

21. *Triereis* Under Oar and Sail

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Introduction

The purpose of this paper is to examine the ancient evidence concerning passage making and performance under both sail and oar of *triereis*.

Xenophon's statement (*Anabasis* 6.4.2) that the sea passage from Byzantium to Heraclea was "a long (or in one version "a very long") day's journey for a trireme with oars" has been regarded as the clearest evidence provided for the speed of a trireme under oar (Morrison, Coates and Rankov 2000, 102–3; Shaw, above pp. 63–7) and as such is considered here in some detail. Similarly Xenophon's account of Iphicrates' *periplous* of the Peloponnese is also looked at closely since this has been taken by Morrison (Morrison, Coates and Rankov 2000, 97, 102–3; cf. Xen. *Hell.* 6.2.11–14; 6.2.27–32) to show that a *trieres* in a hurry travelled under oar rather than under sail. Other voyages undertaken by *triereis* are considered in an attempt to establish how a *trieres* might use her sails and oars to best effect both under normal circumstances and when she was in a hurry. Finally I have included a study of the actions of *triereis* breaking off from battle, since there is an undoubted connection between flight and the use of sails.

Byzantium to Heraclea

Scholarly debate over the "long day's journey for a trireme with oars" has concentrated on whether or not it was physically possible for a trireme to be rowed all the way from Byzantium to Heraclea in a day and on exactly how many hours a long, or a very long, day lasts (Morrison 1991; Shaw, above pp. 63–7 and 68–75). It has been assumed that, whatever the arguments, Xenophon's account describes a journey completed entirely under oar. However the language which Xenophon uses (καὶ τριήρει μὲν ἔστιν εἰς Ἡράκλειαν ἐκ Βυζαντίου κώπαις ἡμέρας μακρᾶς πλοῦς) does not rule out the use of sail. The dative κώπαις suggests that the oars are the means by which the journey is completed in a long day but it does not prove that the ship is rowed throughout the day. Oars

are obviously important or there would be no reason for Xenophon to mention them but it is not possible to tell from the language employed if they were used for the entire voyage.

Xenophon (*Hellenica* 6.2.27), in describing another sea voyage, Iphicrates' *periplous*, writes "but by making his journey with the oar (τῇ δὲ κώπῃ τὸν πλοῦν ποιούμενος) he kept his men in better condition of body and caused the ships to sail better." Again he uses the dative case but we know from his own account that this voyage was completed mostly, but not entirely, under oar. When Thucydides writes about triremes under oar he uses the verb χρᾶμαι "use", which takes the dative case, with κώπαις. Hermocrates of Syracuse talks of attacking the tired Athenians as they approached Southern Italy, "if they used their oars" (Thucydides 6.34). It would be rash to assume that Xenophon, in writing about the distance between Byzantium and Heraclea as "a long day's journey for a trireme with oars" necessarily intended his readers to understand that the ship had to be rowed all the way.

Thucydides sometimes measures distance by relating it to the time taken for a ship to complete a particular passage. Amphipolis is said to be about half a day's voyage from Thasos (Thucydides 4.104). No type of ship or conditions are specified. In the context of the events taking place, the attempt to relieve Amphipolis, one might perhaps guess that Thucydides meant half a day's voyage for a *trieres* but one can not be sure. From Abdera to the River Ister is described as a voyage of four days and four nights for a merchant ship if the shortest course is taken and the wind is always from astern (Thucydides 2.97). Since almost seventy miles of this journey have to be made against the strong currents of the Hellespont and the Bosphorus the following wind is specified because it is important. A ship relying on sail to pass through the Hellespont and the Bosphorus would undoubtedly be delayed by adverse conditions (Severin 1985, 132; Tim Severin, writing about the last age of sail, says that small ships were towed up the Bosphorus by gangs of men working from a tow path), and

so the description would be worthless without specifying the following wind and the shortest course. The size of Sicily is defined by describing the journey round the island as a voyage for a merchant ship of not much less than eight days (Thucydides 6.1). This historiographical practice is continued by Thucydides' immediate successor Xenophon and also by later writers (see Casson 1971, 287; cf. Diodorus Siculus 5.16.1; 3.34.7. Procopius *Bell. Goth.* 3.18.4. Strabo 10.475).

