off of the rock surface are muddled up with man-made carvings.

The recent tracing (fig. 3) and study of old archival material revealed further elements. It appears now that the engraving is up to 2,10 or 2,30 m long (depending on the inclusion or not of some elements on the right-hand extremity), and up to approximately 1,00 m high. There are 9 or 10 horizontal lines carved at intervals of 4,5-6 cm, and 12 certain oblique lines -oars- at intervals of 7-8 cm; three oars cross one to three lower horizontal lines. The lines are l-2 cm deep and l-3 cm wide. The horizontal lines are curved upwards towards the right end. There are some traces of vertical lines on the left end of the engraving. Some further small linear segments, roughly perpendicular to the horizontal lines, crossing the spaces between the latter may be due to natural erosion. Other elements, such as two more or less rectangular, oblong cavities (fig. 4, M and N), up to 8 or 9 centimetres long, 4,5-5 cm deep and 2-3 cm wide, have no clear connection to the engraving.

On the left end, «oar» 1 (fig. 4) is visible on old photographs, looking like a steering oar, as it is not situated under the hull, but laterally to it. Such an incision could not be identified on the carving, and might also be an accidental mark. «Oar» 2 is very short, but its direction is only slightly diverging from the direction of the other oars. As it seems to start from the lower end of the ship's hull, it might represent a steering oar, if we consider this end as the stern. If, on the contrary, the lowermost horizontal line did not stop at point XX, but had initially continued till «oar» 2, a possibility rather difficult to admit, then the latter would be part of the hull. It seems less obvious to consider «oar» 2 as an early precursor or a «primitive» form of ram[6], as the short horizontal projection on the Tragana ship[7], because of its shape and downward direction. Otherwise, at the present state of our knowledge, nothing permits to suggest the existence of a real ram here.

Moreover, on the left part of the carving, some surviving traces as well as old photographs show an important horizontal «projection» (A-B or A-C) higher up on the ship extremity, and approximately at the same height as the upper horizontal lines. It is oriented outwards, and recalls either the «fish emblem» or projecting decoration on Early Cycladic boats[8] or the stem appendage, sometimes animal- or bird-shaped, in particular on Late Bronze Age ships.[9] The approximately vertical extremity of the ship here seems, nevertheless, much lower than the usual «high end» of the Early Bronze Age ships, unless the upper part of the stem-post disappeared, or there was not enough space for it, as the superstructures had also to be carved over the gunwale. However, if there had been an upper part originally, the appendage would be located on the middle of the stem/stern-post, not on its top. The part of the hull (B-E-G-F-C and possibly D) contiguous to the projection may represent astern- or stern-structure, similar to the Late Bronze Age «forecastle»,[10] or the strengthening/enhancement of the Early Bronze Age high extremity.

The uppermost horizontal «line», preserved till point J, consists of a series of crescent-shaped elements. Such arc-shaped traces almost fill the left-hand (preserved) part of the carving, over the horizontal lines, starting from points H and K on the left. It is however true that the available space on the left part of the rock extended higher than on its right part. The arcs might represent cargo, superstructures or even rigging (of an unstepped mast?), which would not be in use, since the ship was represented under oars, rather, than members of the crew or passengers. In any case, there would not have been enough available space on the rock for a mast and sail to be carved.

It is uncertain whether the horizontal line immediately under the crescents continued on the destroyed part, to the right of point O. It is a matter of conjecture if the following lower lines were initially joined to the traces visible to the right of the destroyed part, till points P and Q, or even further to the right, where the surface of the rock has also disappeared. The same happens concerning the lines ending on points R, S, T, U and V, which could have stopped there or continue towards the right. The lowest horizontal line (V-XX) probably stops at one third of the distance (XX) from the left end of the ship. Some traces discernible on old photographs do not permit to affirm that it continued till the extremity. Could this irregular outline mean change of direction, such as observed on hulls of Early Cycladic ships on «frying pans»? A further change of direction of at least the four lowest lines («ripple») is apparently shown at a short distance from the right end, just before they turn upwards to form the right end of the ship. There would be space enough for a last oar towards the right end, but nothing is left of it. This absence may be consistent with the fact that the change of direction of the hull lines starts from this point, in order to form the right hull extremity: an oar could not be used so close to the ship end.

