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# Penteconters and the Fleet of Polycrates

*Kathryn Waterfield*

Abstract:[1] *In his Samian logos Herodotus emphasizes the successful ambitions of the tyrant Polycrates in attaining control of the Aegean during his reign in the last half of the sixth century BCE. He achieved this extraordinary success with one hundred penteconters—fifty-oared ships—and is given credit for being the first Greek thalassocrat. This paper examines what resources were necessary, in general, to pull off such a feat. Using Polycrates' Samos as a case study reveals that a penteconter fleet was a very expensive endeavor in terms of resources and manpower. But the fleet of Polycrates, probably composed, at least in part, of a special design called the* samaina*, is illustrative of the fact that the penteconter went through a number of innovations in the Archaic period to facilitate its usefulness as a ship-of-the-line and cemented its popularity to the extent that it continued in use, in various iterations, for centuries.*

**Keywords:** *Penteconter, Polycrates, Thalassocracy, Samaina, Trireme*

Herodotus says, about Samian sea-power under Polycrates the son of Aeaces:

> Before long Polycrates' affairs were prospering and became the subject of conversation throughout the whole of Greece, not just Ionia, because every military campaign he directed was completely successful. He acquired a fleet of a hundred penteconters and an army of a thousand archers.[2]

Further on in his *logos* on the Samian tyrant he says that Polycrates' bid for sea-power was, 'a plan which Polycrates was the first to have conceived, as far as we know.'[3] Philistus, a naval commander under Dionysius I of Syracuse (r. 405-367), remarks on the 'gluttonous penteconter.'[4] The fragment comes via Harpocration's *Lexicon* of the second century CE, which comments that the expression means 'at full cost' and 'costing a great deal.' 'Gluttonous *triereis*' are also mentioned in the same entry.[5] The point is that the cost of building and maintaining fleets of warships—even of penteconters—was high. So, if Polycrates had a fleet of a hundred penteconters, its maintenance would have been very expensive. Studies of naval development in the Archaic period argue that it was the advent of triremes that triggered greater institutionalization in polis governments.[6] They claim that penteconters were affordable to private owners in a way that triremes were not, and

[1] This paper is adapted from my MA dissertation submitted to the University of Wales Trinity St. David, under the supervision of Errietta Bissa (2016).

[2] Hdt. 3.39.3.

[3] Hdt. 3.122.2.

[4] ἀδηφάγον πεντηκόντορον: *FGrH* 556 F 68. All dates are BCE unless indicated.

[5] The phrase is tentatively attributed to Lysias (5th-4th c.) in the lexicon entry.

[6] Van Wees 2013; Wallinga 1993: 16-17; Scott 2000: 108; de Souza 1998: 287.

so the old-fashioned way of mustering fleets—by calling upon ship-owners to provide them—was employed until triremes demanded greater institutionalization by poleis to fund and manage them. But Polycrates' thalassocracy in the last half of the sixth century was probably built and maintained at public expense, as penteconters cannot have been much less costly to man and maintain in the sixth century than they were when Philistus served Dionysius.

I aim to show, in general, what were the material and manpower requirements for a fleet of a hundred penteconters. In the Aegean during the sixth century there were innovations made to the penteconter's design to make it a better vessel for serving as a carrier of goods and men, and a warship. It is most likely that a maritime polis like Samos kept a penteconter fleet, despite the expense, due to the pressure exerted by the threat of Persian expansion in the 540s. The clearest illustration of this policy is the evidence of Poycrates' special ship design, the *samaina*. Finally, I will argue that the forty triremes Polycrates sent men off in to fight for the Persians against Egypt were not Samian-built. His thalassocracy was achieved via the penteconter fleet.

## *The Penteconter*

No penteconter survives from antiquity, and no ancient source provides measurements for this class of ship. But scholars have conjectured about their size, weight, handling and methods of construction.[7] Most early studies of ancient ships were limited to interpreting archaeological remains such as painted pottery and other artifacts depicting ships, and literary references.[8] The discovery in the nineteenth century of the slipways at Zea offered archaeological evidence for the size of the Classical Athenian trireme and sparked an interest in shipshed archaeology.[9] Discoveries of shipwrecks such as the Viking ships at Oslo in 1938 offered some comparanda and added to the debate about ancient ships.[10] In the later twentieth century underwater archaeology has greatly added to the inventory of shipwrecks and continues apace. As for building techniques and materials of Archaic period ships of the Mediterranean, shipwrecks with preserved hull elements, such as the sixth-century Pabuç Burnu (570-560), and the Place Jules Verne wrecks 7 and 9 (525-510), while not galleys, have helped to inform us about these issues.[11]

The Pabuç Burnu ship was excavated off the coast of Bodrum, Turkey in 2002-2003.[12] It was a modest merchant ship (13-18 m, 42-59 ft) dating to the second quarter of the sixth century, built shell-first, with hull planks assembled with ligatures, in other words, laced or 'sewn.'[13] It is the oldest Archaic-period Greek wreck yet found in the Aegean. It reveals a deviation in the standard sewn-plank hull assembly technique: the shipwrights employed

[7] Torr 1894; Tarn 1905; Köster 1923; Williams 1958; Morrison and Williams 1968; Bremmer 1990; Wallinga 1993; Casson 1995; Morrison and Coates 1996; Scott 2000; Morrison et al. 2000; Blackman and Rankov 2013.