Xenophon's statement concerning the journey time for a *trieres* from Byzantium to Heraclea seems to be in this tradition. He is providing a measure of distance but there are two difficulties in using this as a bald statement of the endurance and speed characteristics of a *trieres* using oars alone.

The first difficulty is that the statement is followed in the *Anabasis* (6.4.3–6) by a long description of the virtues of Calpe Harbour, which is at the mid-point between the two cities. The import of the passage is that in many cases *trierei*s and their crews would find it too great a distance in one day and, since the natives along the coast were anything but friendly, they might be better breaking their journey at Calpe.

The second difficulty is that the language Xenophon uses does not rule out the use of sail. Having oars may be just one of the conditions which enables the distance to be represented as being equivalent to one day's journey: without oars it would under most conditions have taken two days. When Xenophon (*Hellenica* 6.2.27) describes Iphicrates' *periplous* of 372 BC, he uses a similar construction and we know that sails were used on that voyage.

If one looks at the nature of the voyage from Byzantium to Heraclea one can see that whether or not a ship had oars would, under typical summer weather conditions, make a difference to the number of days taken for the trip. Shaw (above, pp. 63–7) has shown in his very thorough analysis of this journey that a *trieres* making between 7 and 8 knots would cover the 129 nautical miles of the journey in between 16 and 18 hours. Unless there was a southerly wind blowing, a ship without oars could not begin her journey north against the 1.5–2 knot current (Shaw, above pp. 63–4) of the Bosphorus. A merchantman trying to make the trip would be extremely fortunate to catch a southerly blowing early in the morning: a calm would be the most commonly encountered condition in the early morning. Any ship without oars would therefore have to wait for a suitable breeze to pick up in the afternoon to make progress against the current. Thus the journey from Byzantium to Heraclea would be certain to take more than one day.

In the case of the a *trieres* attempting the journey, the typical morning calm would be no bar to her progress since the sixteen miles up the Bosphorus could be tackled under oar with a fresh crew. This is perhaps why Xenophon used a dative of instrument in specifying the use of the oars. Once into the Black Sea she would use sail or oars according to the conditions. It would be most likely for

the crew to need to row for eight to ten hours then sail for four to six hours followed by perhaps another four hours under oar. Shaw seems to quickly dismiss the use of sails without oars (Shaw, above pp. 69–73, and conclusion p. 75) on the grounds that the wind speeds required would raise waves which were too big for safe operation of a *trieres* unless the wind blew for only a short time. But this is precisely the summer pattern of fine weather both in the Black Sea and the Eastern Mediterranean (Shaw, above pp. 64–5, summarising the Admiralty Black Sea Pilot; Denham 1979, xxiv–vi) with the afternoon breeze expected to last four to six hours at wind strengths of Force 3–5. Any *trieres* design must surely be able to withstand winds of Force 3–5 for a few hours or to my mind it would not satisfy the historical evidence. Otherwise we would surely hear in our sources of *trierei*s seeking shelter on most afternoons throughout the summer!

It appears that "a long day's journey from Byzantium to Heraclea for a *trieres* with oars" can not be taken as a bald statement of the endurance and speed characteristics of a *trieres* under oar. Other evidence must be considered to illuminate the passage making qualities of *trierei*s.

