X.—Speed Under Sail of Ancient Ships

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Sailing ships were the backbone of ancient commerce and travel. They carried freight, passengers, news. How fast could they move from port to port? The question, an old one, has been dealt with numbers of times. The handbooks and the economic histories have taken it up in detail and even the general histories have given it a passing word.

Despite all this attention, the subject requires a complete re-examination.[1] One reason is that the scholars who have concerned themselves with it have committed more than their fair share of blunders.[2] Another is that nobody has ever assembled all the available evidence.[3] Passages from ancient authors cited by earlier

[1] The following abbreviations are used: Casson = L. Casson, "The Isis and Her Voyage," *TAPA* 81 (1950) 43–56; Charlesworth = M. P. Charlesworth, *Trade Routes and Commerce of the Roman Empire*[2] (Cambridge 1926); Götz = Wilhelm Götz, *Die Verkehrswege im Dienste des Welthandels* (Stuttgart 1888).

[2] Here are a few examples. W. M. Ramsay, "Roads and Travel (in the New Testament)," Hastings' *Dictionary of the Bible*, Extra Volume (Edinburgh 1904) 389, discusses a voyage reported by Aristides in *Orat.* 24, pp. 305–306. Aristides took, he says, 14 days to go from Corinth to Miletus. Then he adds that he is following Masson in this conclusion. There is a double error here. Aristides' voyage was 14 days from Patras, not Corinth, to Miletus; Corinth is nowhere mentioned. Moreover, Masson (in Dindorf's edition of Aristides, Vol. 3, lxi–lxii) is innocent; he repeats what Aristides says, nothing more. H. de Saussure (*Revue Archéologique*, Sér. 6, 10 [1937] 95) follows Ramsay in considering the voyage as from Corinth to Miletus and makes things even more confused by reporting it as 4 days in length. W. Riepl, *Das Nachrichtenwesen des Altertums* (Leipzig 1913) 167 introduces the last possible variation by reporting that Aristides went from Rome to Miletus in 14 days.

Götz (259) cites *Od.* 15.474 ff. as evidence that the trip from the Cyclades around Malea to Ithaca took 7 days. The passage says nothing of the sort. Seven days out from the Cyclades a killing took place and some unspecified time later the vessel arrived at Ithaca.

Riepl, *op. cit.* 164, cites Livy 36.29 to prove that Nicander traveled from Antioch to Phalerum in 12 days. This passage too proves nothing of the sort. Nicander went to Aetolia, spent an undisclosed amount of time there delivering his message, then proceeded to Phalerum. The whole journey, including his stay at Aetolia, took 12 days. For other instances see below notes 7, 17, 20, 32, 38, 47, 51.

[3] E.g., de Saussure (*op. cit.* note 2) and E. de Saint-Denis ("La vitesse de navires anciens," *Revue Archéologique*, Sér. 6, 18 [1941] 121–138), the latest writers on the subject, omit Marc. Diac., *Vita Porphyr.* 6 (although they cite other passages from the

writers have been overlooked by those who came later while some excellent evidence offered in an ancient work entitled, of all things, "The Ship" was not used until 1941.[4] The most important reason, however, is a far more basic one, namely, the approach to the problem.

The technique used up to now has been to provide a list of various miscellaneous voyages and from it to deduce what the "average speed" of ancient ships was,[5] or let the reader deduce it.[6] The lists (though not complete) are useful; the "average speeds" are worthless. How could they be otherwise? They ignore the fundamental fact that the speed of a sailing ship depends first and foremost on the direction of the wind. Against the wind, 100 miles can take as long as or longer than 200 miles with the wind. Columbus flew to America with the trade winds at his heels. When he met contrary winds while working north along the coast of South America he was lucky if he logged one mile forward an hour. To combine the two voyages to strike an average speed will produce nothing worthwhile beyond some practice in arithmetic. In the study of the speed of ancient voyages, the very first step must be to classify them according to the winds encountered en route.

A sailing vessel travels best under a wind that is blowing from some point abaft the beam. The ship can then move at its fastest directly toward its destination. Such a wind, whether blowing directly over the stern or over the quarters (i.e., from a point on either side of the stern) is a favorable wind. Unfavorable or "foul" winds are those that blow from some point ahead. These force a vessel to tack, i.e., sail at an 80 degree angle to the wind, a procedure

same work) as well as a passage from Xenophon of Ephesus (see below, note 20) which had previously been cited by Götz (227).

