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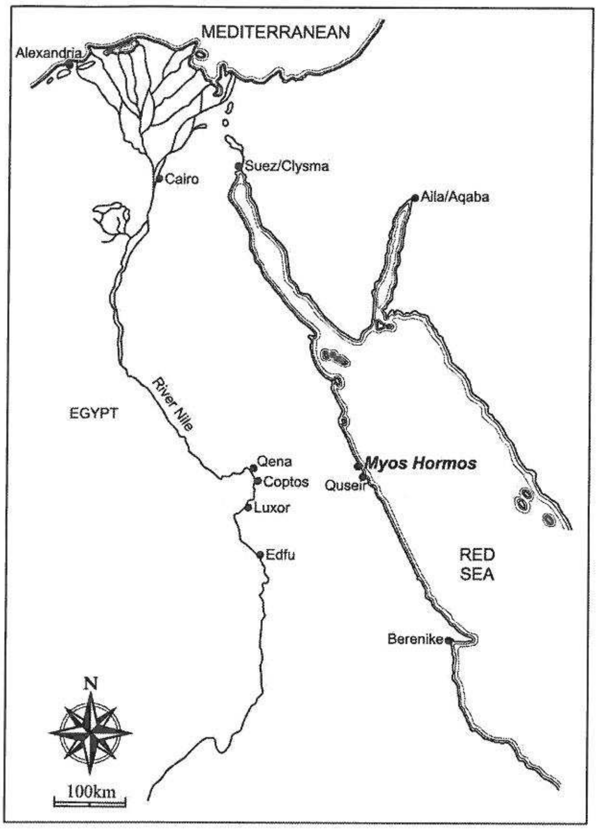
How Fast is Fast?
Technology, Trade and Speed under Sail in the Roman Red Sea

Julian Whitewright



Map 6:1 The northern Red Sea showing the location of Myos Hormos (after Peacock and Blue 2006: figure 1)

The Red Sea represents one of the great maritime highways of the ancient and modern world. It has formed one of the primary geographical connections between the cultures of the Mediterranean world and those of the Indian Ocean, as well as allowing Red Sea cultures to move in either direction. Trade routes have utilized the orientation of the Red Sea from prehistoric times up to the present day; the construction of the Suez Canal has further emphasized the advantageous nature of north / south travel through the Red Sea as a link between East and West. The focus of this paper is on the use of the Red Sea as a trade route and cultural link during the Roman period, specifically the first three centuries of the first millennium AD. Particular emphasis is placed upon an understanding of the relationship between environmental conditions and ancient ship technology as a way of elucidating the maritime routes of the Red Sea and the corresponding overland routes in the Eastern Desert.

Roman Red Sea Trade

Throughout the early first millennium AD Roman commerce with the wider Indian Ocean was funnelled through the ports of Myos Hormos, Berenike and Clysma, located on the Egyptian coast in the northern third of the Red Sea (Map 6:1).

Some indication of the scale of the Roman involvement in the wider trade networks of the Indian Ocean can be found in Strabo's remark that 'now one hundred and twenty ships sail from Myos Hormos to India'.[1] It is worth noting that Strabo is only referring to ships sailing to India. Roman vessels trading with the southern part of the Red Sea and the Gulf of Aden are not included — neither are ships sailing down the coast of East Africa. All of these Roman merchant ships would have had to begin and end their voyage in one of the northern Red Sea ports. As well as Roman ships sailing from Egypt to India, it also seems likely that vessels of Indian Ocean origin were sailing to the northern end of the Red Sea. The author of the *Periplus Maris Erythrœi*, a first-century AD merchant guide to the Red Sea and Indian Ocean, says of Eudaemon Arabia (Aden) 'in the early days of the city when the voyage was not yet made from India to Egypt, and when they did not dare to sail from Egypt to the ports across this ocean, but all came together at this place and it received cargoes from both countries.'[2] It is easy to imagine ships of different cultures engaged in trade on the Indian Ocean converging on the Red Sea in order to reach the markets of the Mediterranean.

The two ports of Myos Hormos and Berenike were central to this long-distance trade. They acted as entrepôts into the Roman Empire for the goods, many of them luxury items, arriving from Arabia, East Africa, India and places further to the east.[3] Once unloaded, goods were transshipped across the desert to Coptos on the Nile. The journey from Berenike to Coptos took twelve days across the Eastern Desert,[4] while the route from Myos Hormos required six or seven days of desert travel.[5] From Coptos goods were taken by boat to Alexandria from where they could be shipped to the wider Roman world. Goods ex-

1 Strabo *Geography* 2.5.12.
2 Passage 26, tr. Schoff 1912.
3 Peacock and Blue 2006: 3.
4 Pliny *Natural History* 6.102–3.
5 Strabo *Geography* 17.1.45.

ported from the Roman Empire to the Indian Ocean probably followed the reverse route.

