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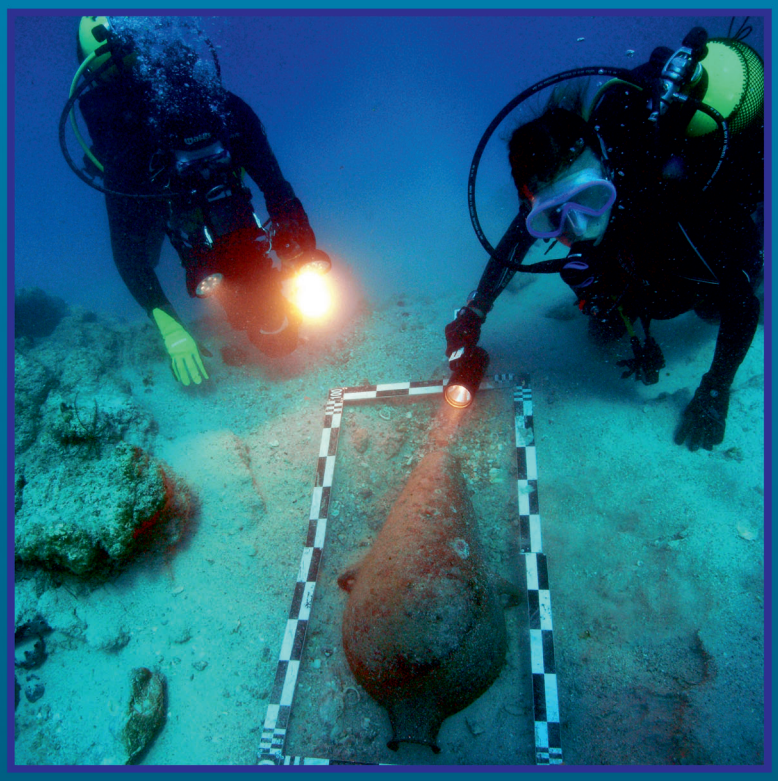

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A Harbourless Sea?

Harbours and the Maritime Cultural Landscape of the Hellenistic and Roman Aegean

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Abstract *– The Aegean Sea has always played a crucial role in the commercial and cultural networks of the Mediterranean. Nevertheless the Aegean, especially mainland Greece and the islands, lost great part of their importance during the Hellenistic and Roman periods. This is, mainly in the early years of the Roman Empire, reflected in the construction of humble harbours with the use of older techniques (rubble moles) instead of the new method of maritime concrete, rendering the Aegean in a way a 'harbourless' sea. The recovery of the region, especially during the Antonine period and particularly in the eastern Aegean, led to the creation of elaborate harbour complexes as e.g. in Ephesos, Rhodes, and Kos, but this phenomenon was geographically limited, many harbours continuing to be much simpler.*

Inhalt *– Die Ägäis hat immer eine entscheidende Rolle in den kommerziellen und kulturellen Netzwerken des Mittelmeers gespielt. Dennoch verlor die Ägäis, insbesondere das griechische Festland und die Inseln, während der hellenistischen und römischen Zeit einen großen Teil ihrer Bedeutung. Dies spiegelt sich vor allem in den ersten Jahren des Römischen Reiches im Bau schlichter Häfen unter Verwendung älterer Techniken (Bruchsteinmolen) anstelle der neuen Bautechnik des opus caementicium, wodurch die Ägäis in gewisser Weise zu einem 'hafenlosen' Meer wurde. Der Aufschwung der Region, vor allem in der antoninischen Zeit und insbesondere in der östlichen Ägäis, führte zur Errichtung aufwendiger Hafenkomplexe wie in Ephesos, Rhodos und Kos, doch war dieses Phänomen geografisch begrenzt, während viele Häfen weiterhin viel einfacher waren.*

The Aegean Sea has always played an important role in the commercial and cultural networks of the Mediterranean, thanks to its strategic position and its complexity as a geographical and anthropogenic space. Since prehistory the archipelago formed a unique maritime cultural landscape, whose importance grew even more during periods when overseas trade, interaction and travelling became a very important aspect of contemporary society.[1] In the dynamic world of Alexander's successors and of the Roman Empire the Aegean formed a crucial part of short and long-haul Mediterranean networks in which harbours and harbour cities became hubs of trade and urban centres (**fig. 1**).[2]

Nevertheless, the Aegean, especially mainland Greece and the islands lost great part of their importance during these periods, due to depopulation, financial decline, warfare and the movement of the centres of political power towards the east and the west.[3] This decline is reflected in the construction of humble harbours with the use of obsolete techniques, rendering the Aegean, in a way, and to use Strabo's term, a "harbourless" sea[4] with less elaborate harbours, especially when compared to the lavish harbours of the Levant (e.g., Alexandria or Caesarea Maritima) and Italy (e.g., Portus or Puteoli). Despite the gradual financial recovery during the Imperial Period, monumental and more elaborate harbours remain, as we will see, few and located in very specific areas.

This paper explores the different harbour realities of the Hellenistic and Roman Aegean through comparing the evolution and nature of harbour construction and operation, focusing on the existence or not of adequate harbour facilities and the parallel function of different types of harbours. The main sources of evidence are archaeological remains, combined with epigraphic and historical evidence, as well as with iconography.

The historical context

The Aegean world witnessed unprecedented changes during the Hellenistic and Roman Imperial

[1] Paterson 1998, 150; Temin 2013, 2; Chaniotis 2018, 10–30; Horden – Purcell 2000, 27.

[2] Casson 1971, 366–367; MacDonald 1986, 262; Bouras 2008; Bouras 2014; Oleson – Hohlfelder 2011, 814–816; Boehm 2018, 127; Feuser 2020, 311–312.

period, especially concerning commerce and seaborne trade, which are the two factors that fundamentally affect harbour construction and development.