[4] Lucian's *Navigium* (see below, p. 143); first included by de Saint-Denis (*op. cit.* note 3, 133, 135).

[5] E.g., Götz (260) concludes that the average speed in Greek times was 4 to 6 knots and then proceeds on this basis to compute the amount of time voyages between a series of given points must have taken. Riepl (*op. cit.* note 2, 160–161) agrees with this in general but adds (168) an overall average speed of 5–7½ knots for the whole ancient period. Cedric Yeo ("Transportation in Imperial Italy," *TAPA* 77 [1946] 232) holds for an average speed of about 3 or 4 knots. Kroll ("Schiffahrt," *RE* 2A.411) offers 5.6 knots for the Greek period and up to 7½ for the Roman. Cf. S. L. Mohler, "Sails and Oars in the Aeneid," *TAPA* 79 (1948) 56, note 29, who, on far too little evidence, concludes that ancient ships sailed as fast with the wind slightly ahead as with a fair wind.

[6] Cf. de Saussure (*op. cit.* note 2) 95–98 and de Saint-Denis (*op. cit.* note 3) 135–8.

that is uncomfortable, wearisome, and slow. The vessel heels heavily, the decks are forever wet with spray, and the sails are constantly being reset. When the destination lies 80 degrees to the right or left of the direction from which the wind is blowing, a vessel can head directly for it. More often the destination lies either nearer than 80 degrees or right in the eye of the wind and then the ship must tack back and forth in zigzag fashion. This is the most time-consuming course of all since it forces the vessel actually to cover far more distance than a straight line to its goal would measure.[7]

To determine the rate of speed of the voyages recorded in ancient literature, we must first distinguish between those made under fair and those under foul winds. Fortunately, in many cases we are specifically told what the wind conditions during the voyage were. Where we are not told we can often, by using modern hydrographic information concerning prevailing winds, make a very good guess.[8]

Also to be considered are two additional factors that clearly play a part in any voyage, namely the nature of the vessel whether fast or slow, and the force of the wind. However, neither is as important as wind direction, for it is this that sets the basic speed and the other factors only cause variations therein.

Voyages Made Under Favorable Winds

Pliny the Elder, in a much-quoted passage (19.3–4), mentions a pair of record voyages and a number of others that he obviously intends as examples of fast runs. All must have been made, of course, before favorable winds. The voyages are as follows:[9]

[7] An excellent case in point is the voyage from Alexandria to Rome which could take as much as five times as long as the return. When Warmington (*The Commerce Between the Roman Empire and India* [Cambridge 1928] 51) tells us that the merchant who wanted to go from Alexandria to Rome could wait in Alexandria "until the direct sailing of cornships began in May" instead of taking the Alexandria-coast of Syria-Asia Minor route, he is talking nonsense. There was no direct sailing from Alexandria to Rome in the summer since the winds did not permit it; see Casson 43–51.

[8] The same winds prevail today as in the days of the ancients. Cf. Casson 49, note 4, where it is pointed out that Nelson in 1798 met the identical winds encountered in a voyage described by Lucian. Mohler (*op. cit.* note 5) has applied hydrographic information and a knowledge of the effect of the wind on sailing ships to certain passages in the *Aeneid* with brilliant results.

[9] Distances are based on George Philip, *Mercantile Marine Atlas*[12] (London 1927) maps 16 and 18; *Reed's Tables of Distances Between Ports and Places in all Parts of the*

Voyage	Nautical Miles	Length of Voyage	Overall Speed
Ostia–Africa	270[10]	2 days	6 knots
Messina–Alexandria	830	6	5.8
Ostia–Gibraltar	935	7	5.6
Ostia–Hispania Citerior	510[11]	4	5.3
Messina–Alexandria	830	7	5
Ostia–Provincia Narbonensis	345[12]	3	4.8
Puteoli–Alexandria	1000	9	4.6