The Red Sea wind regime

The geographical advantages of the Red Sea are obvious, the north / south corridor which it provides between the Indian Ocean and Mediterranean being clear from even the briefest glance at a map. However, seafaring and navigation on the Red Sea are far from simple. As with any body of water, the ease with which a sailing ship can be navigated between two locations is dependent to a large extent on the nature of the wind the vessel encounters. A fair wind will allow a relatively faster voyage to be made than if unfavourable winds are encountered. Understanding the wind regime of the Red Sea is therefore important in understanding the sailing vessels and the ports which they used. The data on Red Sea wind patterns presented here (Figures 6:1–6:5) is derived from the work of Davies and Morgan.[6] In the northern third of the Red Sea, where the ports of Myos Hormos and Berenike are located, the prevailing wind blows from the north for most of the year. This is especially the case between June and September when the frequency of northerly winds is between 75 and 94 per cent. The frequency of northerly winds moderates slightly during the winter. However, it is still 67 per cent in the vicinity of Berenike and Myos Hormos from October to December and 74 per cent between January and March. The central third of the Red Sea experiences more mixed conditions. Northerly winds again dominate during the summer, although the wind is more variable and sometimes blows from the west. During the winter the frequency of northerly winds declines and a southerly wind may be active for 39 per cent of the time from October to December and 33 per cent between January and March. The southern third of the Red Sea follows a similar, albeit more polarized, pattern to the central third. Northerly winds dominate during the summer, prevailing for as much as 75 per cent of the time during September. During the winter the pattern is reversed and southerly winds prevail for 70 per cent of the time from October to December and 55 per cent between January and March. The wind in the Gulf of Aden follows a general pattern of prevailing wind blowing into the Gulf (from the Indian Ocean) during the winter and out of the Gulf during the summer.

A vessel attempting to sail from the straits of Bāb al-Mandab to the coast of Egypt is likely to encounter unfavourable northerly winds at some point on its route. Throughout its history of use as a corridor for travel and trade the presence of persistent northerly winds must have been an added complication to northward sailing on the Red Sea, while making southbound travel relatively simple.[7] The problem of northward navigation has drawn the attention of both ancient and modern authors. Strabo comments that the road from the Nile to Berenike was cut because 'the Red Sea was hard to navigate, particularly for those who set sail from its innermost recess'.[8] Recent scholarly investigation into Red Sea voyaging has identified the problems associated with sailing against the northerly wind.[9]

It is no surprise, given the nature of the wind patterns in the Red Sea, that trade routes were utilized when the winds in the Red Sea and the Indian Ocean were at their most favourable.[10] If the voyage from Egypt to India and back is used as an example, this meant leaving Egypt in August in order to have northerly winds on the voyage down the Red Sea. Ships then sailed across the Indian Ocean on the tail end of the south-westerly monsoon, reaching the Indian coast sometime in September. The return voyage could have been made at any stage after this point, as long as the north-easterly monsoon in the Indian Ocean had begun. Pliny records that vessels left India at the beginning of the Roman month of December and no later than early January.[11] Such a departure date would have given ships a fair wind back to the Gulf of Aden. Vessels then had to sail up the Red Sea and hope that the southerly winds in the southern two-thirds were as frequent and long-lasting as possible. Pliny says that the ships sailing from India to Egypt 'after entering the Red Sea, continue the voyage with a south-west or south wind'.[12] It seems likely that the earlier a ship set off from India (assuming the north-east monsoon had begun) the better its chance of quickly working its way up the Red Sea to the Egyptian ports of Myos Hormos and Berenike. Effective use of diurnal winds would also have played a role in successful northward navigation. Although difficult to accurately quantify, Davies and Morgan note that daytime heating of the land relative to the sea slants the wind, and this has the effect of making one tack more favourable than the other.[13] Successful exploitation of this would have aided a vessel in its voyage northward and it seems unlikely that an experienced seafarer would have overlooked this opportunity.[14]

6 Davies and Morgan 1995: 29–30.

7 Cf. Facey 2004: 11.

8 Strabo *Geography* 12.1.45.

9 Casson 1980; Sidebotham 1989: 198–201; Facey 2004.

10 Cf. Casson 1980.

11 Pliny *Natural History* 6.106.

12 Ibid.

13 Davies and Morgan 1995: 28.

14 The advantageous use of diurnal winds is mentioned by Ibn Mājid in his account of navigating the Red Sea; he noted that they occur mainly on the African coast of the Red Sea and rarely on the Arabian coast. For a translation and commentary see Tibbets 1971: 256 and 370.

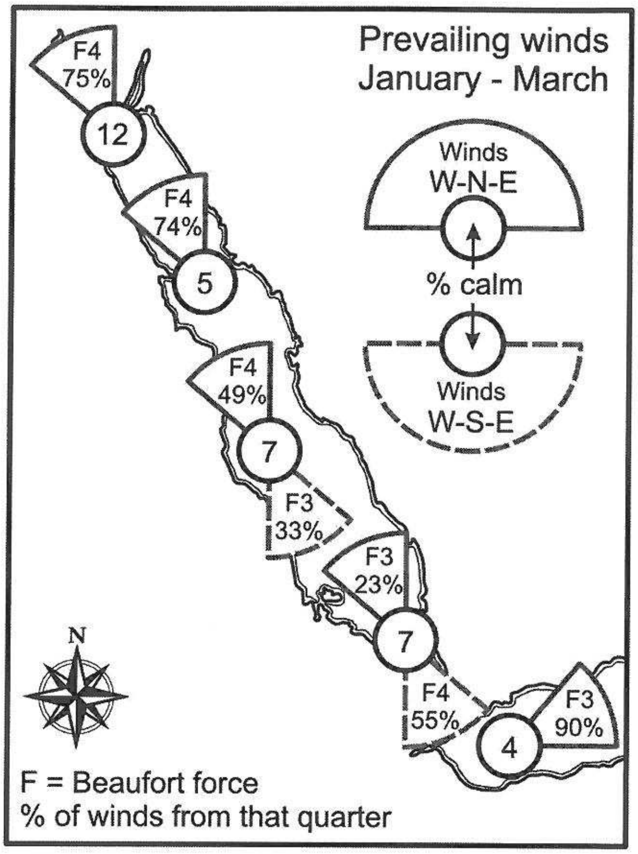


Figure 6:1 Prevailing Red Sea winds, January to March (after Davies and Morgan 1995: 29)