[8] Starr 1979: 59.

[9] Blackman 2013a: 4-14.

[10] Starr made the assertion in 1940 that three of the Oslo ships 'may, with due reservations, be considered typical of the Greek penteconter' (1979: 59).

[11] Pabuç Burnu: Polzer 2010; Jules Vernes 7 and 9: Pomey and Poveda 2018.

[12] Polzer 2010: 28.

[13] Polzer 2010: 30.

rectangular tenons in the plank edges rather than cylindrical dowels as coaks. The Jules Verne 9 plied western Mediterranean waters during the last half of the sixth century.[14] It was a 'coaster,' a small fishing and transport vessel (10 m, 32 ft), excavated, with Jules Verne 7, in the 1990s at the Place Jules Verne in Marseille.[15] It was constructed shell-first, using the sewn-planks method of joinery with dowels and no tenons. The Jules Verne 7, dating to the same period as Jules Verne 9, was a trade vessel (15 m, 46 ft), but her hull construction technique, like that of the Pabuç Burnu ship, marks a transition from sewn planking to the method employed for the later trireme warship and other vessels, because the shipwrights combined techniques, using mortise-and-tenon joinery as well.[16]

A sixth-century penteconter may have also been built using this latter technique, or a combination of the two, because, as Polzer has said, tenons provide greater resistance than dowels to stresses exerted on the hull planks, making the ship stronger and easier to maintain.[17] And a growing demand from the mid-sixth century for new warships with stronger and sturdier hulls that could withstand the tremendous stresses of ramming another vessel and that, in turn, could survive a similar blow, may well have accelerated, if not initiated, this innovation and development in Greek shipbuilding.[18] We can only look forward to the day when an Archaic penteconter is found to confirm this theory.[19]

With some educated guessing we can arrive at estimates for the size of a penteconter. Length is best determined by the room required for a rower to pull an oar effectively, multiplied by the number of oarsmen per file. This room, or *interscalmium*, is the distance between the tholepins (*skalmoi*) for each oar. For a single-banked (*monokrotos*) penteconter with twenty-five oarsmen per side, this means twenty-four *interscalmia*. For a two-level (*dikrotos*) penteconter, probably with thirteen oarsmen at the upper level and twelve at the lower, the oarsystem would have twelve rooms.[20] Vitruvius gives the measurement for an *interscalmium* as two cubits.[21] But due to different standards for the cubit (from 0.444 – 0.527 m, or 17 – 21 in), the *interscalmium* might range from 0.888 m (35 in) to 1.054 m (41 in).[22] Rankov adds a total of nine meters of additional space fore and aft for a single-banked

[14] Pomey and Poveda 2018: 45.

[15] Pomey and Poveda 2018: 45. An experimental replica, named *Gyptis*, was built and put through trials in 2013 off the coast of Marseilles.

[16] Pomey and Poveda 2018: 45-6. Although Homer knew of the technique: mortise-and-tenon joins (*harmoniai*) are mentioned at *Od*. 5.248. The earliest evidence for mortise-and-tenon joinery on seagoing ships in the Mediterranean is found in the Late Bronze Age Syro-Canaanite Uluburun ship (Pulak 1998: 210).

[17] Polzer 2010: 34.

[18] Polzer 2010: 36.

[19] At the time of writing, the Black Sea Maritime Archaeology Project announced the discovery of the first intact ancient Greek shipwreck, dating to the early fourth century, at a depth of 2.09 km (1.3 mi). See e.g. https://www.nationalgeographic.com/culture-exploration/2018/10/black-sea-shipwreck-archaeology-map/?user.testname=none - https://www.nationalgeographic.com/culture-exploration/2018/10/black-sea-shipwreck-archaeology-map/?user.testname=none. According to the lead scientist of the project, Jon Adams of the University of Southampton, the ship is 23 m (75 ft) long and held a crew of 15-25. It was discovered in late 2017 and is among 66 other shipwrecks discovered since 2015, from periods including the Roman, Byzantine and Ottoman. There is still hope for the discovery of a penteconter.

[20] Rankov 2013: 85.

[21] Vitr. *De Arch*. 1.2.4.

[22] Rankov 2013: 89.

penteconter, for a total length of 29-33 m (95 – 108 ft). A two-banked penteconter would be 19 – 21 m (62 – 69 ft) after an additional eight meters are split between fore and aft.[23]

Best estimates for the ships' width can be determined by calculating the widths of the shipsheds (*neosoikoi*) which housed them.[24] In his analysis of the relationship of shipsheds to ships, Rankov argues that the range of both lengths and clear widths of the extant sheds known to scholars implies that they did not all house the same types of ship.[25] Those sheds listed in the inventory with smaller clear widths of 3.2 m to 5.6 m (10.6 – 18 ft) Rankov thinks may have housed penteconters.[26] Coates's estimate of the width of a two-level penteconter at 3.9 m (13 ft) fits within this range.[27] And while none of the penteconter sheds Rankov lists date to the Archaic period, there are some shipsheds that do. Thus far, shipsheds dating to the Archaic period have been discovered at Abdera, Sicilian Naxos, and Syracuse.[28] Herodotus tells us that Polycrates had shipsheds, and scholars believe them to be the first constructed by a Greek polis, though this is purely speculative.[29] Since the penteconter was probably constructed in a similar way and with the same basic materials that triremes were, it would be equally vulnerable to the same threats to its longevity, such as bore worms. Shipsheds would have been important to the maintenance of the Archaic Samian penteconter fleet.