This list gives a good point of departure. It provides an upper limit for us: with a wind from the right direction, a speed of between $4\frac{1}{2}$ and 6 knots could be realized. The variation reflects the two factors mentioned above, that some winds are stronger and some ships faster than others, a point that can be best illustrated by the voyage between Ostia and Africa. The record crossing took, as Pliny shows us, two days. A more usual but still fast trip took $2\frac{1}{2}$ or 3 days,[13] while Marius, when hastening from the war against Jugurtha to stand for the consulship at Rome needed $3\frac{1}{2}$ or 4 days despite a favorable wind.[14] Probably he boarded the first available ship for Rome which, as it happened, was slow. Possibly the wind, although from the right direction, was not very strong.

Let us now compare Pliny's record runs with other voyages of which we have knowledge. Here are seven, each one of which we are specifically told was made under favorable wind conditions.

World[11] (Sunderland 1947) 62–69; *Table of Distances Between Ports*, United States Navy Hydrographic Office, No. 117 (Washington, D. C. 1943) *passim*. In addition, I have used measurements based on the U. S. Navy Hydrographic Office charts of the Mediterranean.

[10] This is the distance between Ostia and a point offshore Cape Hermaeum. Pliny adds that this voyage as well as the Puteoli-Alexandria run listed below was done "mollissimo flatu." This is arrant nonsense of the sort one would expect from a chair-borne admiral like Pliny.

[11] 510 nautical miles is the distance from Ostia to Tarraco through the Straits of Bonifacio.

[12] To Narbo.

[13] Like the air experts who in the last war used to cite the air-travel time from enemy bases to our shores, Cato the Elder showed the Senate a fig that had been picked in Carthage "tertium ante diem" (Pliny, *NH* 15.74; cf. Plut. *Cato Maior* 27.1).

[14] Plut. *Marius* 8.5.

Reference	Voyage	Nautical Miles	Length of Voyage	Overall Speed
Philostr. *Vita Ap.* 7.10	Corinth–Puteoli	670	4½ days[15]	6.2 knots
Thuc. 2.97	Abdera–Mouth of Danube	500[16]	4	5
Acts 28: 13	Rhegium-Puteoli	175	1½	5
Scylax, *Periplus* 111	Carthage–Gibraltar	820	7	4.9
Sulp. Severus, *Dial.* 1.3 and 1.6	Syrtes–Alexandria	700[17]	6½	4.5
Synesius, *Epist.* 51	Phycus-Alexandria	450	4½[17a]	4.3
Philostr. *VA* 8.15	Puteoli–Tauromenium	205	2½	3.4

With the single exception of the last voyage — which we will deal with in a moment — the figures here agree very well with Pliny's records: with the wind in the right direction, a vessel could log between 4½ and 6 knots. The exception, Apollonius' voyage from Puteoli to Tauromenium, must have been made with a very slow ship or very light breezes or probably both. On the second long leg of the journey, from Syracuse to the mouth of the Alpheus, the same ship logged but 2.3 knots.[18] We are told nothing about the winds encountered en route but the prevailing winds in this area blow from the NW[19] which should have been ideal for such a voyage.

[15] Favorable wind and favorable current.

[16] There is an amusing range of figures given for the distance covered on this voyage. Whibley (*A Companion to Greek Studies* [Cambridge 1905] 494) says 460 nautical miles; Assmann ("Segel," *RE* 2A.1053) 470; Köster (*Das antike Seewesen* [Berlin 1923] 179) 500; Kroll (*op. cit.* note 5, 411) 520; How and Wells (*A Commentary on Herodotus* [Oxford 1912] note to 7.183.3) 600; Grundy ("The Rate of Sailing of Warships in the Fifth Century B.C.," *CR* 23 [1910] 107–108) 600. The higher figure presumes that the voyage was made in constant sight of land. For the figure of 500 which I have adopted see Philip (*op. cit.* note 9).

[17] After clearing Utica, Sulpicius Severus and his party landed at some point on the shore of the Greater Syrtes. They spent some time here, then embarked again and made Alexandria in 7 days. Since the point at which they landed is not precisely designated, my figure of 700 is merely an estimate. Charlesworth (247) and de Saussure (*op. cit.* note 2, 96) erroneously took the 7 days as the length of the voyage from Utica.