The right end of the representation is heavily eroded. As it has already been said, it could be reconstructed

a) with all the lines continuing upwards to the right of points P, Q, S(?), T, and U, possibly also V and X, forming a curved stern, or,

alternatively,

b) the hull may have ended at these points, forming a more or less vertical extremity (as on the left end), of which the «closing» vertical lines would have disappeared.

In both cases, there would have been an oblique projection to the right, apparently not belonging to the hull itself, and consisting of two linear elements, X'-X (if not X'-X-Y, forming then a very long line), and possibly Z'-Z, or of three elements (including V or V''– W) in case b). The short line ZZ is uncertain, and YY should be natural. The projecting lines might be interpreted as a steering oar of a curved or a rectangular stern (such as on Late Bronze Age and later ships), or as a «keel extension» or «forefoot» of an Early Bronze Age ship.

In any case, the ship has an angled, vertical left end, with a horizontal elaborate projection high above the keel line, a curved or vertical right end with one or more oblique linear projections (or perhaps one double-lined projection) and approximately 24 oars. This possibly meant a thirty-oared ship, attested since the Bronze Age and during the historic periods. The keel line would be straight, unless the lowest line interruption suggests, by «artistic convention», an Early Cycladic type keel. Being rowed would not exclude the possibility of having a mast with sail and rigging, even if those were used occasionally. Oared ships suggest fast and light vessels, used in particular in piratical or military expeditions.[11]

The ship is relatively deep, but not with exaggeration, as might be thought at first, since the upper left part does not represent elements belonging to the hull, but rather superstructures, as it appears to be the case. The first impression of the representation is that it is a «raft»[12], because of the parallel lines, which might represent lashed trunks. However, the shape of its ends and other elements seem to exclude this. It is also a fact that the surface of the rock chosen, higher on the left-hand part and lower on the right, is adapted for the representation of such an asymmetric image. Parallel lines are present on the Dramesi incised ships, but they are vertical; otherwise, one of the Dramesi ships, with vertical ends, also has a stem decoration and a short oblique projection starting from the lower angle of the stem.[13]

Would the horizontal parallel lines, rather exceptional in prehistoric ship iconography, represent the planking, although usually this is not considered necessary? Could this perhaps mean that the boat represented here was a sewn boat made of laced planks? This is a very early practice,[14] attested by Homer and continuing well into the Archaic period,[15] but it cannot be argued convincingly that such a method of construction was meant to be represented in the present case: the vertical short lines which could represent lashings may be due to erosion (see above). Such parallel lines, frames or planks are rarely represented in historic periods[16], for example on the Aristonothos vase,[17] on an hydria painting, possibly representing Argo and the Argonauts,[18] or on Etruscan ware, depicting Dionysos and the Tyrrhenian pirates,[19] as well as on a scene representing Kaveiroi aboard a ship.[20]

Although in its present condition only a slight part of the initial engraving is preserved, it must have been quite impressive, given its dimensions, the deep relief and its location visible from the port.[21] It could not help the approaching boats as a sea-mark, since it is rather indistinguishable from the surrounding rocks, covered now by different kinds of lichens, and could be seen only from a short distance from the water. Besides, it is turned towards the inner port and not the entrance of the harbour, certainly not the open sea. It might at the most be used as a landing signpost helping to moor safely. In the beginning of this century, sailing boats were put ashore to be repaired exactly underneath the engraved niche, which was situated in the outer part of the port, while small boats moored in the inner port, called now «small harbour».[22]