The full-scale experimental trireme, *Olympias*, was built in the 1980s, primarily to test the oarsystem and learn more about its speed and maneuverability.[30] While *Olympias* is not an archaeologically 'pure' reconstruction, her measurements are probably close to accurate for the trireme.[31] There is no such reconstruction for the penteconter, but the lessons learned from *Olympias*, combined with literary and iconographic evidence, help us understand more about this long-lived ship-type. It is plausible that, despite its smaller size and rowing capacity, the handling of the penteconter was similar to its larger relative.

The word *pentēkontoros* first appears in one of Pindar's Pythian Odes, in 462.[32] But it is certain the type existed far earlier. Homer's Phaeacians, for example, return Odysseus to Ithaca in a galley rowed by fifty oarsmen.[33] In Thucydides' opinion the ships used in the Trojan War were principally penteconters and 'long-ships.'[34] Iconographic evidence from both Greece and the Near East confirms the longevity of the penteconter.[35] The oarsmen in these scenarios were also the fighters, transporting themselves to the scene of battle or a raid as *auteretai*, 'self-rowers.'[36] Engagement by ships at sea involved launching missiles at

[23] Rankov 2013: 90-1.

[24] Rankov 2013: 92.

[25] Rankov 2013: 94.

[26] 11 are identified: Carthage (Ilot 1-2, 29-30), Dor, Loryma, Oiniadae, Poiessa, Ptolemais, Rhodes 2 and Sounion 1: Rankov 2013: 93-4.

[27] Morrison and Coates 1996: 317-19, 345 (App. D).

[28] Abdera: Baika 2013: 274; Sicilian Naxos: Lentini et al. 2013: 405; Syracuse: Gerding 2013: 539.

[29] Hdt. 3.45.4. See Rankov 2013: 76; Blackman 2013a: 18.

[30] Morrison et al. 2000: 1-5.

[31] Morrison et al. 2000: xxviii. Called a 'floating hypothesis' by Pomey and Poveda (2018: 45).

[32] *Pythian* 4.245; also Fr. 259, l. 1 Race.

[33] *Od*. 8.35. See also Arch. Fr. 192 West.

[34]Thuc. 1.14.1.

[35] Davidson 1947; Williams 1958; Basch 1969, 1987; Casson 1995: 53-64; Morrison et al. 2000: 25-30.

[36] Thuc. 1.10.4.

one another, and attempting to grapple and board a ship to take control of it, as in piracy. It seems that innovation in ship design was slow before the sixth century.[37]

Eventually some improvements were made, as we have seen, in the movement away from the sewn-plank method to mortise-and-tenon joinery. There was the development of the two-level, *dikrotos*, oarsystem (mentioned above), strengthening the hulls with decking, and reinforcing the bow.[38] These changes allowed for the same number of rowers aboard a much shorter and somewhat broader ship, thereby increasing its speed and maneuverability. For Morrison and other scholars this suggests a change in the tactical use of the ship from primarily a transport vehicle, or fighting platform, to potentially a weapon in itself.[39] Aggressive ramming tactics became an alternative to the old-fashioned way.

Pliny the Elder cites Damastes of Sigeum, a contemporary of Herodotus, claiming that the *dikrotos* penteconter was developed at Erythrae, on the Ionian mainland opposite Chios.[40] Nearby Phocaea had a reputation for long-distance shipping to the west, and for early settlement there, such as at Massalia (Marseille), where archaeologists discovered the Jules Verne 7 and 9 wrecks. Herodotus tells us that the Phocaeans were the first to utilize the penteconter for long-distance trade ventures.[41] Phocaean naval employment of penteconters is reported in Herodotus' account of the Battle of Alalia, off Corsica, where it appears they experimented with aggressive ramming tactics, confirming that penteconters had rams attached to their prows.[42] Wallinga argues that the use the Phocaeans put their ships to is ideal for the two-level type.[43] At Samos, Polycrates is credited with a special design of *dikrotos* penteconter, the *samaina* (see below). Snodgrass posits that the stereobate dating to c. 600 found at the Samian Heraion supported a *dikrotos* penteconter.[44] It seems that, for sixth-century Ionians, shipbuilding innovation was of particular interest.

### *Penteconter v. Trireme: Resources*

Coates makes a useful comparison between the penteconter and the trireme based upon the capital outlay involved for each.[45] He estimates the cost of constructing a trireme at 360 percent that of the *dikrotos* penteconter.[46] If we use Coates's weight estimate for the hull of a liburnian, a kind of *dikrotos* penteconter, and compare it with that of the *Olympias* trireme reconstruction, the difference in wood requirements can be seen.[47]

[37] Coates 1990: 111-12.