[17a] Synesius stopped for water en route which, including the time consumed in leaving the course and getting back on it, must have taken at least four hours.

[18] Philostr. *Vita Ap.* 8.15. The distance is somewhat over 300 nautical miles and the arrival was on the sixth day.

[19] *Sailing Directions for the Mediterranean* II, United States Navy Hydrographic Office, No. 152 (Washington, D. C., 1941) 33. Cf. Plut. *Dion* 25.1–6 for a graphic picture of the effect of the northwest winds in this area. Dion's little fleet was driven before them from Syracuse to the Greater Syrtes. All hands were amazed when a fresh south wind sprang up to carry them back to Sicily; they never expected a wind from that direction in those waters.

In one of the romantic episodes of Xenophon of Ephesus we learn that a pirate ship made the 400 miles from Rhodes to Ephesus in 4 days, thereby averaging 4 knots.[20] The prevailing wind in this area is northwesterly,[21] precisely the most desirable. Four knots is somewhat slower than we have been led to expect, especially for a pirate ship which must have been a light, fast craft. The ship very likely was overloaded since it had made a capture the second day out and traveled the rest of the way burdened with the spoils.

Sulpicius Severus in one of his dialogues (1.3.1) mentions that the trip from Narbo to Utica took 5 days. The distance is about 500 nautical miles, which works out to an average speed of 4.1 knots. For the 70 odd miles through the Gulf of Lion the ship may have had to tack[22] and, if so, made no more than 2 knots.[23] The rest of the journey probably saw favorable winds[24] and an average speed of 5 knots.

In the following instances we are not given the record of an actual voyage but are told the usual time it took to cross from one point to another. As it happens, all involve sailing with favorable winds.

Reference	Voyage	Nautical Miles	Length of Voyage	Overall Speed
Diod. Sic. 5.16.1	Pityuses–Gibraltar	390	3 days	5.4 knots[25]
Procop. *Wars* 8.18.4	Epidamnus–Rome	600	5	5[26]
Strabo 10.4.5	Cape Samonium in Crete–Egypt	310	3 or 4	4.3[27] or 3.2
Diod. Sic. 3.33	Rhodes–Alexandria	325	3½	3.9[27]

[20] Xenophon of Ephesus, *Ephesiaca* 1.12.3, 13.4 and 14.6. Not 3 days as Götz has it (227; the error is repeated by Köster, *op. cit.* note 16, 179). The trip took 3 days from the point where a capture was made and it had taken a day and a night to reach that point from Rhodes.

[21] *Sailing Directions for the Mediterranean* IV, United States Navy Hydrographic Office, No. 154A (Washington, D. C. 1942) 32–33; cf. Casson 43–45.

[22] The course was southeast and southwest winds are common in this area in the summer; cf. H. O. 152 (note 19, above) 33 and 578.

[23] See below, 143.

[24] Cf. H. O. 152 (note 19, above) 581 and 35, bottom.

[25] The voyage is for the most part west-southwest and the winds in this area are prevailingly easterly; cf. *Sailing Directions for the Mediterranean* I, United States Navy Hydrographic Office, No. 151 (Washington, D. C. 1930) 41.

[26] Favorable winds mentioned in the text.

[27] Winds in this area are strongly northwesterly; cf. note 21 above.

In the light of this evidence we must revise the lower limit of the rate of speed from the 4½ knots we encountered hitherto to 4 knots.

Consider the following voyages:

Reference	Voyage	Nautical Miles	Length of Voyage	Overall Speed
Diod. Sic. 3.33	Average time between Cimmerian Bosporus and Rhodes	880	9½ days	3.7 knots
Marc. Diac. *Vita Porphyr.* 55	Byzantium–Rhodes	445	5	3.7
Ibid. 27	Byzantium–Gaza	855	10	3.5
Ibid. 6	Thessalonica–Ascalon	800	12	2.7

All these voyages must have been made under favorable wind conditions.[28] They are somewhat slower than those we have discussed so far and the reason is not far to seek. The run from Byzantium or Thessalonica to Rhodes involves coasting along the shores of islands or the mainland, a process more time-consuming than sailing directly over open water. Vessels could not reach their maximum speed until they met the waters south of Rhodes.