The *periplous* of Iphicrates

In 373 BC Iphicrates replaced Timotheus as general after Timotheus had been deposed by the people of Athens for not setting out on the mission with which he had been charged. Iphicrates quickly manned his ships and, early in 372 BC, began his voyage around the Peloponnese to bring assistance to the Corcyraeans. Xenophon admiringly describes how Iphicrates not only succeeded in training his men during the voyage but also completed his *periplous* in good time (*Hellenica* 6.2.11–14; 6.2.27–32). Early on in his account Xenophon tells us about some of the measures which Iphicrates adopted: "As for Iphicrates, when he began his voyage around the Peloponnesus he went on with all needful preparations for a naval battle as he sailed; for at the outset he had left his large sails behind him at Athens, since he expected to fight, and now, further, he made but slight use of his *smaller sails*, (τοῖς ἀκατέτοις) even if the wind was favourable; by making his journey then, with the oar, *he kept his men in better condition of body and caused the ships to go faster*" (ἄμεινόν τε τὰ σώματα ἔχειν τοὺς ἄνδρας καὶ ἄμεινον τὰς νᾶες πλεῖν ἐποίει) (*Hellenica* 6.2.27. trans. Carleton L. Brownson. Loeb Classical Library). Morrison (Morrison, Coates and Rankov 2000, 97) translates the last phrase as "he both improved the fitness of his men and achieved a higher speed for his ships." Warner's Penguin translation is "he kept them (the men) in better physical shape and got more speed out of the ships."

Brownson's translation of this passage allows three possibilities concerning the speed of Iphicrates' ships under sail and oar. Firstly it could mean that since the men were kept fitter the ships were faster under oar than they would have been had Iphicrates used his sails more. A long voyage made mostly under sail would inevitably cause

rowers to lose condition, which would reduce the speed attainable under oar. The second, and perhaps the most natural interpretation, is that the ships were faster under oar than when they were using their small sails. The third possibility, which is Morrison's view, is that the ships were faster under oar than they would have been even if they had used both their big and their small sails (Morrison, Coates and Rankov 2000, 97 and 103; it is not clear to me whether the ἀνάτελον was used in conjunction with the big sail in addition to serving as a substitute for it: Casson 1971, 264–7 believes the ἀνάτελον was used on its own, while Morrison, Coates and Rankov 2000, 175–6 think the two sails were used together).

Morrison was led by this conclusion to suggest an amendment to one of the historical requirements put forward for the reconstruction of the *trieres*. "(9) To carry sail well enough for oars to be used on passage only in insufficient or contrary winds" (Coates and McGrail 1984, 91) he thinks should be adjusted by the addition of "or when the ship was in a hurry" (Morrison, Coates and Rankov 2000, 103 n. 3). All voyages undertaken in haste which we hear of in our sources are thereafter assumed to have been completed under oar, "since that was faster" (Morrison, Coates and Rankov 2000, 105).

However when we look at Xenophon's account of the *periplous* in its entirety it is clear that speed is not uppermost in his mind. The big sails are left behind, not to make the passage faster but because Iphicrates expected to fight (*Hellenica* 6.2.27). The exercises which he puts his ships through are to prepare his men for battle (*Hellenica* 6.2.28; 6.3.30). The emphasis is not on speed but on practice and preparation for a naval action.

If we adhere to a more literal translation of the last few words of the first sentence describing Iphicrates' *periplous* a picture emerges which is more in keeping with the rest of the account: "... he kept his men in better condition of body and *caused the ships to sail better*." The voyage under oar, by keeping the men fitter, made the all round performance of the ships better (for the present writer's hypothesis on the "better sailing" ship, see Whitehead 1993). The double use of ἄμεινον makes it unlikely that Xenophon means "better" when describing the condition of the men's bodies and "faster" when describing the performance of the ships. It is more probable that he is using ἄμεινον in this way for emphasis, highlighting the connection between the better condition of the men and the better sailing characteristics of the ships. We can probably still safely assume that the ships were faster under oar at the end of the voyage than they would have been had Iphicrates used his sails more, although that is not what Xenophon is telling us. The better sailing qualities acquired by Iphicrates' ships during the *periplous* are needed to enable his hastily recruited sailors to hold their own in battle against the well trained crews of the enemy (*Hellenica* 6.2.12 and 32; when Iphicrates' men go into action they do so with great success). Moreover, since it has been shown elsewhere (Whitehead 1993) that "better

sailing" is not synonymous with "faster", we are not able to draw conclusions concerning the relative speed of *triereis* under sail or oar. Other parts of Xenophon's account do provide evidence about the speed which Iphicrates' fleet was able to maintain.

