ON THE ROLE OF MULTI-FUNCTIONAL HYBRID HULLS IN THE CONSTRUCTION OF A NARRATIVE OF EARLY GREEK SHIP ARCHITECTURE*

Introduction

Crafting a narrative purporting to reproduce the historical evolution of early Greek ship architecture is an undertaking fraught with difficulties and pitfalls**. The three categories of available evidence, to wit, shipwrecks, texts and representations, lack individually the necessary comprehensiveness to contribute decisively on their own, while the simple (and simplistic) addition of the accumulated information results in an unsatisfactory account due to the specificity of individual wrecks, the vagueness of the texts, and the generic nature of images. A measured blending of input, the careful collating of complementary statements under exclusion of obvious incompatibilities does not alone, however, result in an acceptable narrative. Wrecks, texts and images, as they have come down to the modern beholder, do not represent the sum total of the ancient maritime experience. Nor does the attainable degree of detail offered by the data provide a full spectrum of information. To this must be added factors more difficult to evaluate: the impact of the functional environment, the role of regional building traditions, and the influence of political conditions, as well as aspects derivative of the archaeological record's partial visibility. These latter include absent hull types or regional traits, misunderstandings ancient and modern, and the hobby-horses and personal agendas of scholars.

The evidence raises a number of issues and contradictions requiring analysis and resolution. An implicit — and not always sufficiently remarked upon — leitmotif in the scholarly literature is that the database is composed by images of oared galleys and wrecks of merchantmen, while the texts generally concentrate on activities requiring warships to the quasi-complete

exclusion of all other maritime undertakings. In addition, while the bulk of ship images in Greek art is largely pre-Classical in date, sufficiently well-documented wrecks permitting at least a partial reconstruction, an estimate of capacity, and an ethnic attribution are all relatively late in date. The ensuing narrative, based on the wreck/text/image triad, structures the evolutionary sequence on "warships" alone, with the merchantman treated as a given regardless of whether attested or not, while allowing for some movement of goods on merchant galleys. This reconstruction, in a sense, is not incorrect, but would, it is suggested, bear revision. Emending the cumulative image projected by the textbooks, justifiably oft quoted and constituting the references employed by non-specialists, amounts to a major undertaking, when not an act of *hubris*. Nonetheless, recent developments in the relevant bibliography render such a tentative desirable. In practical terms, the standard narrative is constituted by three fundamental assumptions, without whose acceptance the account would collapse. The first involves a distinction between merchantmen and warships from the earliest times onwards, the second an equation of oared galleys with warships, and the third a cavalier encounter with visibility in the archaeological record.

Establishing a terminology

A critique of the textbook reconstruction of ancient Greek ship architecture does well to commence with terminological issues. Although glossaries are appended to facilitate the reader's navigation through the unavoidable technical terms, the accounts do not offer precise clarification regarding the exact sense in which key words are employed[1]. The notable exception is offered by the Classical Greek type designations such as *triakontoros*, *pentekontoros*, *trieres*. These, however, are adopted as givens from the texts, despite indications that usage did not remain constant: the term *pentekontoros* may, or may not, have been employed to designate both single- and double-level variants[2], while the *trieres* is known to have gone through at least two major stages in its design history[3]. This definitional insouciance finds its roots in the ancient authors, who frequently employ generic terms for specific ship types[4], and has adhered to scholarship since the time when the study of Greek ship building was in the hands of philology[5].

A rigorous terminology constitutes a prime *desideratum*, despite the inconveniences involved. Forging a vocabulary largely predates, by

necessity, the complete analysis of the database since through assigning labels to the material under study the differences and similarities become apparent. Undesirable since apt to steer the enquiry through the external imposition of concepts, this is unavoidable due to the absence of specificity inherited from the ancient texts. In addition, a strict terminology imposes adherence upon the responsible scholar, even in cases when a hazier vocabulary would facilitate encounters with recalcitrant evidence. Yet it is exactly such unfocused linguistic usage which permits lax argumentation. The objections raised here against the textbook accounts stem in part from insufficient attention to terminology. An unpreventable blemish ensues when precise definitions may not correspond to ancient thought and usage. Yet modern thought about ancient topics require specified usage so as to create a basis for discussion.

For the present purpose, five definitions will be proposed to cover a range of craft at varying extents testified to by the database. (Clearly generic terms such as "ship", "boat", "craft", "embarkation", "vessel" must remain in their innate loosely defined state to account linguistically for all-inclusive or generalizing statements[6].)

- A *merchantman* will be defined as a hull conceived to maximize cargo capacity, implying a minimal crew, and a reliance on the cheapest form of locomotion: wind power. Oars constituted a viable alternative only in limited contexts such as maneuvering.
- A *galley*, while a capable sailer, is here understood as designed to seat a large crew of rowers so as to attain high speeds regardless of wind conditions. Its cargo capacity is reduced, although not non-existent. The crew may also double up as warriors, but a galley is not, by definition, a warship[7]. In its many permutations, the galley may, however, eventually become functionally specialized, evolving into the backbone of ancient pre-*trieres* navies.
- A *warship* is a special purpose craft designed for participating in sea battles or in activities related to warfare exclusively. Secondary uses are quasi-excluded due to the design, the size of the crew, and the primary purpose (unless major structural modification is undertaken). In the Greek context, a warship is conceived almost exclusively for ramming: the *trieres*. In this definition, a craft employed for troop transport is not *a priori* a warship — even if adhering to the galley architecture.

The more recent literature has argued for the existence of galleys with increased capacity to carry trade goods, yet little has been done to identify such craft in the representational record. Almost by definition — *l'état des choses oblige* — physical remains of such hulls are non-existent. Two

different terms may be employed.

- A *cargo galley* is a galley with improved cargo-carrying ability. The accent is placed on galley characteristics as opposed to those of a hull conceived to carry merchandise, resulting in a wider-bellied galley, conceived to move primarily under oars.

- A *merchant galley* places the stress on the cargo capacity, yet the hull is designed along galley lines: sleeker, faster, with a galley bow, and designed to be sailed extensively as well as rowed.

At first glance the distinction may seem a case of hair-splitting, but given the gaps in the evidence, it may be of some significance: to eliminate the one or the other, or to employ them as synonyms, would imply, as the terms are defined, a specific procedure through which the shipwrights approached this hybrid form. It would appear too early to operate such a deterministic intervention on the language employed to categorize the data[8].

Obviously, it may be argued that many designs would fall outside these five categories. One may safely assume the existence of a vast, largely invisible, population of small craft capable of moving at speed under oars, sail well, carry cargo, passengers, military equipment or warriors[9]. It should also be kept in mind that any attempt to create type listings uniting all instances thought to represent the available population for any one category would butt against the problem of identifying models as statements of specific design, and of determining minimum dimensions for admission to the above categories[10].

Hybrid designs between merchantman and oared galley

A major failing of the established narrative is to operate an unreflecting distinction between merchantmen and warships in early Aegean ship building without engaging in the prerequisite holistic analysis of all forms of water transport for the period under consideration. Whereas Egyptian hull forms exhibit two distinct tendencies (abstraction made of papyrus craft and embarkations employed in religious contexts) caused by two largely incompatible operational environments, riverine *vs.* maritime, such a differentiation is not possible in the Aegean[11]. Although there are faint indications of several, in a sense, conflicting traditions in the Early Bronze ship imagery, each with the potential to have remained in production despite their later invisibility, Minoan ship building appears to have developed out of the Early Cycladic II craft depicted on "frying pans" from Syros, two plaques from Naxos, a sherd from Orkhomenos, and a model from Palaikastro[12]. The

subsequent development down to the ships on the Miniature Wall Painting from Akrotiri can be shown to ensue in an evolutionary manner[13].