When we combine all the above evidence we find that under favorable wind conditions, ancient vessels averaged between 4 and 6 knots over open water, and 3 to 4 knots while working through islands or along coasts.

Voyages Made With Unfavorable Winds

The difference in speed when traveling before and against the wind can most graphically be illustrated by several of the voyages of Mark the Deacon. We saw above that sailing with a following wind he made from Byzantium to Rhodes in 5 days and from Byzantium to Gaza in 10. The return trip in both cases took just twice as long.[29]

Here are the records of voyages made under unfavorable wind conditions:

[28] Cf. *Sailing Directions for the Mediterranean* v, United States Hydrographic Office, No. 154B (Washington, D. C. 1945) 25 and notes 21 and 27 above.

[29] *Vita Porphyr.* 33–34, 26.

Reference	Voyage	Nautical Miles	Length of Voyage	Overall Speed
Strabo 10.45	Cyrene–West Point of Crete	160	2 days	3.3 knots
Marc. Diac. *VP* 26	Ascalon–Thessalonica	940	13	3
Ibid. 56–7	Rhodes–Gaza	410	7[30]	2.6
Sulp. *Dial.* 1.1	Alexandria–Massilia	1800	30[31]	2.5
Marc. Diac. *VP* 33–4	Caesarea–Rhodes	500	10	2
Ibid. 26	Gaza-Byzantium[32]	1000	20	2
Lucian, *Navig.* 7	Alexandria–Cyprus	250	6½	1.8
Marc. Diac. *VP* 33–4	Rhodes–Byzantium	445	10	1.8
Philostr. *VA* 7.16	Puteoli–Ostia	120	3[33]	1.8
Lucian *Navig.* 7	Sidon-Chelidonian Isles	350	9½	1.5

The speed in this list that appears most out of line is the first but a moment's further study will reveal that it is not really so. From Cyrene to the west point of Crete is NNE. The prevailing wind in these waters is NW. A vessel making the voyage would theoretically travel on a port tack the whole distance. If the wind, however, backed merely a point or so as is extremely common, it would cease being unfavorable. The second, the voyage from Ascalon to Thessalonica, is patently extraordinarily fast since it took but one day longer than the trip the other way (see above) which was favored by the wind from start to finish. The very low average of the last voyage was caused by a heavy storm encountered en route. We can therefore conclude that ancient vessels averaged from less than 2 to 2½ knots against the wind.[34]

[30] Two days of good sailing, a day and a half of storm, then four days of good sailing again, with arrival the following dawn.

[31] Charlesworth has garbled this passage thoroughly. He not only reports it at one point (280) as a voyage from Massilia to Egypt—which is a completely different affair, since the wind would then be favorable—but he reports it as taking 13 days (23 and 247).

[32] For the route cf. Josephus, *AJ* 16.2 (Herod sailed from Palestine to Byzantium via Rhodes, Cos, Chios and Mitylene. He was held up by contrary winds at Chios).

[33] Friedländer suggests (*Darstellungen aus der Sittengeschichte Roms*[10] 2.337–338) that the ship put in for the night at Cajeta and Antium. It is far more likely that it was sailing night and day, beating into the eye of the northwesterlies.

[34] Wind conditions were often bad enough to force a vessel to stop at an intermediate port for days or weeks or even months. It took Cicero three weeks to cross from Patras to Brindisi in 50 B.C. (*Ad Fam.* 16.7, 16.9). Aristides (*Orat.* 24, pp. 305–306) spent 14 days getting from Patras to Miletus (cf. note 2 above). The ship that carried Paul from Malta to Rome had originally set out from Alexandria and been forced to spend the winter at Malta (Acts 28:11).