Nevertheless, the significance of the island as an important stop of sea routes has already been stressed,[23] and the ship motif near the coast seems meaningful in this connection. As a matter of fact, besides practical utility, symbolic value can also be attributed to prominent landscape features, such as a rock[24] enhanced by carving niches and incising images. Since prehistoric times, ship graffiti are well-known ex-votos.[25] Some Early Bronze Age ship representations on stone plaques are known from the island of Naxos (Korfi t'Aroniou) in the Cyclades,[26] not to talk about the ship graffiti of historical periods, as on Delos.[28] Ships have been engraved on walls of temples and large stone blocks, such as at Malta Tarxien (probably 3d millennium BC),[29] dating mostly from the Late Bronze Age (probably *13th-12th* c. BC), as in Kition,[30] or Dramesi. Several ship engravings have been found on the cliffs of the Carmel Mountain range in Israel in a coastal area, at a distance of 3 km from Tel Nami and the anchorage site associated with it and they date from the last part of the 13th century BC.[31]

The Kastro ship could therefore attest a ritual related to the sea.[32] The type of the ship can be approached to Bronze Age parallels, including examples incised on stone slabs, dating mostly of the end of the Mediterranean Bronze Age. Some of these graffiti of boats (of different types than our example) have been attributed to the Sea Peoples.[33] However, its date cannot be proved indisputably, as there are still open questions concerning the destroyed parts, as well as because of the lack of dated contexts.

Even if the particular engraving in the Myrina port had some specific meaning by itself, it is not isolated nor incised on a natural rock. It is located on a vertical surface of a stepped niche on the side of a carved complex.[34] Besides, even if the symbolic, cult or ex-voto hypotheses are retained, a number of rock-cut and carved features on the Kastro do not exclude profane use, and Lemnos' lack of water could explain the cavities, conduits and wells. These rock-cut features suggest possible relationships with the sea, the landing places of the harbour area and water collection,[35] but they may not be limited to them. Their complexity and state of preservation, added to the fact that we cannot yet consider them in their exact cultural context, does not permit any global interpretation hypotheses for the moment. Nevertheless, evidence presents common traits through the centuries in the same area, implying, among other things, navigation, a harbour, ships' arrivals and departures. The on-going systematic study of these important remains should, hopefully, help some pattern emerge that will shed light on their interconnections and possible functions and meanings.

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NOTES

* The author wishes to thank warmly: Mrs. Aglaia Archontidou-Argyri, Ephor of Antiquities, and the Archaeological Council of the Greek Ministry of Culture for the study and publication permit of the Kastro rock-cut features and engravings; the Institute for Aegean Prehistory for a generous grant covering part of the study; Miss Honor Frost for her most precious help and continuing encouragement.

1 Archontidou-Argyri 1994.
2 Beschi 1994:36-37.
3 Marangou 1999b.
4 Marangou 1998.
5 Marangou 1995. Cf. Marangou 1999a.

6 Cf. the Dramesi ship (Basch 1987: 144-145, fig. 302A-B and the Protogeometric Fortetsa ships (10th c. BC): Basch 1987: 159, figs. 320; cf. van Doorninck 1982.
7 Basch 1987: 142, figs. 297, 298.
8 Tsountas 1899: 90; Basch 1987: 80-83, 88; cf. Doumas 1990
9 Such as the Skyros, Gazi or Tragana ships: Basch 1987: 142, figs. 295,297, 298; 145, fig. 303; 146, fig. 304, the Tiryns model: Wedde 2000: 310, nor and fig. 315, or the Kynos vase painting: Dakoronia 1991: 171, fig. 9.
10 Cf. Tragana: Basch 1987: 142, figs. 297,298.
11 Ormerod 1978 (26-27) mentions light piratical ships of later periods in the Black Sea, holding twenty-five to thirty men. Is it a coincidence that the Lemnos inhabitants had a bad reputation as pirates in the time of Herodotus? (Ormerod 1978:20).
12 Cf. Kapitan 1989.
13 Basch 1987: 144-145.
14 Cf. McGrail 1998: 131-133.
15 Cf. Pomey 1997: 90-93.
16 See also Marangou 1995:311 and 313, note 17.
17 Basch 1987: 233, fig. 482 (7th c.BC).
18 Basch 1987: 221, fig. 460 (6th c. BC); Pomey 1997: 20-21.
19 Hockmann 2000: 82, fig. 26 (4th c.).
20 Basch 1987: 272, fig. 578 (5th c. BC).
21 Marangou 2001.
22 Marangou. 1995: 318-319, figs. 8-11.
23 Marangou 1999b.
24 Marangou 2000.
25 Basch 1981; Artzy 1993.
26 Doumas 1990: 715 fig. 4, 719 fig. 7, 735b, 736a.
28 Basch 1987: 376 nos 32, 34-36, 377 no 41, and 378 no 45.
29 Woolner 1957.
30 Basch/Artzy 1986.
31 Artzy 1993; idem 1994.
32 Cf. Marangou 1995 and *idem* 1999a.
33 Artzy 1999.
34 Marangou 1995: 317, figs. 4-5; cf. Marangou 1999a.
35 Marangou 1998.