[38] Morrison et al. 2000: 28-32.

[39] Morrison et al. 2000: 28.

[40] *NH* 7.57.206 = *FGrH* 5 F 6.

[41] Hdt. 1.163.1-2.

[42] Alalia: Hdt. 1.165-6. First to employ ramming tactics: Wallinga 1993:73-6.

[43] Wallinga 1993: 72-3.

[44] Snodgrass 1983: 16 ff. Agreed by Wallinga 1993: 49. Walter and Vierneisel 1959: Abb. 1. Walter 1990: Abb. 92, p. 83 reports another stereobate dating to c. 650. For a full plan of the sanctuary with the stereobates in their context, Walter 1990: 206-7.

[45] Coates 1990: 111.

[46] Coates 1990: 115.

[47] Liburnian as a type of penteconter: Morrison and Coates 1996: 264. Measurements: Morrison and Coates 1996: 345.

Table 1

| | | | | | |
|---|---|---|---|---|---|
| ***Olympias* hull weight:** | | 25 tonnes[48] | +50% | = | 37.5 tonnes in logs |
| 200 Oars | 7-10kg each[49] | 1400-2000 kg | +50% | = | 2-3 tonnes in logs |
| | | | | = | approx. 40 tonnes in logs |
| **Penteconter hull weight:** | | 7 tonnes[50] | +50% | = | 10.5 tonnes in logs |
| 58 Oars | 7-10 kg each[51] | 406-580 kg | +50% | = | 609-870 kg in logs |
| | | | | = | approx. 11.5 tonnes in logs |

The figures above show that the weight of a penteconter's hull would be only twenty-eight percent that of *Olympias*'. According to Bissa's research into where and with what resources the Athenian fleet was built, to determine the demand in logs for a ship we must raise the total in used wood by fifty percent.[52] The undressed wood requirement for a penteconter, then, would be close to thirty percent that of a trireme.

Polycrates probably had ample local timber resources to maintain his penteconter fleet, since it is likely that the hulls were constructed from the coastal pine available on the island and on the slopes of Mt. Mycale.[53] At around twelve tonnes of logs per penteconter, Polycrates would have needed about 1,200 tonnes of seasoned logs to build the hulls for his fleet of one hundred ships, and a ready supply thereafter for maintenance and repair.

[48] Morrison et al. 2000: 210.

[49] Morrison et al. 2000: 240.

[50] Morrison and Coates 1996: 345.

[51] I maintain the weight variable for penteconter oars because, according to Morrison's and Coates's estimates, the liburnian had oars only about 0.4 m shorter than a trireme and would therefore fall into the same weight estimate: 1996: 345.

[52] Bissa 2009: 108, n. 7.

[53] Coastal pine for warships: Theophr. *HP* 5.7. Plentiful timber for Samos: Shipley 1987: 7-8, 10. The *Kyrenia II* ship replica was constructed of Samian pine (*pinus brutia*): Katzev and Womer-Katzev 1989: 163-75. Polzer shows that pine was the wood of choice for Archaic shipwrights based upon shipwreck evidence (2010: 29).

Oak was needed for the hundreds of tenons that joined the hull planks.[54] Pitch, resin and wax to coat the hull were also locally obtainable at Samos.[55] Hides from local livestock could have provided the leather required for the *askōmata*, the sleeves that lined the lower, thalamian, oar-ports.[56] The oar-loops (*tropoi*) that attached each oar to its tholepin were also of leather.[57] Most of the remaining necessary materials, however, such as flax or papyrus for sailcloth, hemp for rope, and significant amounts of metals such as copper and tin for the bronze ram and other fittings, such as the brail rings, and more copper for many thousands of nails, would have to be obtained through trade, as these materials were not local to Samos or its *peraia*.[58] The archaeological evidence indicates that there was plenty of bronze at Samos during the Archaic period, so trade for metals was certainly happening on a substantial scale.[59] So long as there was ready access to trade with Egypt and the Levant, many of the other necessary supplies, which came from those regions, were obtainable.[60] This makes it easy to see one clear motive for why Polycrates would cement an alliance with Amasis II of Egypt (r. 570-526), who at the time held the most power and influence in the region that could supply most of these resources.[61]

To man the penteconters in his fleet, I estimate Polycrates needed a complement of around sixty-five men per ship: fifty oarsmen (*nautai*), ten marines (*epibatai*) or archers (*toxotai*), and a handful of skilled deck crewmen (*hypēresia*).[62] In the rare event that he needed to man the entire fleet at once, six thousand five hundred men would be required. Additional manpower for building and maintaining the fleet included shipwrights, oar-shavers, foresters, sawyers, carpenters, teamsters, metalsmiths, ropemakers, sailmakers, and leatherworkers. Many unskilled laborers and oxen were necessary.[63]

Facilities were needed to build and keep the fleet.[64] The harbor mole the Samians constructed would have been a significant undertaking considering the amount of stone, rubble, and manpower needed to build it. Herodotus says that it was over two stades long (approximately 365 m, 1198 ft) and enclosed the harbor in water as much as twenty

[54] Steffy 1994: 37. *Dryoussa* ('oak island') was an epithet of Samos: Hesych. s.v. *Dryoussa* (Arist. Fr. 570 Rose).