A contrasting architecture, sufficiently different to warrant speaking of a break, emerges towards the end of the Late Bronze Age, in the form of the first Mycenaean vessels. Admittedly, this hull form appears, on the testimony of the available imagery, rather suddenly, and it is not to be excluded that this is connected to changes in ceramic decoration, the addition of figurative designs to the existing abstract and vegetal repertoire, rather than to exclusively ship constructional factors. Nonetheless, even if allowing for a partial invisibility of the earliest statements of the Mycenaean hull type, or an extremely selective representational strategy on the part of Minoan craftsmen leading to exclusion of concurrent forms from the pictorial record, the Minoan ship type appears to the modern beholder as the sole hull in use during the acme of Minoan society. There being no contrast against which to hold up this ship type, the distinction between merchantmen and warships becomes inoperable on the level of hull architecture, and thus has no place in the vocabulary of Aegean Bronze Age ship studies up until around 1400 BC[14].

This train of thought introduces the concept of multi-functionality: what was, as far as the data allow to distinguish, a single ship type was employed — on the testimony of the Akrotiri Miniature Wall Painting — as required, either to carry goods on trading missions, ferry people in religious processions, or transport warriors to theaters of war[15]. Functional diversity as translated into differing architectural forms can only be argued when the necessary contrasting types, and sufficient evidence for specialized (and incompatible) use, are marshaled in support. This mono-functionality cannot be approached solely from the ship architectural evidence, be it physical or representational, but requires close readings of the historical testimonia, and the factoring in of the functional and political environment.

Navigation in the Aegean, and the Eastern Mediterranean if the coastal route is employed, is characterized by constant visual contact with land, causing *cabotage* to be the main mode of movement. Landfalls for eating and sleeping led to limited autonomy being required of a ship and crew, potentially allowing a more specialized use of the hull. If speed was the premium characteristic, the Greek ship architect employed almost the entire hull as the motor section by emphasizing locomotion by oars. If cargo capacity was advantaged, the hull became a wind-driven hold. In either case, on-board livability was of minor import. Political conditions, on the

other hand, argued against mono-functionality. Centralized control of the Aegean and the attendant political stability was a rare phenomenon, essentially imposed only by the Minoans, the Corinthians, the Athenians, the Rhodians, and, intermittently, the Romans[16]. When decentralized into regionally restricted maritime fiefdoms, or entirely outside any form of judiciary, the Aegean became the home of pirates. The invention of the galley by the Mycenaeans, and its continuity throughout ship building history in the region, indicate that the times of peace were few and short-lived. Only with safe navigation can an economy rely on sail-propulsed merchantmen. Unless a political entity could escort its merchantmen with a fleet of galleys, something few were able to do, cargo had to be shipped in hulls capable of moving at speed independent of wind conditions, of deterring attack from marauders (whether privateers or state-sponsored), and of defending itself in man-to-man combat at sea.

Whereas it is possible to interpret the textual evidence as supportive of reading a limited capacity for cargo into oared galleys, it is clear that the standard galley design, be it of single-, double-, or triple-level design, did not offer adequate stowage to sustain a complex economy dependent, as any such entity would be in Greece. on imports to supplement production and natural resources within its own territory[17]. Yet if, as argued above[18], merchantmen required a protected environment, and oared galleys, when reduced to seating capacity alone, could not compensate for reduced bulk, a third way became necessary. That a hybrid hull type midway between a galley and a merchantman, combining speed under oars with increased cargo capacity, existed in the Archaic period is evidenced by the statement from Ploutarkhos that Polykrates ordered the construction of the so-called *samaina*, a craft which was "low and flat in the prow, so as to look snub-nosed, but wide and large and well-spread in the hold, by which it carries a large cargo and sails well[19]."

A number of images depict what the author would characterize as a cargo galley, a vessel designed along traditional galley lines, and retaining oars as the primary mode of propulsion, but endowed with a roomier hold for an increased cargo capacity.

Catalogue[20]

1. White-painted IV oinochoë of unknown provenance, Lefkosia 1947/1-16/1, Cypro-Archaic I (700-600 BC): flat hull with vertical stempost, small

projection at junction of keel and stem, non-descript stempost terminal possibly related to the Mycenaean bird-headed post, stern with post crowned by inward-turned duck-head, loose-footed brailed sail, two steering-oars (Fig. 1)[21].

2. White-painted IV oinochoë from Ormidia (Cyprus), Metropolitan Museum 74.51.511, Cypro-Archaic I: flat hull with vertical stempost and non-descript terminal, forecastle, inward-turned bird-headed sternpost, and aftercastle, loose-footed brailed sail, two steering-oars (Fig. 2)[22].

3. Bichrome IV oinochoë from Karpas (Cyprus), British Museum 1926.6-28.9, Cypro-Archaic I: flat hull with vertical stempost, bird-headed terminal displaced by crew member hoisting anchor, forecastle, stern with inward-turned, highly stylized bird-headed terminal, loose-footed brailed sail, two steering-oars. Large amphora on either side of mast (Fig. 3)[23].

4. Stone relief from the palace at Kujundjik (Nineve), British Museum, reign of Sennacherib (705-681 BC): flat hull with keel rising to vertical stempost crowned by duck-headed terminal, sternpost curving slightly in over hull, lower level of rowers rowing through ports, upper over gunwale, deck with protective sidings, from which are hung shields, raised on stanchions, two steering-oars[24].

5. West Greek krater of unknown provenance by the Aristonothos Painter, Palazzo dei Conservatori, 700-650 BC: curving hull with rising triangular bow terminated by projection at base of oblique post, three "proembolia"(?) extending beyond bow, cleft sternpost curving in over hull, deck raised on stanchions, mast and stays, two steering-oars (Fig. 4)[25].

6. Hebrew seal of Oniyahu, son of Merab, in a private collection, 8th or 7th c. BC: flat hull with vertical stempost crowned by bird-headed terminal, vertical stern, shields along gunwale, sail, single steering-oar (Fig. 5)[26].

7. Seal from Roman tomb on Siphnos, probably 7th c. BC: flat hull with triangular bow and short projection, sternpost curving in over stern, wale- and gunwale-lines running along hull, fore- and aftercastle, one steering-oar (Fig. 6)[27].

8. Ivory situla from Chiusi, end 7th c. BC: curving hull with triangular bow

and large projection, stempost turned inward, stern curving in over hull, sail, one steering-oar (Fig. 7)[28].

9. Clay model from Amathous (Cyprus), Metropolitan Museum 74.51.1752, Cypro-Archaic (c. 600 BC): wide-bellied, deep hull with vertical stempost and short projection at waterline, curving sternpost rising into anthropomorphic terminal with attached aftercastle, two wales along hull and railing on gunwale[29].

10. Painting in a tomb near Kef-el-Blida (Tunisia), 6th or 5th c. BC: flat hull with triangular bow, stern curving into vertical post, sail, two (?) steering-oars[30].

11. Amphora from Vulci, British Museum H230, beginning 6th c. BC: flat hull with triangular bow with projection and possible animal-headed stempost terminal, stern curving in over hull, sail, one steering-oar (Fig. 8)[31].