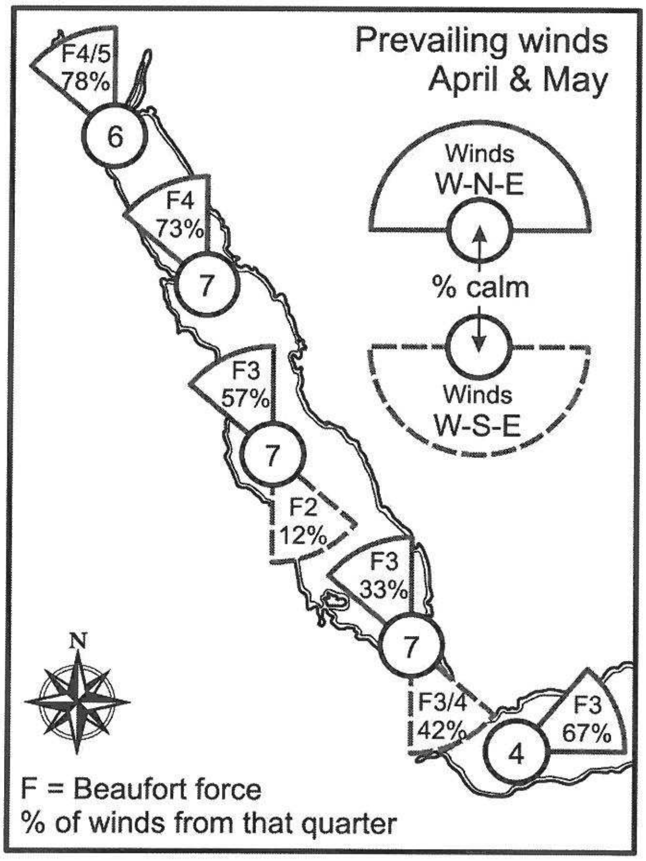


Figure 6:2 Prevailing Red Sea winds, April and May (after Davies and Morgan 1995: 29)

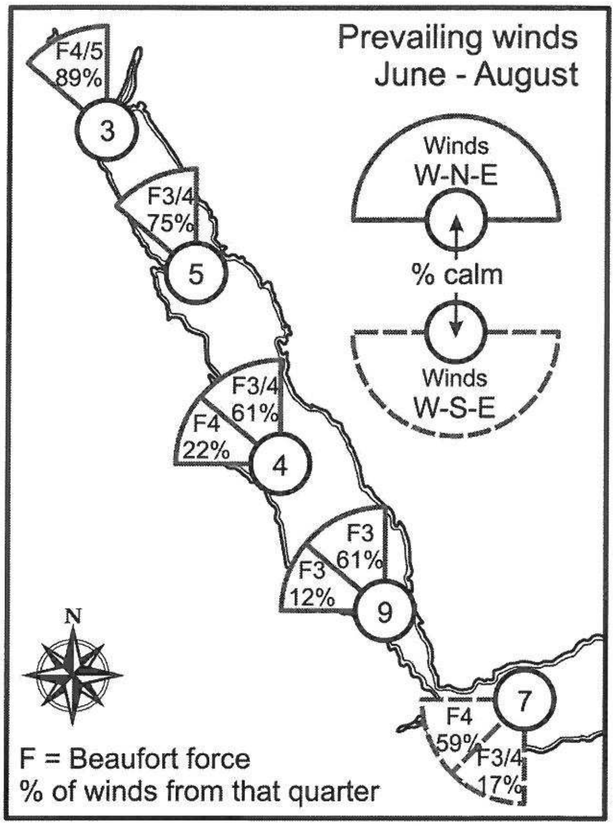


Figure 6:3 Prevailing Red Sea winds, June to August (after Davies and Morgan 1995: 29)

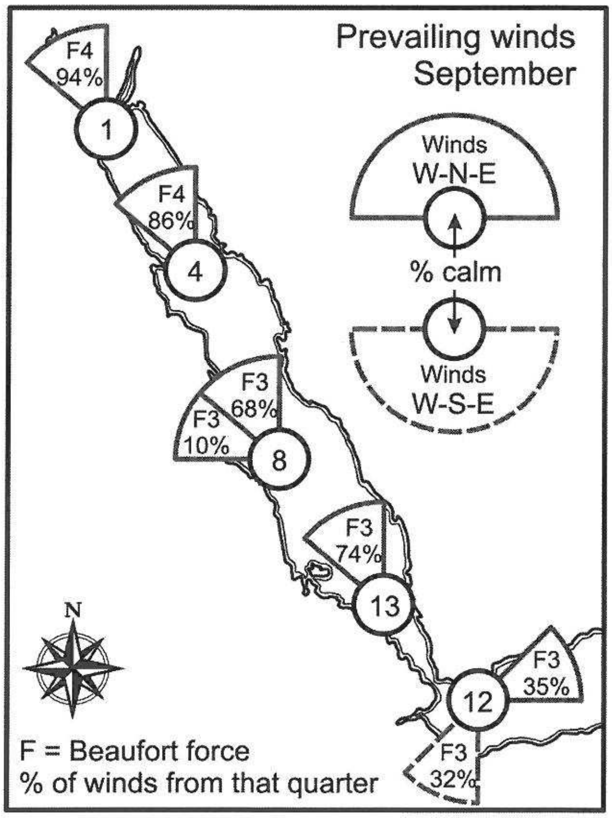


Figure 6:4 Prevailing Red Sea winds, September (after Davies and Morgan 1995: 29)