[55] Trees for pitch or resin: Shipley 1987: 8; Wax. Hdt. 3.48.3 mentions honey, so wax was available.

[56] *Askōmata*: Morrison et al. 2000: 168-9. Domestic animals at Samos, including oxen: Shipley 1987: 18-19.

[57] Homer, *Od*. 4.782; Thuc. 2.93.2; Morrison et al. 2000: 135.

[58] A point driven home by the 'Old Oligarch' [Xen.] 2.11-12 (referring to Athenian naval power).

[59] Tsakos 2012. See also Shipley 1987: 58: 'Samos may have been the main centre for bronze griphon-head *protomai* after about 650.'

[60] Osborne 2009: 280-1 (Map 10.1), 290. Tin was likely obtained from western sources, such as Iberia.

[61] Excavation at Naucratis shows that Samians and other Greeks were in a lucrative exchange relationship with Saïte Egypt long before the reign of Amasis: Boardman 1980: 112; Braun 1982: 32; Bowden 1996: 17-37; Möller 2000:32-6; Briant 2002: 52; Hall 2013: 269-70.

[62] Adapted from Gabrielsen 1994: 106 and Morrison et al. 2000: 108-18 for the trireme. That the marines aboard Polycrates' fleet were archers is implied by Hdt. 3.39.3. Hdt. 7.184.3 rounds up the crew aboard Xerxes' penteconters to 'more or less 80', but there appear to have been additional marines aboard each ship, 'in addition to their native crew'.

[63] E.g., Eudemus of Plataea was honored in 330/29 for providing 1,000 oxen for the work on the Panathenaic Stadium: Rhodes and Osborne 2003, #94.

[64] De Souza 1998: 272.

fathoms deep (approximately 37 m, 121 ft).[65] The harbor would require an authority with the responsibility of tracking in- and out-going ships and equipment, such as the Athenian 'curators of the dockyards' (*epimelētai tōn neōriōn*).[66] It is probable that the commercial and military harbors were separate, as they were at Thasos.[67] The shipsheds[68] would have required ample supplies of stone, metals and wood for construction, workmen to do the building, and then teams of men to operate them.[69] Storage facilities (*skeuothēkai*) were needed to contain rigging and other supplies.[70] Shipyards (*naupēgia*) must have been near or within the harbor area.[71] There must have been a space for the casting pits for the ships' rams.[72] It can be seen from this outline of requirements that building and maintaining a fleet of penteconters required good organization, due to the heavy expense in human and material resources. It is therefore not difficult to believe that penteconters were 'gluttonous' for an Archaic polis as much as they were for the fleets of Dionysius in the fourth and third centuries.

Why keep a polis fleet, and who paid the costs? For Athens, the threat claimed by Themistocles in the early fifth century was Aeginetan aggression, though Persia was ultimately the real threat. In the case of Samos in and after the 540s, the heightened tensions were clearly due to the threat of Persia. To finance the fleet Samos may have had a fund earmarked for naval expenditure, perhaps held in Hera's temple. Perhaps this fund was managed under an institution like the Archaic Athenian *naucrariai*. Translated by van Wees as 'captaincies,' these central government offices, in existence as early as the time of Solon in the early sixth century, were filled by officials tasked with (among other duties) voting on taxing and spending for military campaigns, as well as levying the ad hoc war-tax (*eisphora*), men, horses, and, as the title *naucraroi* implies, ships.[73]

In a controversial statement,[74] Thucydides gives credit to the Corinthians for being the first Greek polis to manage its fleet in 'something like the present way.' He then adds that the first triremes in Greece were built at Corinth. Setting aside the debate about Thucydides' dating of the first Greek triremes, I agree with Wallinga that the expression, 'something like the present way,' indicates that Corinth was considered the first polis to institutionalize fleet management, the established practice by Thucydides' time.[75]

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[65] Hdt. 3.60.1-2. The Archaic breakwater lies beneath the remains of the Hellenistic period construction immediately south of the modern breakwater: Simossi 1991: 283-4 and figs. 3, 6.

[66] *IG* I$^3$ 153.18 (440-425), 236.5-6 (410-404); Pritchard 2015: 104.

[67] Simossi 1991: fig. 3; Shipley 1987: 76. See Baika 2013: 542-5, on the two ancient harbors at Thasos.

[68] Blackman and Rankov 2013: 3. Shipsheds have yet to be found at Samos. A rock-cut slipway probably dating to the classical period has been identified at the north side of Cape Mycale and is assumed to have been Samian. See Blackman 2013d: 562-3; Shipley 1987: 267, site 2800.

[69] See Pakkanen 2013: 58-62 and table 5.1 for the econometrics of the earliest phase of the shipsheds at Zea.

[70] E.g. *IG* II$^2$ 1611 (357/6); Blackman 2013b: 23; 2013c: 137.

[71] Blackman 2013c: 137.

[72] Oron 2001: 95.