12. Fragment of painted clay plaque from Corinth, 6th c. BC: curving bifurcated stern with insignia, mast with lowered yard and sail, rigging, row of pitchers along upper edge of plaque (Fig. 9)[32].

13. Painting on Black-figure kalpis, Rijksmuseum Meermanno-Westreenianum 619/836, c. 510 BC: flat hull with almost vertical stempost and non-descript terminal, sternpost curving up, rowers rowing over gunwale, loose-footed brailed sail, two steering-oars[33].

14. Painting on Red-figure stamnos, the "Siren Vase", British Museum E440, beginning 5th c. BC: flat hull with projection/ram and concave stempost, stern rising into outward-turned post-terminal, rowers rowing through ports, loose-footed brailed sail, two steering-oars[34].

Comments

The three Cypriote vases combine features associated with contemporary galleys and aspects of hull morphology sufficiently unusual to merit attention. None have the characteristic triangular bow profile introduced in the late Middle Geometric period in Greece, yet all display the vertical stempost typical of earlier galleys. The first ship (1) has the small spur known from Mycenaean and Protogeometric to early Middle Geometric

galleys, and the loose-footed brailed sail. The second (2) lacks the spur, but has fore- and aftercastles. The third (3) again lacks the spur, but has the bow figure so typical of Mycenaean galleys, yet carries two large recipients. These ships are nor galleys in the traditional sense, nor merchantmen.

The inclusion of the Kujundjik "roundships" (4) employed by King Luli to evacuate Tyr in the face of the onslaught of Sennacherib in 701 BC may surprise[35]. The best-preserved ship exhibits traits which indicate that the Assyrian artisan commissioned to recreate the scene for the palace at Kuyundjik committed some "artist's errors". The right extremity has a vertical post terminated by an avian figurehead, whereas the left curves up gently from the keel-line. Yet two steering-oars are shown to the right, and the rowers face in this direction. The steering-oars are incorrectly placed at the bow and the oarcrew is inverted accordingly. Although less well preserved, the ship to the right confirms this reading: the steering-oars are shown at the left extremity, and the crew faces the stern. The ship is more roughly carved, and damage obscures the differences in the lines at bow and stern observed on the first ship, but it confirms the post with figurehead as the bow.

The right ship on the Aristonothos krater (5) offers a striking contrast to its opponent. Rather than stress its otherness in terms of ethnicity, it would appear more profitable to note morphological features in harmony with the reading suggested here. The stern is that of a galley, whereas the bow, while not equipped with a prominent projection, has a triangular profile, and the continuations of the wales beyond the post known from galleys. The hull is decked and deep, suggesting an increased cargo capacity[36]. Although no oars are shown, all galleys and galley derivatives were designed to be rowed. The triangular bow profile encountered on the Aristonothos ship is characteristic of the Kef-el-Blida (10) and Meermanno-Westreenianum (13) vessels; if quoted here, it is only to underscore the suggestion that there existed, throughout the Mediterranean, ships that were galleys, but not designed quite like the run-of-the-mill *pentekontoros*, or *dieres*. The existence of a hybrid multi-functional galley design is thus suggested by a scatter of images from the 8th down into the 5th century[37].

Dating the inception of diversity in ship architecture

From the material catalogued above, if correctly interpreted as cargo galleys, an initial date for the inception of the type in the late 8th to early 7th century BC may be suggested. Since the earliest images suggest a

developed hull type, it is probable that the dating needs to be revised upwards — despite the lack of representations. An argument in support thereof can be constructed by reference to developments in the late Mycenaean period, and in particular to the Pyrgos Livanaton ships[38]. The invention of the oared galley by the Mycenaeans some time in the 14th century BC[39], a *de facto* rejection of the Minoan ship type as unsuitable to their needs, led to a greatly diminished ability to carry merchandise. A double vocation as traders and warriors rendered a second design imperative: deeper, somewhat slower, decked, spurless, combining speed with cargo capacity, traits offered by the Minoan ships only under sail[40]. From the ensuing dichotomy rose not only the lineage of Greek decked galleys leading to the *dieres*, and, ultimately, to the *trieres*, but also the cargo galley[41]. The development down to the late 8th century BC cannot be charted with certainty in the absence of sufficient data. Nonetheless, decked galleys appear to have remained in production, as attested by the Middle Geometric II Metropolitan Museum krater and Lefkandi pyxis, the latter which points directly at the two-leveled Dipylon ships[42]. To what extent the decked single-level type, or the double-level design, can be considered cargo galleys remains unknown.

The most significant contribution to a hypothetical answer to the question would be to liberate the discourse from the needless burden of automatically equating oared galleys with warships as a specific type. In the definition suggested above, the warship is mono-functional in its conception, although a partial multi-functionality can be assumed in the context of naval operations. The warship, understood as a weapon in itself, was primarily designed for battle at sea, but also suited for the showing of strength as a deterrent or threat. This could include blockading ports, or escorting convoys of defenseless ships. The sole ship design to fit the definition is the *trieres* (and its subsequent developments), suggesting that the warship — as defined here — appears in Aegean waters when the Greeks invent or adopt this type as the main component of their navies. It is thus argued that all prior developments of hulls primarily designed to be rowed should be considered oared galleys, able to fill a number of functions. In turn, this argument raises two crucial issues, to wit, the date when mono-functional warships became viable, and when their necessary obverse, the dedicated cargo carrier, the merchantman, begins to appear in appreciable numbers in the Aegean, developments which do not exclude the continued use of oared galleys or hybrid designs of greater versatility.

It is customary to consider the merchantman a constant of ship design,

given the high volume of seaborne trade which can be reconstructed from import distribution patterns. As merchantmen are very rarely represented, this requires postulating non-depicted merchantmen for the pre-Classical period, and arguing from to date unexcavated wrecks. Whereas arguments *ex silentio* are a frequently employed, and necessary, tool of archaeology, and a recurrent feature of the research presented here, they should be employed only when other channels of thought have been exhausted. The merchantman is a case in point. It is obvious that hulls, large and small, primarily conceived for transporting goods over short or long distances, were constructed at all times. A subsistence economy in an island or coastal context requires suitable embarkations, with small communities rarely capable of manning a large, or even medium-sized, oared galley. But to term such craft merchantmen requires a step not necessarily supported by the earlier data.

Statistically, the merchantman is a Classical phenomenon. If it is argued that the shipwrecks catalogued to date are cargo-carrying hulls, the *sine qua non* of their detection, excavation, and documentation as archaeological sites since the unballasted galley does not sink, a database of 1149 Mediterranean wrecks is available for the time period 2200 BC to AD 15th century[43]. It is clear that not all these sites constitute wrecks, but for an initial appreciation the problem of calibrating the proportion of incorrect identifications may be considered a constant over time. From the earliest wreck down to 500 BC, some 1700 years, the catalogue contains 38 entries (the 6th century accounts for 23 items). The 5th century alone numbers 38 wrecks. There follows a gradual increase until triple-digit figures are attained for the time span 2nd century BC-AD 2nd century. Even if there are numerous factors involved in constituting a database which so favors the Late Hellenistic/Late Roman Republic to Early Roman Empire periods (there is a sudden drop and gradual decrease from the AD 3rd and later centuries), the numbers cannot be purely random. The volume of trade carried by dedicated cargo carriers likely, on every trip, to be in a state conducive to preservation as an archaeological site if lost at sea is infinitely smaller in the period prior to 600 BC[44].