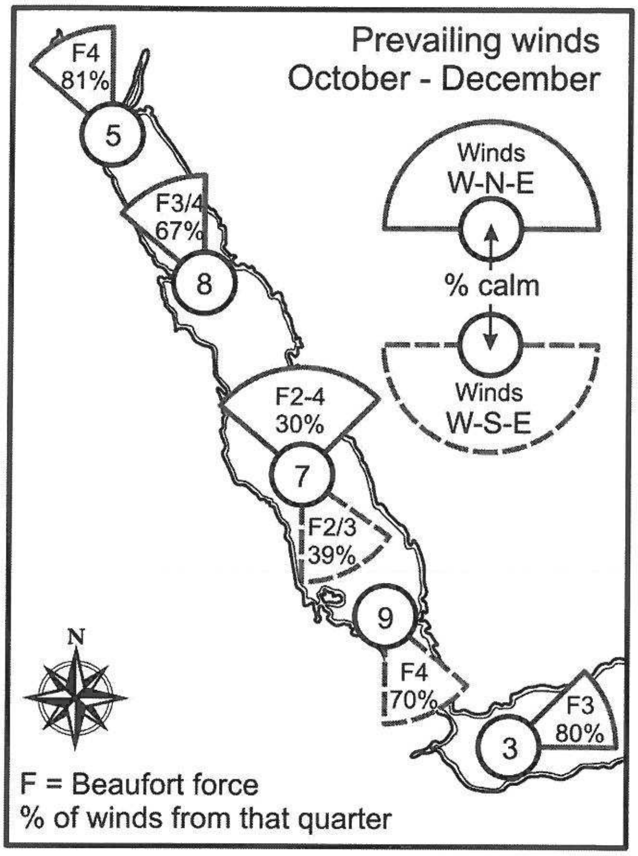


Figure 6:5 Prevailing Red Sea winds, October to December (after Davies and Morgan 1995: 29)

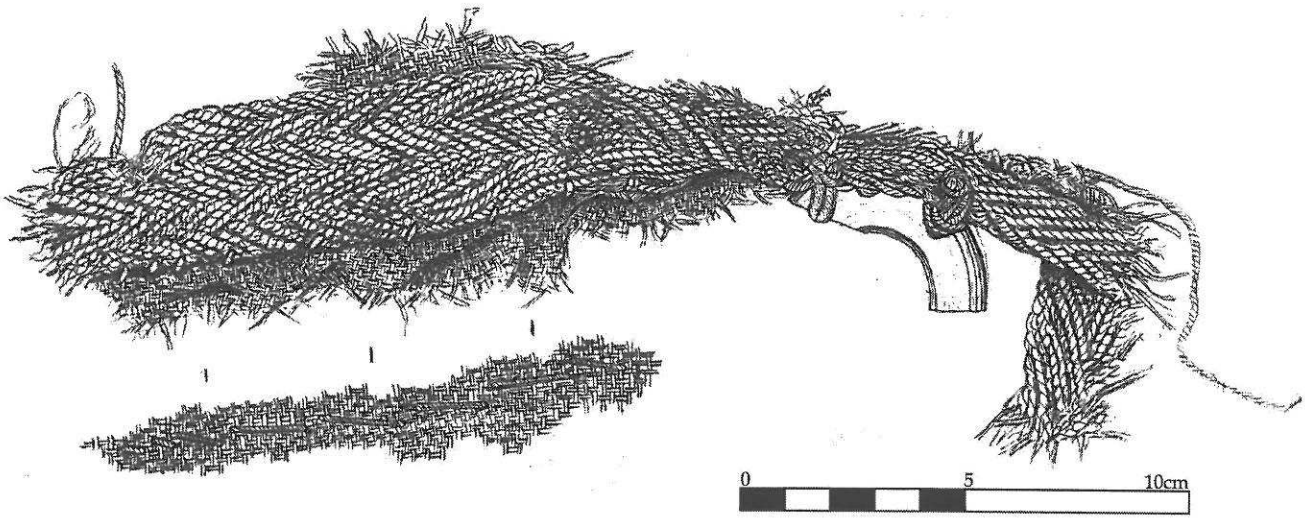


Figure 6:6 Roman sail and brail ring from Myos Hormos, late first / early second century AD (J. Whitewright)

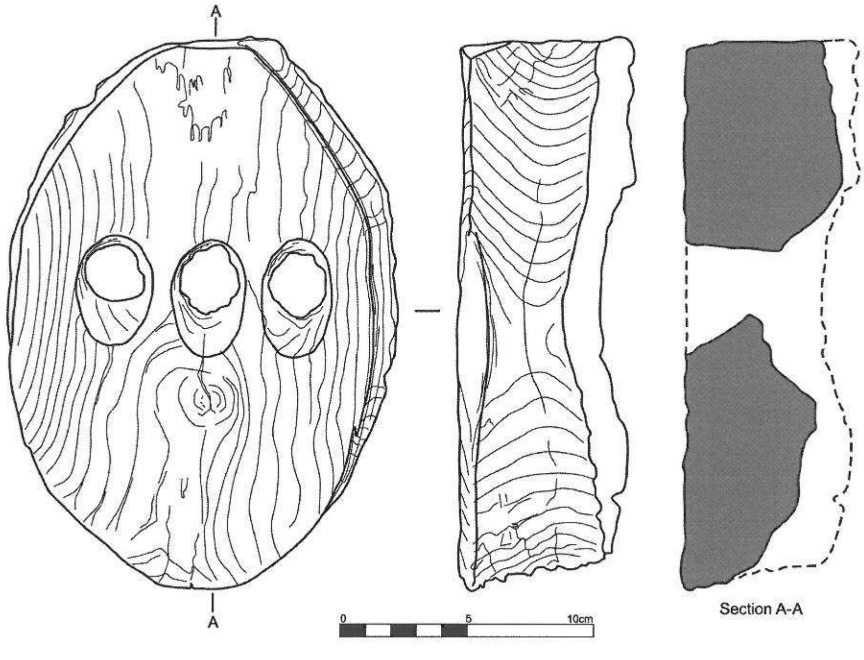


Figure 6:7 Roman deadeye from Myos Hormos, mid / late second century AD (J. Whitewright)