The various training exercises which Iphicrates made his fleet perform must have increased the length of the voyage. For example, drawing the head of the column away from the land and making the ships race to the shore when landing for meals would have made the journey longer (*Hellenica* 6.2.28). Switching from sailing in column to sailing in line abreast and practising the battle manoeuvres would also have inevitably increased the distance run (*Hellenica* 6.2.30). Nevertheless it seems that these exercises did not make the journey any slower than it would otherwise have been (*Hellenica* 6.2.32). Since Xenophon (*Hellenica* 6.2.27) includes leaving the large sails behind in his account of Iphicrates' battle preparations, we must surely conclude that the voyage took no longer than it would have done if the ships had all their sails aboard and had been free to use them. Does this then indicate that Morrison was right to infer that passage under oar was faster than passage under sail? Another piece of evidence from Xenophon's description of the *periplous* provides a possible explanation for why the voyage was no slower than it would otherwise have been.

Iphicrates trained his ships in the various battle manoeuvres by day (*Hellenica* 6.2.30). At the end of the day the ships put into land for the men to have their dinner. It was normal practice for the sailors to sleep on land where they had stopped to dine (Thucydides 8.101; cf. Demosthenes [1213] *Against Polyycles* 22, where Apollodorus complains that he and his crew had to spend the night anchored at sea off Stryme, without food and unable to sleep), and Xenophon (*Hellenica* 6.2.29) tells us something of the precautions which Iphicrates takes to guard against an attack when his force is spending the night ashore. Frequently however, Iphicrates does not allow his troops to sleep on land but pushes on through the night:

But often, if the weather was good, he would put to sea again after dinner; and if there was a favourable breeze they ran before it and rested at the same time, but if it was necessary to row he rested the sailors by turns.

The rowers would have been tired by the end of the day so it made good sense to sail when it was possible and give all the men a rest. However even when he could not sail Iphicrates still put to sea since it was important for him to complete the voyage in good time. These extra sessions on the water, executed partly under sail and partly under reduced oarpower, are surely the reason why the *periplous* took no longer than it would otherwise have done. The extra sessions were necessary because the manoeuvres had slowed the fleet, and perhaps also because the distance run under sail was less than it would have been if the big sails had been aboard.

The number of unknowns: the increased distance

run, the time taken for manoeuvres, and the additional time on the water under sail or reduced oarpower make it impossible for us to determine from Xenophon's account of this voyage whether or not passage under oar was faster than passage under sail. A consideration of other source material and an assessment of the practical constraints affecting the operation of *trieres* in the Eastern Mediterranean may provide clues as to how a *trieres* went about making a fast passage.

Passage making

Summer weather in the Eastern Mediterranean is characterised by a daily cycle of sea and land breezes separated by periods of calm. Trying to proceed under sail during a calm, or with an unfavourable wind would not be conducive to fast passage making. If on the other hand a *trieres* attempted to complete a long passage entirely under oar even when the wind was favourable, her crew would become too tired to row efficiently and her speed would be bound to drop. Moreover rowing with a tail wind reduces the cooling effect of the breeze which makes it a particularly endurance-sapping activity. Common sense demands that a *trieres* in a hurry was rowed in periods of calm, when the wind was favourable but very light, and when the wind was contrary; and sailed when the wind was favourable and strong enough to maintain a satisfactory average distance run. In reality all sorts of other factors would come into play. For example, a tired crew would benefit from sailing with a favourable light breeze in order to allow the rowers to regain their strength, in circumstances where a fresh crew might row on until the wind had strengthened sufficiently for there to be no drop in average speed when switching from oar to sail power. The evidence of our sources appears to support these assertions.

Xenophon (*Hellenica* 2.3.31) relates how Critias attacked Theramenes in a speech, telling him that he should not turn around if he is hampered in his course, but should work hard, as a sailor would, until a favourable breeze arises. Apollonius Rhodius, who had lived in Rhodes and Alexandria, although ostensibly writing about a mythical voyage in the distant past, sometimes provides anachronistic nautical detail which can be useful when one is trying to understand maritime practices of a later date (for example, his description of the fitting of a *hypozoma* to *Argo* seems more likely to relate to the larger warships of the third century BC, *triereis*, *tetrereis*, and *pentereis*, than to a Bronze Age *pentekontor*).