Notwithstanding the realization that the pictorial evidence cannot be expected to chart the development of ship architecture in its every detail, it cannot but be noted that depictions of recognizable merchantmen are extremely rare prior to the Roman period. For the time span under study here, down to the 5th century BC, only five instances can be catalogued, of which three are dated immediately before and after the turn of the century[45].

Similarly, and for well-known reasons, merchantmen appear rarely in the literature down to the court, cases involving shipwrecks in the corpus of speeches by the Athenian orators in the Classical period. A topic in itself, it may briefly be noted that although the merchantman existed in the time of Homeros, as indicated by similes employing some aspect of the merchantman as a comparandum, the type never appears in corpore in the Homeric epics. It is erroneous to argue that the twenty-oared ship was a merchantman: the texts indicate that it is a swift oared galley of multiple purpose, including cargo transport[46].

The reasons for the absence of the pre-Classical merchantman in the wreck/text/image data triad are surely manifold, including inclement conditions for conservation, and irrelevance to most literary and representational themes. A further element towards an explanation may be sought in the political conditions. Through its inability to escape or defend itself against a pursuer, a merchantman requires the rule of law over the seas it is to travel. If, in addition to the natural dangers of the sea, hostile behavior from foreign galleys would render crossings unnecessarily dangerous, a partial or full curtailment of non-military traffic if restricted to merchantmen would result. The mono-functional merchantman became viable only when the Aegean was pacified, that is, dominated by one or more states capable of exerting control with a substantial fleet. Despite the occasional presence of what appears to be a standing navy in the Archaic period (Polykrates), this does not happen until the inception of trieres-based fleets and the rise of Athens. This capital advance in ship architecture created the first mono-functional warship (as defined above), incapable of doing extra-duty as a cargo carrier. Although other forms of oared galleys, including cargo galleys, remained in use, the appearance of the trieres is linked to the increased use of merchantmen to transport goods.

The date for the introduction of the trieres constitutes a problem well beyond solution within these pages[47]. The parameters involved are manifold: interpreting Thoukydides I.13 and solving the conflict with Thoukydides I.14; testing the compatibility of further literary testimonia such as Herodotos II.159, Clement I.16.36, Plinius VII.56.207, Diodoros XIV.42.3, and Nikolaos of Damaskos (FGrH 90 F.58); accepting Thoukydides' date of 704 BC, or favoring the re-dating on grounds of a faulty generation count to c.650 BC, or arguing for a late 6th c. date; gauging the consequences of these conflicting dates, including their impact on the origins of the trieres, and on the rate of innovation in early ship architecture; factoring in such aspects as the role of ramming in galley design, and the speed of trieres incorporation in fleets — and the reasons therefore. The analysis is rendered difficult by the

very uneven evidence at the scholar's disposition, being essentially a handful of Greek texts which either ignore the Levantine situation, or misinterpret or misrepresent it[48].

Contrary to some scholars, the present author does not consider the evidence adequate to establish beyond doubt the *trieres* as a late 8th/early 7th century invention. The three key statements in Thoukydides I.13 concerning the Corinthians as (1) the first modern shipbuilders[49] and (2) the first builders of *trieres*, and (3) Ameinokles as the builder of four ships for the Samians[50], are preceded by formulations indicating doubt[51]. In addition, the statement regarding the first naval battle is qualified as the first of which knowledge is still available. Furthermore, the position of I.13 before the *Methodologia* should be warning enough not to read this passage as having the same factual imprimatur Thoukydides attempts to place on his account of the Peloponnesian War[52]. Whereas it is attractive to argue that Diodoros XIV.42.3 confirms Thoukydides[53], the statement regarding Dionysos I of Syracuse (a Corinthian colony) being spurred by the presumed Corinthian origin of the *trieres* to initiate a major naval building programme may not do more than attest to Thoukydides' sources being known in Syracuse. A later source (a 1st century BC text going back to a 4th century BC informant, in this case probably Philistos of Syracuse) cannot confirm since an independent transmission is not assured[54]. It is significant that Thoukydides I.14 bundles the Corinthians, Ionians, Samians, and Phokaians together as having had navies almost without *trieres*, and dates the serious appearance of the type to just prior to the Persian Wars[55].

Herodotos tends to confirm the impression that regardless of when the *trieres* was invented, it did not play any attested role whatsoever before the middle of the 6th century. Although it may be argued that the plundering raids of Polykrates required *pentekontoroi* rather than *trieres*, III.39 and III.44 allow a fairly precise date to be advanced for the Samian tyrant's (re-)constructing his navy around the *trieres*, and hint at an inability by his victims to face his *pentekontoroi* with superior weapons[56]. If Thoukydides I.14 (also before the *Methodologia*) is correct in stating that the first to employ trieres were the Sicilian tyrants and the Corcyraeans towards the end of the 6th century, then a general lack of Greek *trieres* may be postulated in the Eastern Aegean until they appear in Polykrates' fleet[57]. Herodotos VI.6-13 certainly indicates that the proper use of the trieres was a largely unknown subjects for the Ionians just before the battle of Lade in 494 BC. The fact that the Phokaians employed *pentekontoroi* at the battle of Alalia *c.* 535 BC is not proof in itself that trieres were not in use at that time since they had, as told by Herodotos

III.163-166, left their homeland in *pentekontoroi*[58]. Their behavior in the waters around Corsica prior to being confronted by the Etrusco-Carthaginian fleet is akin to that of Polykrates around Samos, and requires more versatile vessels than trieres. Fighting the enemy to a Pyrrhic victory with a fleet half as large as that of their opponents suggests that the Etruscans and the Carthaginians did not employ triremes[59]. This would, in turn, be surprising as far as the Carthaginians are concerned, hinting as it does that the Phoenicians had not yet adopted the three-level galley.

An early adoption by the Phoenician in the Levant cannot be argued from the available data, all which point to a late 6th/early 5th century introduction, possibly with Kambyses' establishing of a Persian fleet as the impulse[60]. The sole other attested user of triremes is Necho, according to Herodotos II.159, yet it has been plausibly argued that the Egyptian *kbn(w)t*, translated by Herodotos' informant as *trieres*, is a generic term in use since the Old Kingdom, and, thus, with changing semantic context, *trieres*, then, merely being an approximation for an oared galley employed for essentially bellicose purposes, with no information on specificities of design and oarage[61]. Given the uncertainties involved in readings of Thoukydides I.13, the manifest anti-Greek slant of Clement I.15-16, the testimonia of Thoukydides I.14 and Herodotos *passim*, and the chronological position of Nikolaos of Damaskos[62] and Diodoros' sources much later (both 1st century BC) than Thoukydides casting doubt on their independence, it would appear that Herodotos II.159 should best be divorced from the *trieres* question[63]. The final item to be noted is that the *trieres* employed by the Greeks against the Persians in 480-478 BC were not, according to Thoukydides I.14, decked, implying a more primitive stage in the development, perhaps congruent with a reading underlining the newness of the design (as is the information on the battle of Lade) at the beginning of the 5th century BC[64]. To retain the early to middle 7th century as the date of invention of the *trieres*, a date supported only by a generous and partially preconceived interpretation of Thoukydides I.13, would require accepting that a design slated to change the nature of naval warfare in the Mediterranean — not to mention the political impact on democracy in Athens — remained for three generations without any discernible traces in history. This constitutes an unlikely construct.