[73] Van Wees 2013: 53. For a full examination and interpretation of the evidence for the *naucrariai* in Archaic Athens, see van Wees 2013: 44-61.

[74] Thuc. 1.13.2 (trans. Hammond). The controversy concerns the dates Thucydides gives for the commission of Ameinocles by the Samians to build ships, and the date of the first sea-battle; as well as the question of the trireme's introduction to Greece, and even who invented it. See Hornblower 1991: 42-4.

[75] Wallinga 1993: 28.

Herodotus offers another piece of evidence for this institutionalization. He reports that the Corinthians sold (albeit for a nominal sum) twenty polis ships to Athens in the early fifth century.[76] The implication is that this was a regular practice; we are told they had a law which forbade giving ships away. From this we can infer the presence of an institution tasked with the decommissioning of polis warships.[77] This reveals that Archaic Corinth had organs of government, like the Athenian *naucrariai*, dealing with fleet management, from at least the mid-sixth century, but probably earlier. There are hints that such an institution also existed at Miletus, and at Chalcis and Eretria. We have some vague references to the *aeinautai*, or 'constant sailors,' holding important offices.[78] Some claim the *aeinautai* were associations or guilds of seamen.[79] But Plutarch's talk of governance suggests that in the sixth century their role was much more central and public.[80]

It would be surprising if such an office did not exist in a maritime polis such as Samos. In fact, an inscription offers an intriguing clue. The so-called Aeaces Inscription indicates an office with responsibilities for managing certain financial assets of Hera's sanctuary.[81] Based on epigraphical style, according to Jeffery, the inscription dates to the last years of the sixth century or early fifth.[82] It is a commemoration of an Aeaces son of Brychon, who may be the father of Polycrates; if so, the dedication was probably made by the tyrant Aeaces, the nephew of Polycrates, who ruled Samos as a Persian proxy until he was expelled in 500 during the Ionian revolt, and then reinstated in 494.[83] The dedication was inscribed onto a statue of a seated deity or dignitary dating to c. 540 and discovered at the Kastro at modern Pythagorio, the site of the ancient acropolis.[84] The inscription celebrates oversight (*epistasin*) of the spoils (*sulēn*) accrued to Hera. Carty convincingly interprets the inscription and the controversies surrounding its dating and provenance, and argues for the elder Aeaces holding a magistracy which empowered him to manage tithes of spoils from raiding and warfare, to be housed in Hera's sanctuary. She argues that in the elder Aeaces' time—the second quarter of the sixth century—the funds were likely earmarked for building programs related to improving the sanctuary. But she also suggests that such a magistrate could sanction and arrange raids and arbitrate in disputes over spoils arising from such raids.[85] Raiding from Samos would obviously require requisitioning of ships. This seems remarkably similar to a 'captaincy' of sixth-century Athens.

[76] Hdt. 6.89.

[77] Bissa 2009: 116 for discussion of Corinthian warships as a commodity.

[78] *Aeinautai* at Miletus: Plut *QG* 32 (*Mor.* 298c-d). Chalcis: *IG* XII.9, 909, 923 = *SEG* 27-559 (3rd c.). Eretria: *SEG* 34-898; Petrakos 1963: 545-7. The stele was found in 1977 and matched to the base by Ritsonis in 1984: see Catling (ed.) 1985-6: 21; van Wees 2013: 57, n. 59

[79] 'Apparently an association of sailors': Sherk 1990: 238. As magistrates at Miletus: Robertson 1987: 356-98, dismissed by Gorman 2001: 109.

[80] Wealthy ship-owners whose role evolved to magistracies: Bravo 1977: 29.

[81] *IG* XII, 6 2:561, Meiggs and Lewis 2004 [1969] #16). The controversy is a result of scholars wishing to align the Aeaces of the dedication chronologically with the supposed Aeacid tyrant dynasty to which Polycrates belonged.

[82] Meiggs and Lewis 2004 [1969] #16; Jeffery 1990: 330 (Samos 13).

[83] Hdt. 4.138.2, 6.13-14, 6.22.1, 6.25.

[84] Boardman 1991, no. 96; Freyer-Schauenburg 1974: 14; Ridgway 1977: 134; Carty 2015: 53. Identification of Kastro as ancient Samian acropolis: Tölle-Kastenbein 1969: 67.

[85] Carty 2015: 130.

Alternatively, in mid-sixth-century Samos, there could have been a combination of central funding combined with liturgical contributions, as was the case later, at Athens and elsewhere. During Cleisthenes' reforms (508/7) some the duties of the *naucraroi* were redistributed to the demarchs and we are told that their role became similar to the liturgical trierarchic symmories of the fourth century.[86] In other words, the *naucraroi* evolved from being the physical providers of naval requirements, to a group which pooled resources to contribute to the public fleet. Samos could plausibly have done something similar in the mid-sixth century. If Polycrates and his brothers gained influence through such an institution and used it to rise to power, they/he may have altered it in a similar way and expanded the bureaucracy to accommodate Samos' increased public wage-earning population, such as rowers[87] and craftsmen, involved in the fleet. As Irwin has argued, 'Samos could have been considered the Athens of the sixth century,' a forerunner of and guide for future thalassocracies.[88]

## *The* Samaina

Plutarch says that Polycrates commissioned a special type of ship, the *samaina*.[89] A fragment of Lysimachus of Alexandria (first century) describes the ship as *dikrotos*.[90] According to these descriptions and another by the even later Hesychius (fifth/sixth century CE), the *samaina* was thought to be somewhat wider and roomier than the standard two-level penteconter.[91] It was fully decked, and was fast and stable enough to make voyages on the open sea, and had some modification at the prow.[92] This modification may have been a narrowing of the prow, and the consequent production of a snub-nosed profile resembling a boar's snout, but the texts of both Plutarch and Hesychius are corrupted, making interpretation difficult.[93] Nevertheless it is clear these innovative features made the ship recognizably Samian.