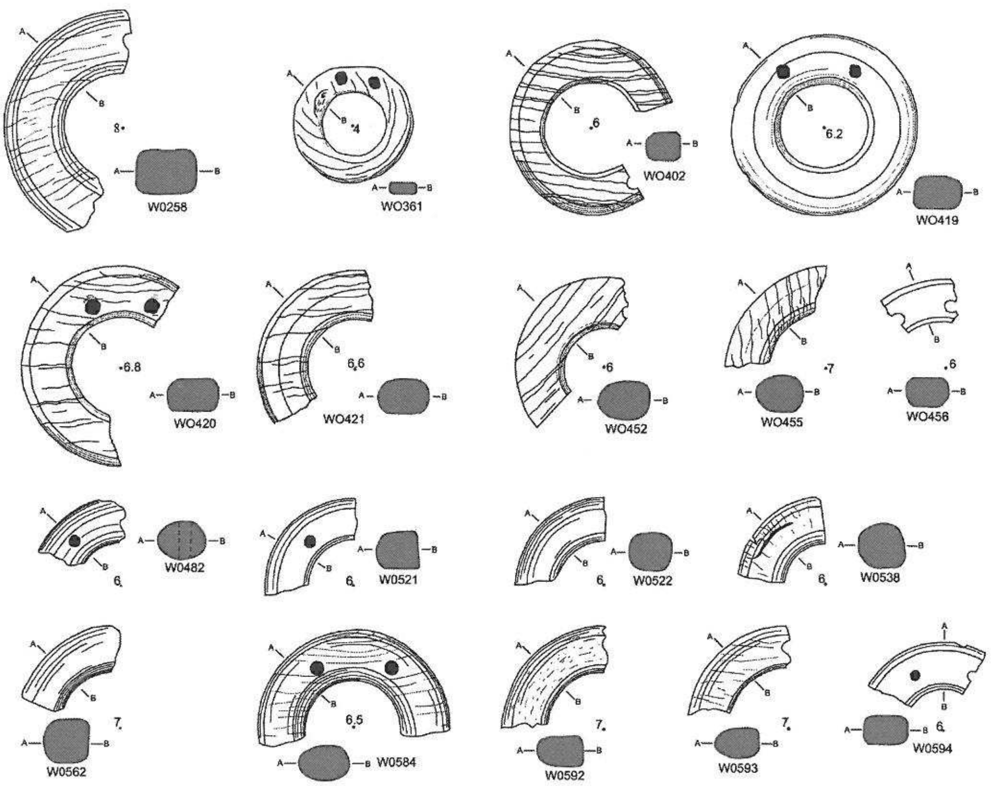


Figure 6:8 Example of wooden brail rings from Myos Hormos, first century BC – third century AD (J. Whitewright)

With the problem of sailing to windward in mind, it is interesting to observe that the authors of the *Red Sea Pilot* note that 'Anyone used to sailing to windward will not find the Red Sea markedly worse than anywhere else.'[15] Sailors native to the Red Sea or other areas where upwind sailing was a part of life may have taken for granted the techniques required to sail to windward and continued their voyages accordingly, once northerly winds were encountered. Sailors from areas where favourable trade winds generally prevail during the sailing season, such as the Indian Ocean, may have had far more difficulty adapting to the unfamiliar conditions of the northern Red Sea.

The northerly wind and the location of ports

The environmental reality of prevailing northerly winds has led to the location of Red Sea ports being considered in terms of the wind patterns before other contributing factors. In general, this theory concludes that a port situated as far to the South as possible, within the overall context of a specific culture, will be preferable to a more northerly port. The main reason for this has been the assumption that northward sailing is so difficult as to make transport or travel overland a more favourable option. This viewpoint is best summed up in Casson's statement regarding the relative merits of Berenike and Myos Hormos; 'Berenike was well over 200 miles south of Myos Hormos, which meant, for returning vessels, that much less beating against the northerlies which prevail in the Red Sea above latitude 20° north.'[16] Quite simply, there was no reason to waste time sailing against the prevailing northerly winds in order to reach Myos Hormos when Berenike would serve perfectly well and was located over 200 miles to the south.

The assumption that ports needed to be located as far to the south as possible only takes into account the prevailing wind regime which complicates Red Sea navigation, particularly in the northern third. No account of the actual sailing ability of ancient ships or the difference in costs of transporting goods overland rather than by sea has been included. Such a line of argument also overlooks the fact that ports such as Myos Hormos and Clysma were located at the northern end of the Red Sea and were used extensively during antiquity. Archaeological evidence from Myos Hormos indicates that a significant quantity of the rigging material found there originated in the Indian subcontinent. This material included sail cloth (Figure 6:6), a deadeye (Figure 6:7), and brail rings (Figure 6:8). Sailing ships engaged in trade between the Red Sea and the Indian Ocean must have been capable of reaching the port, despite the direction of the prevailing wind. Likewise, in the medieval period it is Myos Hormos, under the new name of al-Quṣayr (later known as al-Quṣayr al-Qadīm) which is reused as a port of trade, rather than the more southerly port of Berenike. Proximity to the river Nile and by inference faster land communication, rather than a southerly location, may have been an underlying cause of the reuse of Myos Hormos in the Islamic period. This is implied by Qalqashandī writing in the fourteenth century, who states that 'Al-Quseir is on the northern side of Aidhab and some of the ships frequent it; it is near to Qus and Aidhab is far from Qus.'[17] The location of ports in the Red Sea during antiquity was obviously dependent on more than just the direction of the prevailing wind.[18]