Thus a number of different enquiries converge on a shared historical nexus: the concerted use of the merchantman becomes possible when economic and political changes have rendered the appearance of the *trieres* as the predominant ship of Greek fleets possible, if not necessary, a

development which coincides with the need for large-scale importation of grain, and the battle for survival against the Persians, thus leading to two mono-functional evolutions in ship design, each dependent on the other, the merchantman to feed the economy that sustained the *trieres* which, in turn, protected the merchantman. Although the *trieres* remains invisible in the shipwreck data, there is an abrupt increase in the number of wrecks in the second half of the 6th century BC, wrecks probably to be understood as merchantmen. Prior to about 550-530 BC, movement over water was dominated by multi-functional galleys. If the *trieres* did exist, it had no historical impact.

Visibility in the archaeological record

The above account certainly requires further work. It may even border on being that of a heretic. But it attempts to integrate all factors impacting on ship design and use, and its study, into a holistic approach, into what may be termed a "grand narrative". A tale spun across a millennium. It acknowledges that interpretation in Archaeology entails constructing plausible scenaria from disparate data, where the order in which evidence is marshaled, and the unequal stress placed both by availability and the scholar on given factors, will influence the results. Thus crafting a narrative founded on the remains of a complex system becomes a study of visibility requiring a substantial allowance for the invisible. Examining the evidence of wrecks, texts, and representations cannot merely result in an account of whatever happens to be available, but must be a study of method itself: how to de- and reconstruct the database in constant reference to the imponderables. Such an approach allows amplification of the available evidence: the earliest representation or mention does not constitute a beginning, a dearth of images should not be taken on face value alone, textual under-representation requires enhancement. The bottom line is that of plausibility, the placing of all elements within a coherent framework, thereby avoiding overstressing a single wreck, text or image.

A consideration of the inadequacies of the database leads to inferences (rather than speculation) regarding the invisible elements. The *trieres* itself, if dated to the 7th century, constitutes the major example, a design leaving no other traces than the vague formulations of Thoukydides I.13. It would be necessary to postulate a sufficient production to sustain the technology at one or more centers over three to five 30-year generations — given the explosion of *trieres* towards the end of the 6th century, leading to the

appearance of comparatively large *trieres* fleets, several yards would be required to maintain *trieres*-building know-how among their shipwrights despite an almost non-existent demand[65], small *cellules de veille*, just in case. Arguing in favor of a Greek origin for the *trieres*, and thereby probably imposing an early date, would require a suitable two-level design, for which there is no extant Greek representational evidence. The Dipylon ships constitute a first attempt, the ships of Luli the evolution thereof[66]. Either Greek two-level ships with oarports existed, yet remain invisible to the modern beholder, or a 7th century Greek *trieres* developed a Phoenician advance, itself derivative of a Greek design[67].

The available textual evidence, too, hides more than it reveals behind the use of the generic *doru, naus, ploion* and *ploia makra*. In fact, apart from specific statements such as those made by Herodotos regarding the Phokaians and Polykrates, or the use of type-specific designations in Homeros (abstraction made of how modern scholars understand them), the texts offer a very limited *aperçu* of early ship building and ship use. The seabattle between the Corinthians and the Corcyraeans, introduced as the first known such event by Thoukydides I.13, obviously hides an enormous range of sea-born activity of a more or less bellicose nature: the rise of Corinth before and under the Kypselids, encounters during the colonization, the Lelantine war, conflicts pitting sea-faring states against local homologues or landlubbers, to mention a few potential contexts[68]. Clearly, interpreting the available database requires a delicate balancing act, and a willingness to go beyond the restrictions imposed by the visible[69].

Conclusions

It would, then, be foolhardy to argue that merchantmen were a rare sight in the Aegean maritime economy before the Classical age solely on the absence of representations, or on the low number of wrecks discovered and dated to period before 600 BC. Similarly, rejecting Thoukydides I.13 does not automatically redate the appearance of the *trieres* to *c*. 550 BC. It is the accumulation of indications culled from the catalogue of wrecks, the texts, the representations, the functional environment, and the political conditions reconstructed independently of reference to ship architecture, which leads to the proposals made herewithin. The abrupt increase in the number of wrecks around 550 BC[70] coincide with the testimony of Thoukydides I.14 to suggest that a *trieres*-induced reduction of piracy and other unsettled conditions at sea could have led to an accrued viability of merchantman-

orientated transport in the later 6th century[71]. A comparative absence of protected sea lanes leading to a reduced use of merchantmen, in turn, requires alternative means of cargo distribution. Homeros in the *Odysseia*, Herodotos III.39 with III.44, and Ploutarkhos' *Life of Perikles* on Polykrates, and Herodotos III.163-166 on the Phokaians, coupled with a series of images, suggest that the early Greeks, rather than escorting merchantmen with galleys, may have resorted to the multi-functional and hybrid cargo galley.

As the narrative stands it is clearly a product of the critique of the literature which colored the epistemological framework at the outset. In its present form, it is also under-documented, requiring a fuller treatment of the texts, particularly in reference to the dating of the *trieres*. Yet in attempting to point to areas requiring further work, such as the incorporation of data lacking the visibility required for a positivist reading, it does place a more than just discreet question mark next to some of the fundamental ideas upon which the textbooks construct their accounts of the early Greek ship architecture.

Michael Wedde
Loutropyrgos
GR-19006 Nea Peramos
Greece

NOTES

**The present paper should be understood as experimental, owing its existence to discontent with textbook accounts. It does not claim to solve the many problems involved in decoding the data relative to early Greek ship architecture, but to offer a viable approach. The author's views on the Bronze Age, Iron Age, and early Archaic developments are laid out in Wedde 1996.

1. Glossaries generally cover technical terms of hull construction, rigging, and ship handling. Casson 1971:389-402 is exceptional in linking terms in the glossary to discussions in the

text, thus creating a book which can function as an extended glossary. Contrast Morrison/Williams 1968:338-340 and Gardiner/Morrison 1995:248-251. All three avoid the contentious and generally loosely defined generic terms. The problems involved in providing clear-cut definitions for ancient terms (witness *eikosoros* and *pentekontoros*) unfortunately promote less than rigorous usage.

2. The term *pentekontoros* constitutes one of the major problems facing the scholar. From having initially been understood as designating a single-level 50-oared open hull, as it clearly is in Homeros, some scholars have come to believe it may also cover two-level vessels, due to the absence of a commonly employed term for this design; *cf.* Morrison/Coates 1986:33-35, Casson 1971:58-59 with 59n82, 61-63, Gardiner/Morrison 1995:250 *s.v.* pentecontor. Wallinga 1993 would argue otherwise, making the *pentekontoros* into a, by definition, two-level craft seating 13 and 12, or 14 and 11 rowers (thus ignoring the Bronze Age and Homeric evidence to the contrary), and functionally a merchant galley (although not necessarily as defined here). His reconstruction of the oarage on the Dipylon ships, lower level through ports, upper over an outrigger, has no factual basis (as noted by Morrison 1994). Whereas Herodotos, *The Histories* I.164 on the Phokaians, offers proof that a *pentekontoros* could carry cargo, the approach of Höckmann 1989 is to be preferred.

3. The Themistoklean *trieres* was, according to Thoukydides, *The Peloponnesian War* I.14.3, undecked (or only partially decked), functioning exclusively as a weapon in itself. Kimon (Ploutarkhos, *Life of Kimon* 12.2) added a wide deck, thereby preparing a potential move away from ramming in favor of pitched battle between hoplites involving boarding, the approach employed by the Corinthians at the battle of Sybota in 433 BC (Thouk. I.45-54; *cf.* Morrison/Coates 1986:62-68). The issue of undecked/decked hulls remains unsolved, but *cf.* Wedde 1993 for an introduction to the problem.