Naval warfare of the period was slowly evolving away from a kind of land-fighting at sea. This old style was characterized by using numerous marines, with the objective of boarding and fighting hand-to-hand or overwhelming the enemy with missile volleys.[94] The fact that early Archaic fleets were a mix of heterogeneous ships would have hampered the development of coordinated tactics. Perhaps the Samians were addressing this problem

[86] Reformed *Naucrariai*: Phot. s.v. *Naukraria* (citing Cleidemus' *Atthis*) *FGrH* 323 F 8; Androt. *FGrH* 324 F 5; *Ath. Pol.* 21.5.

[87] An inscription from archaic Eretria records the polis' incentive to pay wages to seamen sailing beyond either of the extreme northern and southern ends of the Euboean Straits. The fund for the wage is one to which 'everyone must contribute.' *IG* XII.9, 1273.1274 ll. 10-12; *SEG* 41.725 (550-500 BCE); *LSAG* 84; Cairns 1991: 310-13; van Wees 2013: 27.

[88] Irwin 2009: 400.

[89] Plut. *Per.* 26.3-4.

[90] *FGrH* 382 F7 = Photius and *Suda* s.v. Σαμίων ὁ δῆμος ὡς πολυγράμματος, Σ77.

[91] Hesych. s.v. Σαμιακὸς τρόπος, citing Didymus (1st c - 1st c CE). Casson 1995: 64; Wallinga 1993: 93-5.

[92] Wallinga 1993: 93-4 and nn. 72-3; Damianidis 2008: 63-8 for full refs.

[93] Wallinga 1993: 94, nn. 72, 73. A fragment of Choerilus of Samos (*FGrH* 696 F 34h = F 322 (6) in Lloyd-Jones and Parsons 1983), remarks on 'a swift Samian ship with the shape of a pig' (νῆυς δέ τις ὠκύπορος Σαμίη, ὑὸς εἶδος ἔχουσα). Morrison and Williams suggest a change in the ram of penteconters c. 530 based upon iconography: Morrison and Williams 1968: 91-101.

[94] E.g., even the Battle of Sybota in 433 seems to have been fought this way: Thuc. 1.49.1-3.

with their new design. As Wallinga has said, maneuvers at sea, including tactics which employed the ram, would benefit greatly from a mostly homogeneous fleet.[95]

As for what the sources are trying to describe about the shape of the prow, I suggest that the *samaina* had an innovative ram design. After all, it is at Samos where the lost-wax method of bronze-casting was said to have been introduced to Greece, and which produced master metalsmiths such as Theodorus.[96] A polis with such a reputation for skill at both bronze-working and seafaring is surely a good candidate for the development of the snubbed, bladed bronze ram we see depicted on coins from Zancle/Messana, minted 493-488, by Samian exiles, which some claim represent the *samaina* (figure 1).[97]

Figure 1: Silver tetradrachm of Zancle/Messana 493-488, said to represent the *samaina* (Ashmolean HCR_7480-b).

[95] Wallinga 1993: 47.

[96] Bronze-casting: Paus. 8.14.8. Theodorus: Hdt. 1.51.3, 3.41.1; Diod. 1.98.5.

[97] Samian exiles at Zancle/Messana: Hdt. 6.6-17, 22, 25.

Figure 2: Nineveh Relief detail showing a ship manned by oarsmen, with pointed ram at the prow. Gypsum fragment, from the SW Palace of Sennacherib, 705-681 (BM 1851,0902.30).

If Archaic ship iconography can be trusted, the principal ramming timber for earlier Archaic penteconters was sheathed with hammered plate-bronze and tapered to a point.[98] This is what is depicted on the late-eighth/early-seventh century Nineveh Relief panel and other images of warships down to the later sixth century (figure 2).[99] The earlier ram may have had a primarily defensive, not offensive, function.[100] The Samian innovation may have been a response to the problems of employing such rams offensively in sea-battles such as that at Alalia, where the Phocaeans' rams were 'turned aside.'[101]

The Samians, then, may have made modifications to strengthen the prows of their ships to accommodate a new design of ram. They employed their masters of bronze-casting to produce a tougher, custom-fitted, blunt-nosed ram to avoid a result like that suffered by the Phocaeans. The full decking would further strengthen the hull to stand the force of ramming, while making the ship more stable on open seas.[102] The prow depicted on the tetradrachms of Zancle/Messana show just such a snub-nosed silhouette, particularly in

[98] Casson 1995: 85 and n. 41.