We find that Apollonius' Argonauts row when there is a calm but sail when the breeze is favourable (*Argonautica* 1.600 and 607, 2.660). In Thucydides (6.34), Hermocrates of Syracuse suggests attacking the Athenian fleet if it makes the crossing from Corcyra to Italy under oar and the sailors are tired out from rowing. Since this is a crossing of perhaps 70–80 nautical miles this provides a useful reference for what length of passage under oar would tire out the crew of a *trieres*. When approaching enemy-held

waters a sensible commander would surely have used his sails if the wind was favourable, in order to preserve the strength of his rowers. Hermocrates goes on to say that if it did not seem wise to attack, the Syracusans could retire to Tarentum. One presumes that he would not recommend an attack if the Athenians came up under sail with their oarsmen still fresh.

Strong contrary winds (Apollonius Rhodius *Argonautica* 1.586; 2.528; Herodotus 7.168), or a storm (Thucydides 4.3.1; 8.99), might prevent a ship setting out or cause it to seek shelter. When he is not seeking to train his men Iphicrates sails when the wind is favourable and proceeds under oar if it is not. Since the oarsmen have worked hard all day they row in shifts to enable them to get some rest (Xenophon *Hellenica* 6.2.29). A non-stop voyage from Piraeus to Mytilene also requires the rowers to operate in shifts. Thucydides (3.49) tells us that the ship was lucky not to be hampered by contrary winds, but during a non-stop passage of this length, 184 nautical miles (Morrison, Coates and Rankov 2000, 95), the rowers might easily have become exhausted if they had rowed all together, even allowing for the possibility of a favourable wind and some of the passage being completed under sail. Thucydides does not mention sailing in his account of the voyage but that does not rule out the use of sails. He describes the extraordinary measures taken to ensure maximum distance run when the ship is under oar, but since it is unlikely that any such extraordinary measures were required in order to sail most efficiently, he would have no reason to write about those parts of the voyage completed under sail.

Long voyages undertaken in a hurry seem to warrant using the oarsmen in shifts. Although the two voyages mentioned above are certainly both exceptional in their different ways, it appears that rowing in shifts was quite normal practice (Morrison and Williams 1968, 309–10). Polyainos (5.22.4) relates a story of the Athenian general Diotimus, a contemporary of Iphicrates (Xenophon *Hellenica* 5.1.18–24), who landed a number of men from his ships by night to set an ambush for the enemy. At dawn he had his ships stationed offshore at the place of ambush, with troops on deck ready for action. He ordered those rowers left on board to pull in turn the thaliamian, the zygian, and then the thranite oars. The ships attempted a landing and were attacked by the enemy, who were then taken in the rear by the ambushing force. There would have been no point in rowing each level in turn if it had not been normal practice since it would only have made the enemy suspicious. Although there is no evidence in the cases of Iphicrates' *periplous* and the dash to Mytilene of how the oarsmen were organised to row and rest in turn, the Polyainos passage suggests that it was usual for *triereis* to be rowed in turn by each of the three levels. The rowing of undermanned ships *monokrotos* and *dikrotos*, with one and two levels, at Aegospotami suggests that the sailors were familiar with the practice. In such a dire emergency and with no time to think they would have been unlikely to attempt anything unusual (Xenophon *Hellenica* 2.1.28). At

Sphacteria the thalamians are left aboard the ships when the Athenians make a landing on the island (Thucydides 4.32). The way that our sources sometimes distinguish between rowers by referring to their different levels may reflect the operational reality of rowing, resting, and (bearing in mind Aigospotami) eating in shifts (Thucydides 6.31; Aristophanes *Acharnians* 162; although both these cases seem to be concerned with differences in pay).