There are several voyages which I have not included since it is impossible to determine the winds encountered during them. There are, for example, the voyages

Sailing Time Between Principal Mediterranean Ports

By combining the average speeds that we have worked out — 4 to 6 knots with the wind and 2 to $2\frac{1}{2}$ against — with modern information concerning prevailing winds, we are able to give an estimate of the time it took to sail between the ports of the Mediterranean. This information is given in Table 1. It must be remembered that the figures refer to direct voyages over more or less open water. Vessels traveling along coastal routes frequently put in at a convenient port for the night[35] while those traveling through the Aegean Islands often laid over at the most convenient island each night.[36] The length of such voyages consequently varied with the number and length of the stopovers.

reported by Herodotus (4.86) that took place in the Black Sea, an area of variable winds. The speed seems to have been 2.5 to 3 knots but there is a complication in that the figures Herodotus gives for the distances covered are much greater than they should be. His figures are based on a ship's average speed which in this case he overestimated; cf. How and Wells (*op. cit.* note 16) *ad loc.* Strabo (11.2.7) reports that the voyage from Phasis to Amisus and Sinope took two or three days. Since the distance is 235 nautical miles this would mean a speed of $3\frac{3}{4}$ or 5 knots. Then there is the circumnavigation of Sicily to which we have references in Thucydides, Strabo and Plutarch. On such a course a ship would theoretically meet both favorable and unfavorable winds. Strabo (6.2.1) quotes Ephorus as saying that the circumnavigation took 5 days and nights. Since the distance is roughly 500 nautical miles, the speed works out to 4.2 knots. Plutarch (*Mor.* 603A) says 4 days, which would mean 5.2 knots. Thucydides (6.1) gives 8 days. Unquestionably he means traveling by day only (cf. 2.97 where he specifies sailing day and night). If we allow 15 hours a day for travel, he agrees with Strabo; if less, with Plutarch. In any event, all the figures indicate that, in going around Sicily, vessels met more fair winds than foul.

I have also omitted voyages that took less than a day. These are too short to be of value in computing averages.

[35] E.g., the 4-day trip from Rome to Stabiae mentioned by Galen (*Methodus Medendi* 5.92 [Kuhn, vol. 10, p. 363]) which non-stop would have taken less than 2, since the winds in this area are northwesterly. Paul needed 15 days according to the Western text of Acts 27:5 to travel from Sidon to Myra. If the figure can be relied upon, it indicates that his ship probably laid over a good many nights since the distance is under 400 nautical miles. Cf. also Paul's voyages in Acts 20:14–15 and 21:1.

[36] Cf. the voyage of Cicero from Athens to Ephesus which consumed two weeks (*Ad Att.* 5.12, 13). The *aphracti* in which he sailed must have been very much like the little open sailboats which ply between the islands today. When Paul crossed from Philippi to Alexandria Troas (Acts 20:6) he probably laid over at Samothrace (cf. Acts 16:11–13). The 4-day sail from Athens to Rhodes mentioned by Lycurgus (*In Leoc.* 70) must have involved stopovers. The ship was a *lembus* (cf. 17), a craft quite capable of making the direct run in less than 4 days.

TABLE 1

Boldface figures represent estimates based on the sailing speeds worked out above. Regular figures are from the voyages listed in the text above.

Alexandria	to	Byzantium	(via Myra and Rhodes[37])	**17–20** days
		Crete	(via Myra and Rhodes[37])	**11–14**
		Cyprus		**6½**
		Cyrene		**7–9**
		Massilia		**58–78**[38]
		Myra	(left of Cyprus[37])	**5½–7**
		Naples	(left of Cyprus, Myra, Rhodes or Cnidus, south of Crete, Malta, Syracuse, Messina[39])	**50–70**
		Rhodes	(via Myra[37])	**7½–10**
		Rome		**53–73**
Ascalon		Thessalonica		13–19
Berytus		Rhodes	(via Syria and coast of Asia Minor[40])	**7–9**
Byzantium		Alexandria		**9**
		Gaza		10
		Rhodes		**5**
Caesarea		Rhodes		10
Carthage		Gibraltar		**7**
		Rome		**2–4**
Corinth		Naples		**4½–7**
Crete		Alexandria		**3–4**
		Cyrene		**1½–2**
Cyprus		Alexandria		**2–2½**
		Rhodes		**4–5**
Cyrene		Alexandria		**4½**
		Crete		**2**
Epidamnus		Rome		**5**
Gaza		Byzantium		20
		Rhodes	(via Syria and coast of Asia Minor[41])	**10–12**

[37] For the route see Casson 43–46.