Roman sailing ships on the Red Sea

An indication of the potential capability of merchant ships engaged in trade on the Red Sea is impossible without first establishing the nature of the rig and sail plan of the vessels concerned. The archaeological remains of the rigging of vessels utilizing the port of Myos Hormos during the Roman period fall within the same rigging tradition as other published finds from the Mediterranean.[19] The general form of the sail fragments (Figure 6:7), deadeye (Figure 6:8) and brail rings (Figure 6:9) is consistent with rigging finds from classical contexts within the Mediterranean basin and observations of rigging depicted in iconographic sources[20]. These finds comprise most of the components required to rig a sailing vessel within the classical Mediterranean tradition.[21] Brails, and brail rings in particular, are components unique to the Mediterranean sailing rig. Their use is inconsistent with any of the other forms of sailing rig known to have been used at this time in the Mediterranean or Indian Ocean.[22] As a result of this, it seems reasonable to assume that Roman sailing vessels engaged in trade in the Indian Ocean and sailing from the Egyptian Red Sea ports were outwardly similar in appearance, operation and capability to their Mediterranean contemporaries, at least in terms of the sailing rig.

The Mediterranean square-sail rig of the Roman Imperial period was a sophisticated and highly developed sailing rig. By the first century AD, the Mediterranean square rig consisted of all the component parts required to sail on all

15 Davies and Morgan 1995: 26.
16 Casson 1980: 22, n. 2.

17 1913: 465.
18 Cf. Ward, this volume.
19 Whitewright 2007.
20 As well as Mediterranean sources which depict Roman square-rigged vessels, a pot sherd from the port of Berenike has a graffito of a square-rigged ship in the Roman style, dating between AD 50 and AD 70, see Sidebotham 1996: 315–7.
21 Whitewright, forthcoming.
22 Ibid.

points of sailing. A strong system of standing rigging, comprising shrouds, forestay and backstay, was in place to support the mast both laterally and longitudinally on all courses a vessel may have sailed. Likewise the running rigging of such ships was designed to act as efficiently as possible. The system used for shortening sail, known as brails, allowed ancient mariners to reduce the size of their sail at a moment's notice. Brails also allowed sailors to change the overall shape of the sail depending on the course being sailed and in doing so to sail a vessel in the most efficient manner for a given course. It seems likely that all of these features would have allowed Mediterranean sailors in the first millennium AD to sail on both upwind and downwind courses, if they so wished. Textual sources from the Mediterranean refer to sailing techniques and practices which are consistent with vessels sailing to windward and which would not be used on any other course.[23] Likewise the invention and use of a small foresail or *artemon* on the Mediterranean rig is indicative of an ability to sail an upwind course — the *artemon* being of only limited use on other sailing courses.

Textual evidence survives from the ancient world which provides a further indication of the ability of Roman sailing ships to make ground to windward. Records from the Roman Mediterranean detail the time taken to sail between different locations in the Roman Empire.[24] Some of these voyages are recorded as having taken place with fair winds and some with foul winds. In the context of the ancient world 'foul' winds generally refer to winds from a contrary direction. Put simply, voyages made with a foul or unfavourable wind would have been voyages made in an upwind direction. Analysis of such voyages can give an indication of the overall speed of a vessel between two places in the form of *Velocity Made Good* (Vmg), in other words, the relative speed of the vessel directly to windward. The importance of Vmg as a way of recording a vessel's sailing capabilities has been observed during the trial voyages of replica vessels from Scandinavia.[25] Reference to eight voyages, listed here (Table 6:1), indicates that the Roman sailing ships of the period, presumably rigged with the standard Mediterranean square-sail rig, could attain an average Vmg of 1.9 knots. The actual figure might be slightly more or less depending on the exact nature of conditions encountered *en route*, the state of repair of the vessel and the ability of its crew. A Vmg of 1.9 knots equates to a distance of about 45 nautical miles sailed over a 24-hour period in upwind conditions. Sailing trials of replica vessels from the Viking era, carrying a square-sail rig broadly similar to that used by the Romans, returned a Vmg to windward of between 1.5 and 2 knots.[26] This compares favourably with the data derived from historical sources for Roman ships. Roman merchant ships on the Red Sea were rigged with the same sailing rig as Mediterranean vessels; they would have been operated in the same way and would have had a similar performance. This would have included being able to sail on an upwind course at an average of 1.9 knots Vmg. For comparative purposes it is worth noting that historical records of Roman merchant ships contain a fastest average speed, over a distance of 670 nautical miles between Corinth and Puteoli, of 6.2 knots.[27]

	Route	*Distance (nm)*	*Time (days)*	*Vmg (kts)*
1	Rhodes — Gaza	410	7	2.4
2	Alexandria — Marseilles	1500	30	2.1
3	Puteoli — Ostia	120	2.5	2
4	Gaza — Byzantium	855	20	1.8
5	Rhodes — Byzantium	445	10	1.8
6	Caesarea — Rhodes	400	10	1.7
7	Alexandria — Cyprus	250	6.5	1.6
8	Sidon — Chelidonian Isles	350	9.5	1.5
			Average	*1.9*

Table 6:1 Sailing times of Roman merchant ships in unfavourable Mediterranean conditions (data derived from Casson 1995: 288–9)

Seasonal currents in the Red Sea

Having considered the wind regime of the Red Sea and assessed the potential capabilities of the Roman vessels which sailed upon it, one further important environmental factor remains: namely, the seasonal currents of the Red Sea, which vary in both direction and intensity during the year. The Red Sea has a very high salinity level due to the lack of permanent rivers, the lack of regular rainfall and the continual solar evaporation.[28] A direct result of this is that in order to replace water lost by evaporation, water must flow in through the straits of Bāb al-Mandab. This water of average salinity is more buoyant than the existing seawater and a counter-current is formed. Incoming water flows northward in the upper area of the water-column, while denser, more saline water flows outward at the bottom.[29] Northwards-running currents reach their peak in the winter when they are pushed in by the easterly winds

23 Augustine refers to the use of the *artemon* to balance the sailing rig and keep the bow of the vessel at the correct angle to the wind while sailing close-hauled, tr. Casson 1995: 240, n. 70; Aristotle *Mech.* 851b observes the practice of brailing up one portion of a vessel's sail when it is necessary to sail to windward, tr. Casson 1995: 276.