On another occasion, when a short voyage was undertaken without any need for haste, the oarsmen were handled differently. The Spartan admiral (*nauarch*) Teutias sailed from Aigina with a fleet to attack the Piraeus. Since he had all night to complete his journey, and it seems wished to make his attack at dawn, he ordered his men to row for a while, and then to rest, and continued to alternate rest and rowing through the night. When he was a thousand metres or so from the entrance to the harbour he halted the fleet and let the men rest until daybreak. Then, as day was dawning, he led the assault on the Piraeus (Xenophon *Hellenica* 5.1.18–24). Teutias's method of handling his oarsmen was probably a more agreeable way of making a passage than rowing in shifts. It allowed all the oarsmen to rest together and they may even have found it easier to sleep without the noise of the ship being rowed (Morrison and Williams 1968, 311; cf. Aristotle *Meteorologica* 2.9. (369b 10); Euripides *Iphigenia in Tauris* 407, 1133).

In the virtually tideless Mediterranean a ship that was not under way would only drift with the wind, so during the frequent calms no ground would be lost if all the rowers rested at the same time. Teutias was able to allow his men to rest like this, probably taking advantage of the calm which usually descends on the Saronic Gulf at night in summer. During a daytime passage an astute commander might prefer to rest and then row his men all together through a hot, windless morning in the expectation of help from a favourable breeze in the afternoon. In good weather the afternoon breeze starts about the same time each day and dies away towards dusk. Although its direction and strength may vary depending on the locality, a good *kubernetes* would be well aware of these differences and would know whether or not the wind was likely to be favourable.

Triereis on passage used their oars during period of calm or to make progress against contrary winds. Long voyages undertaken in haste required the oarsmen to operate in shifts and it appears that it was not unusual to see a *trieres* being rowed by each level in turn. As an alternative the crew might be ordered to row and then allowed to rest all together if a ship was in no particular hurry. When the wind was favourable a *trieres* would proceed under sail although a strong contrary wind or a storm might prevent her from setting out or cause her to seek shelter.

Triereis in flight

Other evidence concerned with the performance of *triereis* under sail and oar, not connected with passage making

but, in part at least, associated with haste, is provided by accounts of *triereis* in flight. Manoeuvrability, speed of turn, ability to go directly upwind, and to go astern, were vital leading up to and during a sea fight, but once the decision had been made to flee, getting clear of the battle was the only requirement.

When the Greeks at Salamis heard of the capture of the Athenian acropolis some of their commanders hurried aboard their ships and hoisted the sails to flee (Herodotus 8.56). Following his account of Salamis Herodotus repeats a slanderous Athenian story concerning the alleged flight of Adeimantus and the Corinthians prior to the battle. This tale has Adeimantus and the rest of the Corinthian fleet hoisting their sails to make good their escape (Herodotus 8.94). Although the story is probably false, for it to have had any credibility at all, ships in flight must normally have used their sails. At Lade the Samian ships which turned away before battle had been joined also hoisted their sails (Herodotus 6.14). In all of these cases the ships had not sustained any damage, and therefore would have had their full oar power available, and yet they chose to hoist sail. Since the hoisting of sail served, rather like the striking of colours in a later era, to signal that a ship was not going to take any further part in the battle it is not safe to draw conclusions as to the relative speeds under sail or oar. However the sails must have driven the ships well enough to take them out of the battle line since otherwise they surely would have fled under oar without bothering to waste time by hoisting sail.

Speed under sail must have varied according to which sails were being used. A ship using its big sail, or perhaps even both sails, would sail faster than one which was just using its *ἀκάτειον*. However in the three cases mentioned above it is not possible to determine which sails were hoisted. Herodotus just uses the generic name *histia* and gives no clues as to which sails he means. Thucydides (7.24) only refers to sails once in his entire work and then only to remark on the capture of the sails of forty *triereis* from the forts at Plemmyrium. This does at least tell us that, by 413 BC, ships going into action were leaving sails on shore. We never hear of *triereis* making use of their sails; a case perhaps of the commonplace not warranting a mention. In 410 BC Alcibiades ordered forty ships under Thrasybulus and Theramenes to remove their big sails (τὰ μεγάλα ἱστία) and follow him to Parium (Xen. *Hell.* 1.1.13. cf. Lysander leaving his big sails ashore before Aigospotami. Xen. *Hell.* 2.1.29). Therefore we can be sure that by this date the smaller sail, the *akateion*, was being carried into battle since there would be no point in describing a sail left ashore as big unless it was to distinguish it from another of a different size which remained on board. Xenophon's account of Iphicrates' *periplous* in 372 BC is the earliest reference to the *akateion* sail by name but its use must have been well established by then. Although we can not be sure that the *akateion* was carried into battle in the early part of the fifth century BC we know that it was by the end of the century. Since the only evidence I have