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LIST OF ILLUSTRATIONS

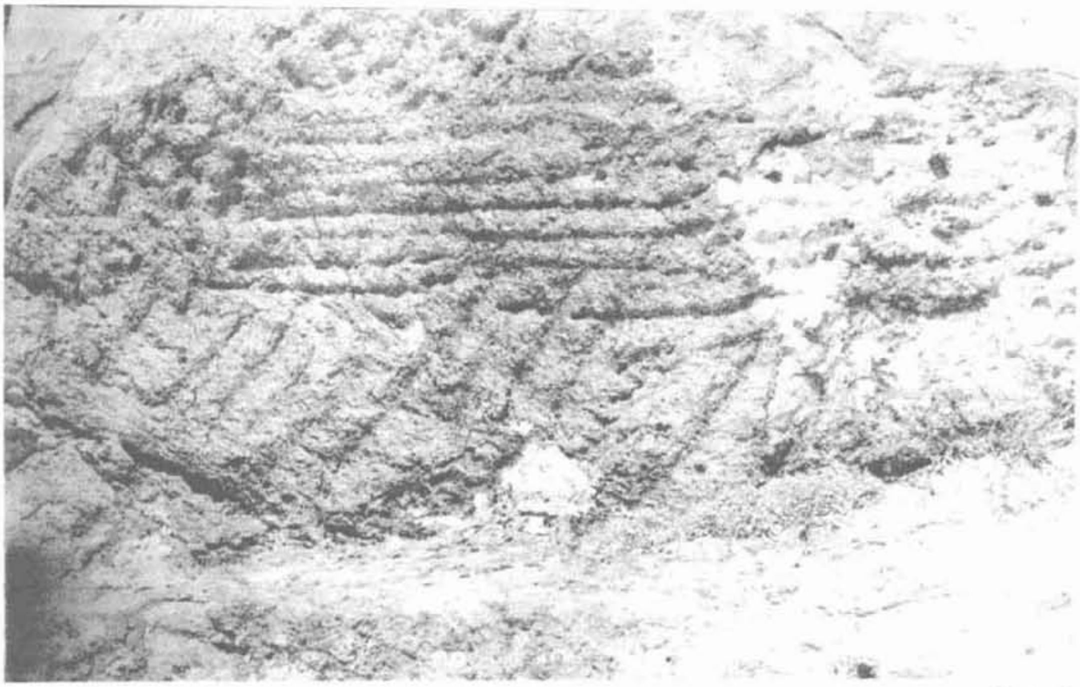

Fig. 1

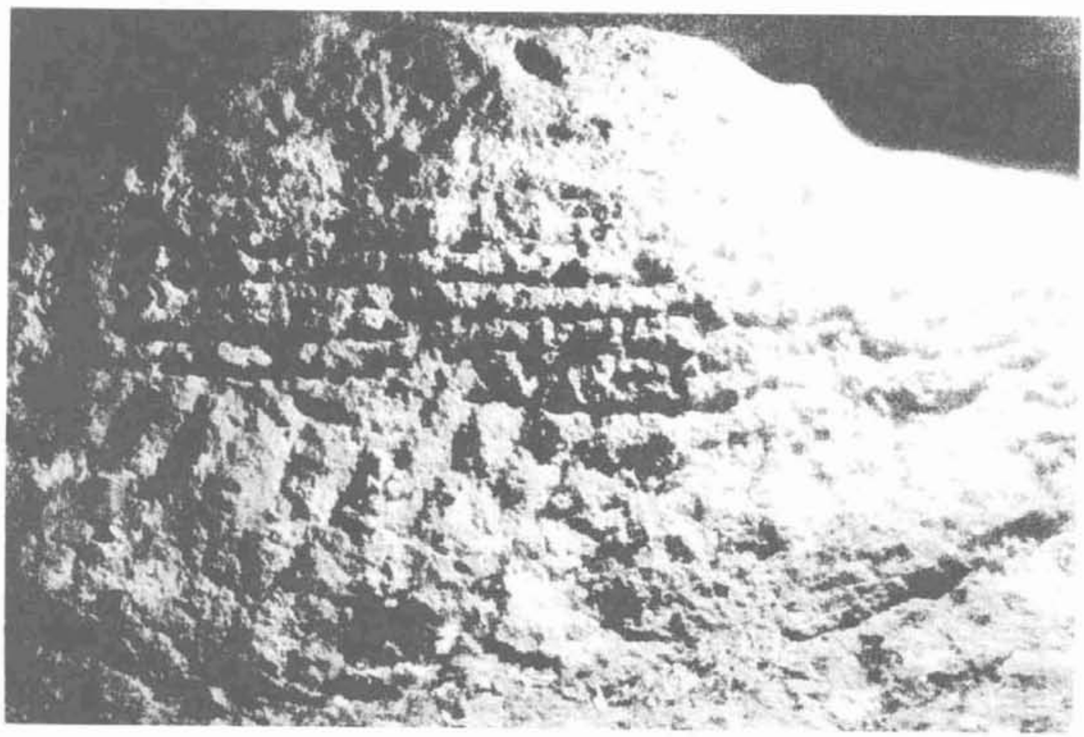