[38] The journey from Alexandria to Naples was a fight against continuous foul winds. The average time could not have been much under 50 or 60 days and could very easily reach 70; see Casson 43–51. Sulpicius Severus tells us of a trip by boat from Alexandria to Massilia in 30 days and adds that it was a very prosperous voyage (*Dial.* 1.1). Indeed it was. His vessel must have had better than average luck with the winds and made a minimum number of stops en route. Riepl shows the same ignorance of the importance of wind-direction as Warmington (see note 7 above) when he estimates (*op. cit.* note 2, 168) that a fast ship could travel from Alexandria to Massilia in 12 days. Oertel, in CAH X, 387, has three such blunders.

[39] For the route see Casson 43–51.

[40] For the route see Casson 46; cf. Ramsay (*op. cit.* note 2, 380) and James Smith, *The Voyage and Shipwreck of St. Paul*[3] (London 1866) 65–70. The length of this voyage agrees with Mark the Deacon's figure (*Vita Porphyr.* 33–34) of 10 days for the trip from Caesarea to Rhodes.

[41] See the previous note. The estimate of time for this voyage can be confirmed by combining two references from Mark the Deacon: the total trip from Gaza to

TABLE 1—*Continued*

Gibraltar	Carthage		6–8
	Rome		7–10
Massilia	Alexandria		20–30
	Rome		2–3
Myra	Alexandria		2½–3½
Naples	Alexandria		9–11[42]
	Corinth		5½–8
	Rome		3
Narbo	Rome		2½–3½
	Utica		5
Rhodes	Alexandria		3½
	Berytus		3–4
	Byzantium		10
	Caesarea		3–4
	Cyprus		1½–2½
	Gaza		3–4[43]
	Rome		45–63
	Tyre		4
Rome	Alexandria		10–13[42]
	Carthage		2–4
	Epidamnus		4½–6½
	Gibraltar		7
	Massilia		4½–6
	Naples		1–1½
	Narbo		3
	Rhodes		7–11
	Tarraco		4
Tarraco	Rome		3½–5
Thessalonica	Ascalon		12
Tyre	Rhodes	(via Syria and coast of Asia Minor)	9–11[40]

SPEED OF FLEETS UNDER SAIL

A good deal of attention has been given to how fast ancient warfleets could travel under oars. Aemilius Paulus' record 8-knot dash from Brindisi to Corcyra is quoted again and again.[44] Yet fleets did not travel sustained distances under oars — when they did, I am certain it was neither often nor for long distances that

Byzantium took 20 days of which the leg from Rhodes to Byzantium consumed 10 (*Vita Porphyr.* 26, 33–34).

[42] Cf. Casson 51.

[43] The 7-day voyage reported by Mark the Deacon included a severe storm; see above 143 and note 30.

[44] Livy 45.41. Cf. Assmann (*op. cit.* note 16) 1054, Köster (*op. cit.* note 16) 180, How and Wells (*loc. cit.* note 16).

they made 8 knots.[45] During a journey of any extent they hoisted sail and depended on the wind. And here we come to a problem that has never been touched: how fast could a fleet sail?[46]

TABLE 2

Reference	Voyage	Nautical Miles	Length of Voyage	Overall Speed	Wind
Appian *BC* 2.13.89	Rhodes–Alexandria	325	3 days	4.5	Favorable (cf. n. 27)
Plut. *Dion* 25.4–5	Greater Syrtes–Heraclea Minoa	475	4½	4.4	Favorable (cf. n. 19)
Polyb. 5.109–10	Sason–Cephallenia	160	1¾	4	Favorable[47]
Lucan 9.1000–5	Troy-Alexandria	550	7	3.2	Very favorable
Procop. *Wars* 3.25.21	Carales–African Coast	200	3	2.8	Favorable[48]
Livy 29.27	Lilybaeum–Cape Mercury	65	1	2.7	Favorable (cf. n. 19)
Polyb. 3.41.4	Pisa–Massilia, via Ligurian Coast	240	4½	2.2	Unfav.–fav.[49]
Caesar *Bell. Afr.* 98	Utica-Carales	160	3	2.2	Unfavorable[48]
Ibid. 34	Lilybaeum–Ruspina	140	3½	1.7	Favorable
Caesar *BC* 2.23	Lilybaeum (?)—Anquillaria	90	2½	1.5	Favorable
Diod. Sic. 20.5	Syracuse–Cape Mercury	220	6	1.5	Unfavorable[50]
Herod. 8.66	Euripus–Phalerum	96	3	1.2	Variable
Caesar *Bell. Afr.* 2	Lilybaeum–Africa	85	4	1	Unfavorable[51]
Plut. *Dion* 25.1–2	Zacynthus–Cape Pachynus	340	13	1	Unfavorable (cf. n. 19)
Procop. *Wars* 3.13.21–3	Zacynthus–Caucana	320	16	.8	Unfavorable (cf. n. 19)