24 Casson 1995: 288–9.

25 Englert 2006: 39.

26 Vinner 1986: 224.

27 Casson 1995: 284.

28 Davies and Morgan 1995: 37.

29 Ibid.

prevailing in the Gulf of Aden. During the winter, these currents flow northwards as far as the site of Myos Hormos up to a speed of 0.5 knots.[30] Such a figure may seem insignificant, but when taken as a ratio of the Vmg made good against the wind by a Roman sailing ship it represents an additional 25 per cent or more of the speed of the vessel on a direct course: a far more significant figure. Even when faced with northerly winds a vessel would still have been able to make steady progress towards its destination. The currents decrease between January and April before flowing southward during the summer, when the north wind is at its strongest.[31] This final point lends further emphasis to the need for vessels to return to the Red Sea as quickly as possible in order to avoid fighting both wind and currents during their journey northward.

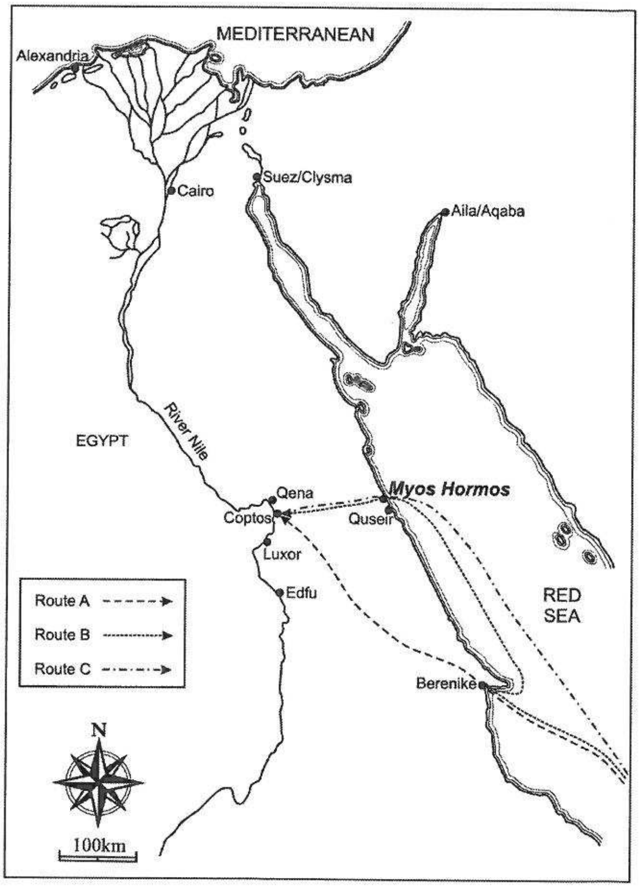
Discussion

The evidence presented above strongly suggests that Roman sailing vessels engaged in navigation on the Red Sea and Indian Ocean were rigged in the same fashion as contemporary ships in the Mediterranean. This sailing rig comprised all the component parts required for upwind sailing. Textual sources detailing the time taken to sail between specific places in the ancient Mediterranean suggest that Mediterranean sailors had the technical knowledge and ability to sail upwind at an average Vmg of 1.9 knots. It is valuable here to reiterate the statement made by Davies and Morgan regarding upwind sailing in the Red Sea, that 'Anyone used to sailing to windward will not find the Red Sea markedly worse than anywhere else.'[32] Sailors of a Mediterranean tradition, in vessels rigged in the Mediterranean fashion, would seem to have been well-equipped to tackle northward travel in the Red Sea. These conclusions regarding the capability of Roman sailing ships can be applied to possible trade routes in the northern Red Sea. Three potential routes based on known locations of ports and road systems can be identified (Map 6:2):

* Route A: Sail to Berenike, overland transport to Coptos.
* Route B: Sail to Berenike, sail to Myos Hormos, overland transport to Coptos.
* Route C: Sail directly to Myos Hormos, overland transport to Coptos.

To travel from Berenike to Myos Hormos by sea would require a voyage of roughly 200 nautical miles. A vessel sailing north and by-passing Berenike altogether in order to sail directly to Myos Hormos would be required to sail 150 nautical miles further than the same vessel sailing directly to Berenike only.

Using the average Vmg of 1.9 knots would allow the voyage from Berenike to Myos Hormos to be made in 4½ days. If the lowest Vmg of 1.5 knots was applied it would take a vessel 5½ days and the fastest Vmg of 2.4 knots would see the voyage completed in 3½ days. For a vessel sailing past Berenike and straight on to Myos Hormos, the extra time required would be 3½ days at an average speed, and c. 4 days and 2½ days for the slowest and fastest Vmg respectively. A vessel with a strong southerly wind, sailing at the fastest documented long-distance average speed of 6.2 knots, would be able to complete the journey between the two ports in 32 hours and the straight-on route in 24 hours.