4. Thouk. I.13 is the *locus classicus*, causing disagreement on the crucial date of when the *trieres* was invented (*cf.* below).

5. Not to be misconstrued as a blanket condemnation of philology as a research tool. On the contrary, Torr 1894:105-124 provides ample evidence of the contribution of the texts to understanding the range of ship types employed in Antiquity. *cf.* also Casson 1971:157-168.

6. To be complete, the present definitions ought to include the terms "navy", "fleet", "convoy", etc. In the present text a generic ship term transcribed from the Greek and italicized refers to the Greek type (e.g. *trieres*). The same obtains for Roman craft (e.g. *liburna*). The latin form in roman type is employed for non-Greek, non-Roman variants (e.g. the Phoenician trireme).

7. As illustrated by a use as pirate ship: piracy is not an act of war unless perpetrated by one state upon the subjects of another (making the dealings of Polykrates a borderline case). Yet ship types originally introduced by pirates, such as the *hemiolia* and the *liburna*, may find use in the navies of a state. On the *hemiolia*, *cf.* Casson 1958, Morrison 1980; on the *liburna*, Anderson 1962:31-36, Casson 1971:340.

8. Casson 1971:157-168 discusses a number of terms by which hull types clearly to be understood as merchant galley were designated. The multi-functionality, and the possibility that any given term was applied to a range of related designs, argue against a too rigorous application of such terms as *pentekontoros*.

9. *Cf.* Casson 1971:329-343 on small craft.

10. Based on experience with Aegean Bronze Age models, the present author is less sanguine than others in evaluating the contribution offered by this category of finds. Frequently models are too schematic, devoid of size indicators, and lack morphological uniformity to constitute a confident basis for typological analysis (clusters!).

11. The state of the database imposes an unfortunate concentration on Aegean and Greek ship building at the exclusion of other traditions. It is difficult to argue for foreign impulses when the necessary evidence is lacking, yet it would be incorrect to argue against for exactly the same reason.

12. Conveniently united at Basch 1987:79-82 figs 158-168, 78 fig.152, 83 figs 169, 172, and 170-171. For a discussion, cf. Wedde 1996:127-128, 137-140.
13. For extensive discussion, cf. Wedde 1996.
14. This distinction is latent in Morrison 1994 when he states that round sailing ships are common in pre-Geometric imagery. To consider the Syros "frying-pan" craft and the Naxos lead models as warships (Morrison/Coates 1986:25) is to misunderstand the evolution of early Aegean ship architecture.
15. Cf. Marinatos 1974:color pls 7, 9; Morgan 1988:figs 9-12, 189; Doumas 1992:figs 26, 29, 35-38; Televantou 1994:foldout pls 1-2, 4, foldout figs 1, 3.
16. Traditional or historical evidence support these candidates' entry on the shortlist. Other seapowers such as the Ionians and the Samians may or may not have sought to root out pirates from their nests. The ability to protect shipping either through escorting cargo carriers with galleys, or countering predation by employing cargo galleys capable of armed resistance, does not imply an active anti-piracy policy. State-organized piracy may be argued for as one aspect of the maritime involvement of the Samians under Polykrates. On piracy, cf. Ormerod 1924.
17. According to Garnsey 1988 the inception of large-scale grain imports to Greece, chiefly Athens, has been systematically up-dated in the scholarly literature. He prefers the late 6th/early 5th century as the turning point.
18. Admittedly in insufficient detail: the present purpose is merely to raise the issue, since an adequate treatment would require a work of ancient history.
19. In John Dryden's translation of the Life of Perikles 26.3. Such a deep-hulled galley has been postulated by Höckmann 1989, who suggests the ship on the "Siren Vase" (Cat. nr 14) as an adequate approximation in pictorial terms. On the samaina, cf. Casson 1971:63 with n.104. Wallinga 1993:93-99 is, as frequently on other issues as well, thought-provoking and partly fanciful. For the literary testimonia, cf. Dunst 1972:159-161 (although his explanation for the ram being described as either boar-headed or fish-headed is to be rejected emphatically).
20. No more than a checklist is intended. It includes all instances considered by the author to represent cargo galleys at the time of writing. No attempt is made at this early stage to distinguish between cargo galleys and merchant galleys in the pictorial record. References are restricted to one (Basch 1987 if available) or more illustrations and/or a more substantial publication. The author does not claim to sail previously uncharted waters. The merchant galley does appear in the textbooks (cf. Casson 1971:157-158, 1995, Wallinga 1993 etc.), but little has been done to identify early examples and incorporate them into an overall explanatory framework.
21. Basch 1987:260 fig.563; Westerberg1983:44-45 cat. nr 54 and 117 fig.54.
22. Basch 1987:261 fig.567; Westerberg1983:45 cat. nr 55 and 118 fig.55.
23. Basch 1987:261 fig.564; Westerberg1983:43-44 cat. nr 53 and 116 fig.53.
24. Basch 1987:314 figs 660-661.
25. Basch 1987:233 fig.482; cf. Schweitzer 1955.
26. Avigad 1982:59 fig.1, Stieglitz 1984:139. Discussed by Lionel Casson at the Third Symposion as a merchantman, but without subsequent publication. The shields (or oar-ports?) render a reading as a merchantman problematic.
27. Basch 1987:248 fig.522. The image may also represent an oared galley.
28. Basch 1987:409 fig.871. The shape reproduces that of the six ships on an Etruscan oinochoë in the Maritime Museum of Haifa, dating to 725-625 BC, which may also be cargo galleys. An almost identical vase with five such vessels is in the University of Missouri Museum of Art and Archaeology, cf. Biers/ Humphreys 1977.
29. Basch 1987:252 fig.536; Westerberg 1983:41-42 cat. nr 50 and 113 fig.50. Contrast Landström 1969:28-29 fig.61 (Basch 1987: 253 fig. 540) who reconstructs a merchantman

with the projection well above the waterline.

30. Basch 1987:397 fig.826.

31. Basch 1987:408 fig.868

32. Basch 1987:237 fig.494. The stern morphology suggests a galley (cf. Snodgrass 1983:17), rather than a merchantman (cf. Basch 1987:235).

33. Basch 1987:228 fig.474; Galestin 1977:58-59 cat. nr 11.

34. Basch 1987:270 fig.574; Morrison/Williams 1968:114 Arch.94. Included on the basis of Höckmann 1989. On this ship, cf. also Tilley 1989:430-431 for an interpretation as triple-banked early trieres type. The present author employs the term "banked" according to Tilley's definition as being a file of rowers down the length of the hull, as opposed to "level", being all rowers of banks at the same height in the hull.

35. It is imperative that one avoids consulting the drawings by A.H.Layard since these misrepresent the "roundships", as documented by Basch 1987:314 fig.661 for example. All statements are based on id.: 314 fig.660. Cf. also DeGraeve 1981:pl.XLI.87a. Casson 1971:65 correctly terms the ships devoid of bow-projection "merchant galleys"; cf. DeGraeve 1981:67. Basch 1969:150 sees a fundamental relatedness between Luli's "longships" and "roundships", but considers the former to be "simply a military version of the 'round' ships." The reverse appears to be the case. The issue revolves around whether the Lulian "roundships" are cargo galleys or merchant galleys, as defined above.