[45] Cf. Mohler (*op. cit.* note 5) 48–52. Grundy's assumption (*op. cit.* note 16) that 8 knots was a reasonable speed was convincingly answered by Tarn ("Fleet-Speeds; A Reply to Dr. Grundy," *CR* 23 [1910] 184–186) who held for 4½–5 knots for a fleet in a hurry and 2 when not.

[46] Tarn's estimate of 2 knots (see previous note) cannot refer to travel under sail since he includes at least one voyage during which oars must have been used. Alcibiades took all night up to breakfast to go from Parium to Proconnesus, about 25 nautical miles (Xen. *Hell.* 1.1.13). The ships must have been rowed since the large sails, as was usual before going into battle, had been left ashore. The slow speed — they averaged not over 1½ knots — was no doubt caused by their having to buck both current and wind; cf. *The Black Sea Pilot*[9] (Hydrographic Office of the Admiralty, London 1942) 25 and 62.

[47] Cf. H.O. 152 (note 19, above) 33 and 38. Sason is off the mouth of the Aous, not the Achelous as Tarn (*op. cit.* note 45) has it.

[48] Cf. H.O. 151 (note 25, above) 47.

[49] The northerly and northwesterly winds in this area (cf. H.O. 152.35) would have been unfavorable for the first leg of the voyage as well as part of the last.

[50] Cf. H.O. 151.48.

[51] "vento certo celerique navigio vectus," by which Caesar must mean that the vessels traveled quickly through the water, not that the voyage was quick; every schoolboy must have known that Scipio had taken a huge fleet over the same crossing in one quarter the time. The wind was fresh and strong, sufficiently so to do a complete job of scattering the transports and forcing them ashore at different points all along the coast. Assmann ("Seewesen" in Baumeister's *Denkmäler des klassischen Altertums* [Munich and Leipzig 1888] 1622) states that this voyage "agrees [with

In gathering the evidence to answer this question we must be very selective. We must not include voyages where it is likely that oars played a part. We may use those in which supply ships participated, for a fleet's speed is determined by its slowest members and the swift triremes would have no occasion to run out their oars when they had to dawdle alongside slow-sailing transports. We may also use voyages that lasted several days or more. On such occasions, oars were rarely used, if at all, since rowing was a short-lived power, to be held in reserve for battle or emergencies.

The first three voyages listed in Table 2 are considerably faster than all the others. This can be easily accounted for. The first involved triremes alone, the third swift *lembi* alone, and the second was made under a wind that was remarkable for its steadiness and freshness.[52] The rest of the table presents a consistent picture. Before a favorable wind, a fleet could log between two and three knots.[53] With unfavorable winds, a fleet usually could do no better than 1 to 1½ knots.

Livy 29.27] in an average speed of 2¾ knots," which is as low as bad arithmetic can get. The error is repeated by How and Wells (*loc. cit.* note 16).

[52] With a strong favorable wind Belisarius' fleet made from Malta to Caputvada, 165 nautical miles, in either a day or a day and a half (Procop. *Wars* 3.14). His speed must have been anywhere from 4.5 to 7 knots, depending upon the exact hour of his arrival. If Thucydides, as is probable, is thinking of a fleet in 7.50, his statement confirms the figures for these swift voyages. The quickest voyage from Carthaginian Neapolis to Selinus (125 nautical miles), he says, was two days and a night, i.e., an average of 3½ knots.

[53] Caesar's trip to Ruspina and Curio's to Anquillaria were very slow. Probably they were held back by heavily laden transports.