[99] E.g. Berlin 31013a (7th c.), pl. 8c Morrison and Williams 1968; Louvre E 735 (7th-6th c.), pl. 11d Morrison and Williams 1968.

[100] Scott 2000: 102.

[101] ἀπεστράφατο γὰρ τοὺς ἐμβόλους: Hdt. 1.166.2.

[102] Casson 1995: 52. This argues in favor of employing the technique of mortise-and-tenon joinery in the penteconters' construction (see above).

the profile of the ram itself. Such an innovation might help explain Polycrates' notorious success.[103] Polycrates' special ship design and the greatest source of his naval success became the image of his legacy and the shorthand for his *megaloprepeia*.

Reinforcement of the prow to improve ramming capabilities is not unknown. Trireme prow and cathead reinforcement is recorded later for the Corinthian ships sent to aid Syracuse against Athens' fleet in 413.[104] The improvements were made so that the Corinthian ships could attempt a frontal, rather than the usual, oblique approach to ramming. This maneuver was previously avoided because of the danger of destroying one's own ship in the attempt.[105] The Corinthians' success led the Syracusans to adapt their triremes as well, with disastrous results for the Athenian fleet.[106]

## *Polycrates' Triremes*

What about Polycrates' triremes? Herodotus reports that Polycrates contacted Cambyses and the result was the shipping out of Samian political dissidents to serve the Persian king against Egypt.[107] The men, who could have numbered as many as eight thousand, were sent off in forty triremes.[108] Scholars have questioned whether these triremes belonged to Polycrates. Wallinga claims they must have been Egyptian, and were provided to Polycrates by Amasis as a result of their alliance.[109] Carty suggests that the rebels were actually pro-Persian, and Polycrates sent them off in Amasis' triremes to serve as slave-soldiers in service to Egypt.[110] But if this were the case, why did the rebels not just defect over to the Persians, as Phanes of Halicarnassus did, rather than beg for help from Sparta?[111]

In my opinion van Wees is correct in positing that the triremes were from the Persian fleet, sent to Samos for manning, when Aristagoras received ships from Artaphernes to attack Naxos.[112] As Carty rightly points out, there was no longer any pressure to remain loyal to Amasis, as he was dead by 526, when the Persians launched their attack on Egypt.[113] In any case, the loss of so many skilled seamen and fighters must have been a significant blow to Polycrates' ambitions to rule the Aegean.

If the triremes carrying the Samian dissidents were part of the Persian fleet, then it may be that Polycrates was held responsible for their safe arrival with their human cargo. When the men rebelled and made off in (some, perhaps not all) those ships, Cambyses may have held Polycrates responsible, thus souring their new alliance, and lowering the Samian

[103] Hdt. 3.44.

[104] Thuc. 7.34.5; Murray 2012: 19-20.

[105] Murray 2012: 17-21.

[106] Thuc. 7.36.2-5.

[107] Hdt. 3.44

[108] Ibid.

[109] Wallinga 1993: 117; agreed by Carty 2015: 139.

[110] Carty 2015: 184.

[111] Phanes: Hdt. 3.4. Begging Sparta: Hdt. 3.46.

[112] Aristogoras: Hdt. 5.31-33. Ships from Persian fleet: van Wees 2004: 306, n. 19.

[113] Hdt. 3.10; Carty 2015: 173.

tyrant in Cambyses' esteem.[114] If this were not the case, then there would have been little need for Polycrates to turn to the rebellious and self-interested satrap Oroetes, who was ruling his own small but rich empire of Lydia, Ionia, and (after murdering Mitrobates and his son) Phrygia.[115] We certainly hear no more about triremes at Samos until Lade in 594.[116] When Polycrates crosses to the mainland to meet with Oroetes, it is in a penteconter.[117]

## *Conclusion*

Polycrates' fleet of penteconters, many or all of which were a special design that was distinctly Samian, needed substantial outlays of manpower and resources to succeed. Since Samos did not have access to all the resources needed for expediting such a project, networking was necessary to gain and maintain access to them. Thus we can see one important motive for Polycrates to maintain a relationship with Egypt. He made overtures to Persia for similar reasons. And without ample manpower, his ambition to rule the Aegean was dead in the water.

But, despite the 'gluttony' of the penteconter, in the mid-sixth century, for close to a generation, Samos successfully managed and utilized a public fleet with which it prospered and withstood the threat of Persian invasion. It is a testament to the usefulness of the penteconter during the Archaic period, and opaque hints in the archaeological and literary record suggest that Samos, like Corinth and possibly other poleis, employed institutions like the Athenian *naucrariai*. And despite the rise of the trireme as the warship of choice around the end of the sixth century, from the long-ship to the liburnian, the naval appeal of the fifty-oared ship continued for many generations after Polycrates' rise and fall.

KATHRYN WATERFIELD
LAKONIA, GREECE

[114] As Darius held Aristagoras responsible in the early 490s (though in hardly identical circumstances); Hdt. 5.35, 105.

[115] Hdt. 3.120, 3.126; Mitchell 1975: 85.

[116] Hdt. 6.8.

[117] Hdt. 3.124.2.

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