36. For a reading as decked, cf. Wedde 1993. The suggestion by Morrison/ Coates 1986:28 that the beak-like bow was "designed to engage and hold the upper works of an enemy ship and, like the later Roman corvus, prevent disengagement while the boarding party did its work" ignores the fundamental difference in the corvus being a manipulable piece of deck equipment, and not part of the hull. To have the "beak" run up on an enemy hull would surely result in the two becoming locked together, placing the attacker in danger of becoming, in turn, a target, and would require either substantial redistribution of ballast and/or time-consuming wood-chopping to free the "beak" from the upper works (an operation which even a slight sea would render even more difficult). Rankov 1996:51 notes that the rowers of the trieres accounts for 15 tonnes (or 36%) of the total displacement of 42 tonnes, and function as ballast. The crew must remain seated so as not to destabilize the ship. Cf. Coates/Platis/ Shaw 1988:63-64. Sleeswyk 1991 suggests a limited use of the crew to trim the craft for the attack, raising or lowering the ram, depending on the type of target.

37. It is debatable whether the graffito on an Etruscan vase from Veii, dating to 700-650 BC (Basch 1987:408 fig.865) should be included. Further instances of the oblique stempost without bow projection appear in later periods but need not be of concern here. In addition, there are a number of models which defy confident type-designation.

38. In Wedde 2000. the author distinguishes between the Tragana type, an oared galley with a projection at the bow, and the Skyros type, a related design without the projection, possibly decked on the testimony of the Enkomi Grave 3 ships, to which type the Pyrgos Livanaton ships were assigned when they were made available to scholars by Dakoronia 1987 (op. cit. 122 figs 1-3). These images, rather than the Skyros (Basch 1987:142 fig.295) or Enkomi (id.:148 fig.311) ships, best illustrate the second Mycenaean hull type.

39. The date is suggested by the available imagery, the Late Helladic B and C periods, which cover, according to Manning 1988:56, the timespan 1360/1325-1065 BC, according to Warren/Hankey 1989:169, 1340/1330-1065 BC. Since the appearance of the two Mycenaean types is rather abrupt, one may calculate with a certain undocumented development time. Whether this should include the Late Helladic IIIA period (Manning: ?/1490/1450-1430-1400 BC; Warren/Hankey: c. 1390-1340/1330 BC) cannot be ascertained. Interestingly, the Marmor Parium 15 ascribes the first pentekontoros to Danaos c. 1510 BC (Jacoby 1904:5; cf. Davison 1947:19n1).

40. The large ships on the Akrotiri Miniature Wall Painting are generally considered first-rate

sailing vessels (cf. Gillmer 1975, 1978, 1985A, 1985B). The substantial overhangs and the reduction of the motor-section when under oars to 50% of the length overall argues for a disadvantage against the galley design when rowed, even though the maximum crew would have attained 80% of the effectifs on a pentekontoros.

41. Cf. Wedde 1993, 1996.

42. The Metropolitan krater: Basch 1987:178 fig.374 (rejecting Basch's LG II date, and reading); the Lefkandi pyxis: Kalligas 1987:83 fig.1, Popham 1987:357 fig.4.

43. Based on Parker 1992, excluding 70 entries outside the Mediterranean, and 42 undated wrecks, adding the Cypro-Mycenaean wreck of Point Iria (Pennas/Vichos/Lolos 1996), and the 5th-century wreck of Alonissos (Hadjidaki 1996).

44. Of the 38 pre-500 BC Mediterranean wrecks only 12 can be associated to varying degrees with Greece, either by site or cargo (quoted with the catalogue numbers of Parker 1992):

    362   Dhokos (near Hydra); 2200 BC; no hull remains
    1079 Sheytan Deresi (Turkey); 1600 BC; no hull remains, but Minoan influence on pottery
    544   Kimi (Euboia); 15th c. BC; no hull remains
    [*]   Point Iria (Peloponnese); 13th c. BC; no hull remains to date
    451   Giglio Campese (Italy); c. 600 BC; minor hull remains, Greek and Etruscan cargo
    599   Lindos B (Rhodos); 6th c. BC; no hull remains
    835   Plemmirio C (Italy); c. 550 BC; no hull remains, Greek pottery
    106   Bon Porté A (France); 550-525 BC; hull remains, Greek and Etruscan cargo
    317   Circeo (Italy); 550-500 BC; no hull remains, Greek pottery
    113   Brégançon (France); 6-5th c. BC; no hull remains, Greek pottery
    441   Gela (Italy); late 6th-early 5th c. BC; hull remains, Greek pottery
    1243 Zakynthos B (Zakynthos); 550-450 BC; no hull remains.

    There are obviously drawbacks in attempting to work with understudied and under-published material, but the listing's sole purpose is to bring out the extent of the problem. Giglio, Bon Porté, and Gela have permitted M. Bound to document the "GBG technique", shell-first, edge-to-edge laced strakes (cf. Bound 1991:31), but, obviously, no other ship constructional data can be won from the entries.

45. A list suffices here: the 7th century Amathous model British Museum A202 (Basch 1987:259 fig.559); the 6th century model Metropolitan Museum 74.51.1750 (id.:258 fig.558); the Black-figure bowl in the collection of the Archaeological Institute of Heidelberg University, dated to 530-520 BC (Casson 1996:263 fig.1); the Black-figure kylix British Museum B436, dated to c. 510 BC (Basch 1987:221-222 figs 461, 462, 464), and the fresco from the "Tomba della Nave" in Tarquinia, dated to 490-480 BC (id.:411 fig.880). On the merchantman, cf. Ericsson 1984.

46. Wallinga 1993:27-28, 41-45 errs in believing Odysseia 9.322-323 adequate for interpreting the eikosoros as a beamy freighter since a 20-oared ship, clearly a galley, appears elsewhere, cf. Ilias 1.308-311, Odysseia 2.212-213, 4.669, 778-779 (employed by Odysseus to bring Khryseis back to her father, by Telemakhos to go to Pylos, and by the suitors to lie in ambush). To do so he is obliged to distinguish between the freighter and the galley without sufficient evidence. Cf. also Wallinga 1995:38-39. Despite the pages Wallinga consecrates to the eikosoros, and the speculations of Morrison/Williams 1968:46, the type remains largely undefined. The author requests leave to return to the question of ships in literary mentions in greater detail elsewhere (while noting the admonitions of Kirk 1949:139, and E. Linder [peer review of Wedde 1996; the author is grateful to Prof. Linder for the kind and encouraging remarks at the Lamia symposion]). Although the matter has been admirably treated by J.S. Morrison in Morrison/Williams 1968 and by Casson 1971 a reconsideration within the framework proposed herewithin, and in other writings of the present author, will result in variant interpretations.

47. The author hopes to return at greater length elsewhere.

48. If it is assumed that a Phoenician advance in the Levant would rapidly diffuse to the Carthaginians, the Central Mediterranean (or Etrusco-Carthaginian, since an alliance is known at least for the mid-6th century, and contact likely in Sicilian waters) situation should be included.

49. Wallinga 1993 and 1995 argues that the modernity involved a new organisation of the fleet, not a new design. It is nonetheless attractive to think, although impossible to prove, that the terminological change from *triakontoros/pentekontoros* to *trieres/tesseres* etc., that is from describing the full oarage to merely that of a unit per side, would have caused an impact on the oral traditions behind the writings of the early historians.

50. Carpenter 1948:7 claims Ameinokles built *pentekontoroi*, echoed by Wallinga 1993:23 (*katapharktoi pentekontoroi*) and 1995:41 (*pentekontoroi* according to Corinthian state specifications), but both scholars provide ample evidence for a flawed understanding of early Greek ship architecture. Williams 1958:126 suggests an amendment from "τέσσεραç" to "δικρότουç".