Map 6:2 Northern Red Sea, showing three alternative routes to Coptos

Textual sources referred to above include details of the length of time taken to travel from the Red Sea ports to Coptos, where customs duties were levied. Both desert journeys would have utilized the watering stations located at various points along the route. The journey between Berenike and Coptos across the Eastern Desert is known to have taken twelve days and the journey from Myos Hormos to Coptos required seven days travel through the Eastern Desert. The three routes can therefore be summarized, according to the time taken to complete them (and the elements comprising them):

30 Davies and Morgan 1995: 40–44.
31 Ibid.
32 Ibid.: 26.

* Route A: 12 days (12 days overland).
* Route B: 12 days (4.5 days sailing plus 7 days overland).
* Route C: 11 days (3.5 days sailing plus 7 days overland).

In each case at least seven days of desert transport is required, the difference being made up in extra desert transport on the overland route from Berenike to Coptos and extra time spent sailing if the route via Myos Hormos was selected. From a purely economic standpoint, the difference in cost between the different routes is therefore the difference in cost between four and five days sailing and five days of desert transport. This assumes that factors such as offloading times and costs are the same in each port.

It is widely acknowledged by scholars that seaborne transport in the Roman Empire was generally cheaper than transporting the same goods via overland routes.[33] The principal difference in cost between the routes is the difference in cost between four to five days' sailing and five days of overland transport; therefore route A will only become cheaper if land transport is cheaper than seaborne transport. It would be convenient at this point to be able to calculate the relative cost differences between the different routes. Scholars of the ancient economy have generally calculated the relative cost of different types of transport on the basis of documents such as Diocletian's edict of prices (AD 301).[34] Horden and Purcell have noted the unsuitability of this type of approach to the calculation of transport cost because such costs do not concern economic costs but merely list maximum haulage rates.[35] They also note the many different ways in which goods were moved (pack animal, cart, coastal vessel, large sailing ship, and so on) and also the many different reasons for moving goods in the first place (tribute, military requisition, 'straight' trade, rent, redistribution within a single estate, etc), factors which further complicate direct cost comparison.[36] Duncan-Jones notes that the 'Edict of Diocletian'' has a total disregard for regional variation,[37] a statement seemingly at odds with his attempt to apply a ratio derived from the edict to Empire-wide differences in transport costs. With all of the above in mind it would seem unwise to attempt to calculate the cost of transport in the Red Sea and Eastern Desert based on the costs of moving different goods, for different reasons, through a different environment in the Mediterranean. It may simply be best to highlight the reasons for the difference in cost between seaborne and land-based transport as seen by the economist Adam Smith who observed of coastal shipping 'six or eight men, therefore, by the help of water carriage, can carry and bring back in the same time the same quantity of goods between London and Edinburgh, as fifty broad wheeled wagons, attended by a hundred men, and drawn by four hundred horses.'[38]

Analysis of Roman ship technology and its potential capability under sail has been outlined above. A previous reliance on the Red Sea wind regime as a means of explaining the location of port sites has been challenged by a reassessment of the sailing capabilities of Mediterranean ships; vessels rigged in an identical fashion are archaeologically proven to have been present on the Red Sea in antiquity. This, in combination with a fresh study of wind and current patterns in the Red Sea, has allowed a model of the potential routes and their relative travel times to be calculated. Given the uncertainty of our ability to accurately calculate the relative transport costs of shipping goods by land and sea in the Roman empire, it must suffice to say that the shipping route via Myos Hormos would have been economically cheaper in antiquity because of the reduction in the quantity of overland shipping this route entailed.

Conclusion

Such analysis is based primarily on economic and environmental considerations. If they were the only contributing factors then it seems unlikely that a port other than Myos Hormos, providing as it did a convenient trade-off between navigable winds and minimum overland transport, would have been required. Such a view, at best, accounts for only some of the factors which dictated where ships sailed and people traded during antiquity. Other reasons, rooted in political, social or material origins, may have dictated which Red Sea port merchants chose to utilize at various times. The presence of other contributing factors has been indicated by the myriad of methods and reasons for trade and exchange which so complicate any attempt to directly compare the cost of different forms of transport (above). Likewise, sailors of a Mediterranean background were seemingly suited to Red Sea conditions and in particular upwind sailing. Seafarers and navigators from the Indian Ocean may have been less familiar with the techniques and technology required for upwind sailing, and as a result they may have been limited to using a more southerly port, at least until they learned or adopted the practices required for upwind sailing. This situation may be paralleled in later periods when Indian Ocean merchant ships seem to sail only as far as Jiddah, vessels local to the northern Red Sea performing the function of trans-shipping goods from Jiddah to Egypt.[39] At a more unquantifiable level, certain merchants may have preferred certain ports because they were offered

33 Duncan-Jones 1982: 366–9; Finley 1999: 126–30; Greene 1986: 39–44; Horden and Purcell 2000: 151; Temin 2001: 176, 188–9; Yeo 1946: 230–3, 236.
34 For example, Duncan-Jones 1982: 366–9; Yeo 1946.
35 Horden and Purcell 2000: 377.
36 Ibid.
37 Duncan-Jones 1982: 367.
38 Campbell and Skinner 1976: 32–3.
39 Facey 2004: 9–11.

incentives to go there or simply had family or other social ties with the place. There are many potential reasons why a vessel should sail to one Red Sea port rather than another. This paper has attempted to show that the wind regime of the Red Sea, which had previously been seen as one of the most important factors in the location of Red Sea ports, is simply one of a myriad of contributory factors. This paper has also attempted to demonstrate that the potential of ancient shipping, at least when built in a Mediterranean tradition, has so far been underplayed. The maritime technology in use in the Red Sea would have allowed merchant vessels to navigate to all parts of the Red Sea during the Roman period.

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