quoted concerning the hoisting of sails for flight refers to actions from the early part of the fifth century BC we must consider later evidence to determine whether or not the *akateion* was used in this way.

Epicurus the philosopher, who set up a school at Athens in 306 BC, when he was 35, uses the phrase “hoist the *akatia*” (ἐπαρᾶμένους τὰ ἀκάτια) metaphorically to indicate flight (Epicurus Frag. 163. ed. Usener from Plutarch *Moralia* 1094D; at *Moralia* 15D Plutarch uses the phrase “to hoist the Epicurean *akateion*” in connection with flight). Epicurus’ association of the *akateion* with flight suggests that in his time it was hoisted by *triereis* (and perhaps *tetrereis* too) wishing to break off from an engagement. It seems that even if a ship had left its big sail ashore it still fled under its *akateion*. This implies that, even with the reduced sail area provided by the *akateion*, sufficient driving force was generated to take a ship out of the battle line.

The evidence for flight under sail suggests that when the manoeuvrability needed to press home or avoid ramming attacks was not required ships would hoist sail to take them out of the battle line. Although it is not clear when the practice began of using the *akateion* as a battle sail when a ship needed to flee, it is certain that the *akateion* was used in this way by the end of the fifth century BC. Even under *akateion* alone a ship was fast enough to break away from the battle.

Conclusions

It does not seem safe to take Xenophon’s phrase, “It is a long day’s journey from Byzantium to Heraclea for a trireme with oars” as a bald statement of the endurance and speed characteristics of a *trieres* under oar. The context of the passage suggests that, for many *triereis*, the journey would have taken more than a day. It may also be that “with oars” was included to indicate that oars will have had to be used to pass through the Bosphorus and therefore it is quite possible, given a similar use of the term by the same writer when we know that sails were indeed involved, that we could be talking about use of both sails and oars in covering this distance.

It is not possible from Xenophon’s account of Iphicrates’ *periplous* to determine whether or not passage under oar was faster than passage under sail. Speeds under oar and under sail would have differed with changes in wind strength, wind direction and sea state. Therefore it can not be definitively stated whether it was faster to voyage under oar than sail or vice versa. Ships in a hurry to complete long passages seem to have used their rowers in shifts. Other evidence suggests that if there was no need

for speed the oarsmen could be used, and allowed to rest, all together. *Triereis* fleeing from battle hoisted sail and, even under *akateion* alone, were swift enough to break clear of the fight.

The evidence of our sources, together with a consideration of prevailing conditions in the Eastern Mediterranean, point to the fastest passages being made under sail and oar, the exact combination of the two being dependent on the length of the voyage and the weather at the time.

Implications for a second reconstruction

The points raised above may have implications for any future reconstruction. Historical requirement (9) should in my view remain “To carry sail well enough for oars to be used only in insufficient or contrary winds” It also seems to me that it is not safe to demand that any reconstruction should be capable of being rowed by a crew of average strength and endurance from Byzantium to Heraclea in “a long day”. The context of Xenophon’s statement suggests that this was probably beyond many ancient *triereis* and their crews. Moreover since I hope I have demonstrated that it is likely that a *trieres* could be expected to complete some of the journey under sail we should not be demanding that our crews are able to row for 16–18 hours at between 7 and 8 knots. In my view, in line with Hermocrates of Syracuse’s statement of the length of crossing using oars, about 70–80 miles, which would cause a crew to arrive tired, a *trieres* reconstruction which can maintain a speed of 7–8 knots under oar for ten hours a day would adequately fit the historical evidence.

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