51. *Cf.* Westlake 1977, 1989:8-9 on λέγεται-constructions in Thoukydides. Wallinga 1993:13n3 notes Thoukydides' caution.

52. The chapters before the *Methodologia* give the impression of being a mixture of hearsay and tradition, a mere cavalcade through a millennium or more as preface to the main purpose of Thoukydides. Too great a stress should not be placed on the information they contain.

53. Morrison 1979:58, 1994:228.

54. All information on the Diodoros passage from Morrison 1994.

55. Morrison/Williams 1968:160 note that Thoukydides minimizes earlier conflicts so as to aggrandize the subject of his *oeuvre*.

56. Morrison/Williams 1968:129 deem the *pentekontoros* "the armament proper to an aspiring pirate chief" (*cf.* the assessment of Polykrates by Haas 1985:37-38, 46 as a "glorified pirate chief" — despite the recognition that he strove for thalassocracy). Basch 1977:7, Morrison 1979:60, and Lloyd 1980:196 concurr.

57. Morrison/Williams 1968:130 are troubled by the inference from a late 6th-century date for the *trieres* that Polykrates could acquire enough hulls to sacrifice the 40 sent with dissidents to aid Kambyses so soon after the design was introduced. The same authors (*ibid.*) and Davison 1947:20-21 suggest that Polykrates would have had a fleet of 100 *triereis*, retaining slightly more than half, a force inadequate to defeat the returning dissidents.

58. Davison 1947:20 fundamentally misunderstands the *trieres* vs. the *pentekontoros* design when claiming that the Phokaians would have employed the former had the type been available. Wallinga 1990:137 with 137n8, 1993:68 understands the Phokaian *pentekontoroi* as merchant-galleys.

59. Wedde 2000.:Section 5.5 argues that the damage caused to the Phokaian ships derived from hulls not designed to function as weapons in themselves being used to ram the enemy craft out of desperation when faced by the 2:1 odds in the enemy's favor. In this argument, the *trieres* becomes the first ship type purposefully designed to ram, and the various preceding forms did not fill the requirements of structural strength and momentum to the extent of allowing designing battle strategy on ramming alone. The battle of Sybota suggests that even as late as 433 BC, after the Persian Wars had proven the worth of ramming, commanders could still resort to the pitched hoplite battle at sea — as Kimon reasoned in the 460's by decking the *trieres*. Wallinga 1995:48 claims the Phokaians employed "'ramming' or *diekplous* tactics" at Alalia (yet contrast *id.* 1993:34 claiming the Phokaian ships to be functionally merchantmen), developped through repeated clashes with the Carthaginians and their allies, and that they were forced to withdraw when the enemy introduced the *trikrotos naus*, a two-level 50-oared ship with a third level added in the hold (*thalamians*), accomodating 20-22 rowers for a total of 70-72. These, *pace* Wallinga, resulted from installing the *trikrotos* system on galleys of the Egyptian *kerkouroi* type. Much the same

arguments appears in Wallinga 1993:111-113, although the *trikrotos* system is explained as adding *thalamians* to Lulian biremes.

60. On the Phoenician trireme, *cf.* Basch 1969, 1977, 1980, 1987:319-334. Morrison 1979:54-56, 62 rejects Basch's case, placing the difference in the supplementary manning, and argues against a pre-5th-century date. *Id.* 1995:56-57 accepts a 5th-century Phoenician *trireme* without outrigger.

61. Wallinga 1993:104-105, 1995:46. Davison 1947:21n3, Lloyd 1975, and Morrison 1979:53 accept Necho's triremes, with the latter two considering them of Greek inspiration, Basch 1969:232 as Phoenician. Lloyd 1972:272-275 translates *knbt*-ships as "Greek-styled war-galleys".

62. Accepted as support of a Corinthian origin of the *trieres* by Lloyd 1975:52-53.

63. As argued by Wallinga 1993:129.

64. Scholars disagree on reading the structural contrast between Themistokles' and Kimon's *triereis*. Morrison 1941:41 argues for a change of tactics, from sea warfare centered on ramming to pitched hoplite battle at sea, with Morrison/Williams 1968:162-163 seeing this as a result of the conservatism of Kimon, with a possible influence of the Khians sailing with him. Morrison 1979:56 and Basch 1987:295, 301 more or less concur on seeing an eastern influence in that the Eastern Greeks and Phoenicians favored the second approach. Wallinga 1993:177n15 considers the Kimonian *triereis* to be troop transports since hoplites, not *epibatai*, are mentioned, and therefore rejects a return to older mores.

65. Perhaps restricted to ships-of-state such as the *Salaminia* and the *Paralos/Paralia* — although not implying that these Athenian ships were *trieres* at an early date.

66. Morrison 1995:54-55 argues that Luli's biremes are *dikrotos* triremes. This allows him to push the invention of the *trieres* back before the end of the 8th century, thereby validating Thoukydides I.13, and ressurecting Clement I.16.42.3.

67. The earliest evidence for oarports is the Til Barsip fresco from the reign of Tiglat-Pileser II (745-727 BC; DeGraeve 1981:pl.XXXIX.83), followed by the Lulian ships (*c. 700 BC*). The earliest Greek instance is the left ship on the Aristonothos krater (*c. 700-650 BC*), a single-level, decked galley (*cf.* Wedde 1993).

68. There is a fragmentary report to Tiglath-Pileser III, written soon after 738 BC by Qurdi-Asshur-Lamur, recounting how seaborne Ionians attack three cities and are pursued by ship (*cf.* Braun 1982:15). In 715, Sargon II boasts in two different inscriptions that he "caught the Ionians out of the midst of the sea, like a fish", and that he "caught, like fishes, the Ionians who live amid the Sea of the Setting Sun" (*id.* 15-16). The AD 2nd-century historian Abydenos claims that in 696-5 "Sennacherib [Sinecherim] (...) on the seacoast of the Cilician land defeated the warships of the Ionians and drove them to flight" (*FGrH* 685 F.5 §6; *id.* 18, *cf.* Momigliano 1934), the Abydenos version being preferred to that of Berossos of Babylon (3rd century BC), who speaks of a landbattle (*FGrH* 680 F.7 p.386).

69. With the reward likely to be derision when other scholars disagree. Wallinga 1993 and 1995 are a case in point: substantial extrapolation on not always sufficiently sturdy ground leading to questionable readings — witness the discussions on the *eikosoros*, the *pentekontoros*, and the *samaina*.

70. Employing the median date approach of Parker 1992 indicates that 19 of the 23 6th-century BC wrecks date to 550 or later. There is also a noticeable increase in ship representations *c.* 560-500 BC, coinciding with the augmentation in the number of known wrecks, and the attested use of the *trieres* in Greek fleets.

71. Humphreys 1978:170-171 also suggests a rapid increase in the number and size of mono-functional merchantmen coupled to the surge in *trieres*-building around the time of the Persian Wars.

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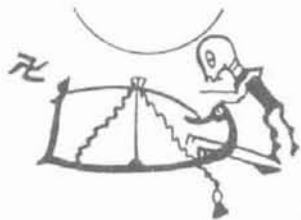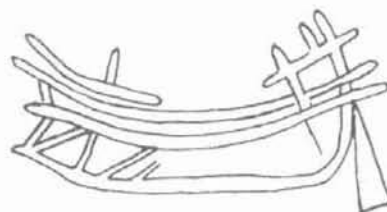
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