Fig. 2


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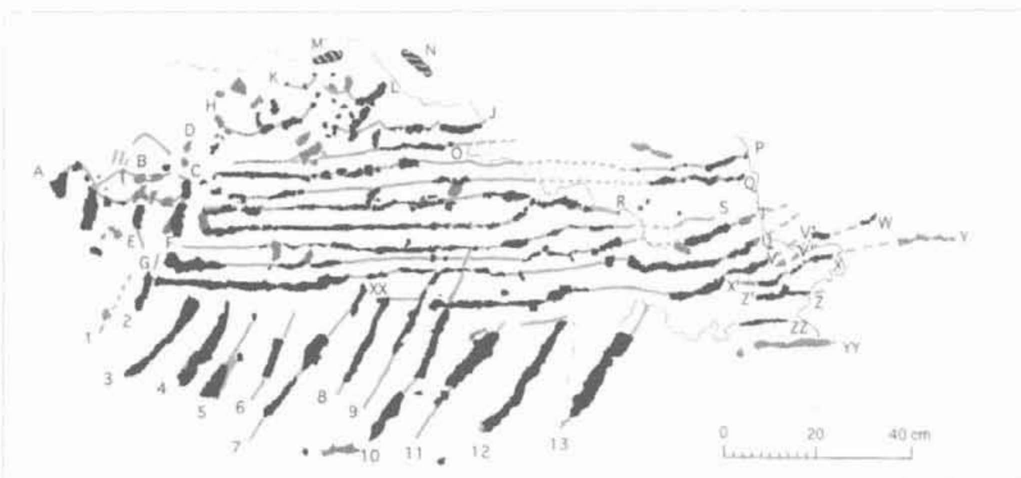
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Fig. 4