The Hellenistic period (323–31 BC)

Beginning with Alexander the Great and continuing with the successors, the horizon of the people of the Aegean was greatly expanded and created a series of new opportunities.[5] Commercial relationships were intensified in frequency and volume, especially concerning the import and export of victuals like grain or wine, as well as of enslaved people.[6] The old and new networks operating the Aegean and its harbours played an important role as a bridge between the 'old' and the 'new' Greek world, with harbour cities like Rhodes or Delos becoming unique cosmopolitan centres of trade, finance, and seafaring.[7] Furthermore, the accumulation of wealth and power in the hands of Hellenistic rulers allowed for the generous funding of construction projects, including harbours, for practical as well as for political reasons.[8]

Nevertheless, the Hellenistic expansion was not a totally positive period in the history of the Aegean. The relocation of large parts of the population to newly established urban centres outside the archipelago, as well of the centres of power and economy to the east lead to a stagnation of the population in the region especially after 200 BC.[9] The political fragmentation and the constant antagonism between the Hellenistic kingdoms and, later, Rome, lead to a series of wars which hindered even more financial development, as well as the efforts to improve commercial networks and harbours in specific areas which often changed hands between rival states and rulers.[10] The endemic piracy had a similar negative impact on the development of commerce.[11]

Fig. 1: Map of the Aegean region, with the main Hellenistic and Roman harbours mentioned in the text (author)

The Roman Imperial period (31 BC–AD 330)

The Roman Imperial period in the Aegean was marked by the conclusion of the political and financial unification and the establishment of a long period of peace, from the end of the Roman civil wars and until the first Barbaric Invasions. This allowed the rise of population and gradual financial recovery of the archipelago, which already was a much more urbanized region than other parts of the Roman Empire.[12] In terms of seaborne trade and traffic, the Aegean formed part of various commercial networks connecting the eastern provinces and coastal cities of the empire, whereas the general increase in the volume of Mediterranean trade and the use of ships of larger tonnage opened new opportunities for merchants and mariners and brought new demands on contemporary harbours. Continuing the Hellenistic tradition, many Roman emperors, as well as local elites, invested large sums of money for the improvement and embellishment of harbours.[13] Despite the overall improvement of conditions in the Roman Aegean, the image was, however, far from being ideal. The whole region had lost its independence, whereas the main political and financial centres had moved away. Recovery, especially in areas that were devastated by the wars of the 1st century BC, was often slow and the necessary imperial patronage was uneven and delivered

3 Rougé 1966, 129–132.

4 For the use of the term "harbourless" see Strabo 5,3,5; 9,5,14; Dionysius of Halicarnassus 3,44,3.

5 Paterson 1998, 150; Temin 2013, 2; Lawall 2005, 215.

6 Kay 2014, 178–181; Scheidel 2011, 293–302; 2014, 178–181, 200.

7 Rostovtzeff 1941, 620; Green 1990, 381. 526; Archibald 2005, 10–12.

according to specific political conditions in a frequently opportunistic way.[14] Ancient authors like Strabo or Pausanias refer to harbour cities that had lost all their past glory and often lay in ruins in their time (e.g., Delos during the Imperial period)[15].

The evolution of ships and seamanship

Harbours are built and operated in order to fundamentally serve ships, their cargoes and passengers. This is why their relationship with the development of shipbuilding in technology, size, tonnage and ship handling methods is crucial for understanding the development of contemporary harbours. Especially the ships' size and draught is what can dictate the form harbours will take in order to be able to accommodate them.[16]

In the Hellenistic period the creation of new trade networks and the increase in the overall cargo volume transported overseas was not followed by any evident increase in ship tonnage.[17] The Thasos harbour inscription of the 3rd century BC[18] documents ships of 80 and 130 t, i.e. small and medium capacity respectively, according to the classification suggested by Casson, Parker, Boetto and Nantet,[19] but no bigger ones. Inscriptions reporting donations of grain cargoes between the end of the 4thand the early 2nd century BC mention only one cargo of 8,000 *medimnoi* (c. 330 t) against two cargoes of 4,000 *medimnoi* (c. 165 t), five cargoes of 2,800–3,000 *medimnoi* (115–120 t), one of 2,333 *medimnoi* (c. 95 t), and one of just 500 *medimnoi* (c. 20 t).[20] Shipwreck data is similar although poor, since few shipwrecks of the period have preserved adequate information on their overall size and tonnage. Ships of small capacity, much like the Kyrenia shipwreck, the Hellenistic shipwreck of Serçe Limanı, or the Hellenistic ship of Pisa are all no more than 15 m long.[21] Ships of greater tonnage operated in the Mediterranean before (e.g., the 130-ton Alonissos shipwreck)[22] and after the Hellenistic period (e.g., the 350-ton Madrague de Giens shipwreck),[23] but the fact that no such ship has yet been discovered dating in this period could be an indication that these were rare.

Shipbuilding technology, according to these shipwrecks, shows that the previous mortise-and-tenon construction method continued to be the predominant one and was perfected.[24] Sailing methods similarly remained unchanged for most ships, with the use of the loose-footed square sail of the Archaic and Classical periods.[25] Two-masted ships must have been known, as it happened in earlier periods (e.g., the 5th century BC Tomba della Nave fresco),[26] but there is no evidence for that in Hellenistic shipwrecks or iconography.

Several larger ships were, however, built in the period. Such were the increasingly larger polyreme galleys of naval fleets,[27] as well as of the unique and lavish Syrakusia (c. 240 BC), the gigantic grain freighter of Hiero of Syracuse.[28] Notwithstanding the limited usefulness of many such vessels – Syrakusia would only travel once before being put on display – the ability of contemporary shipbuilders to create such huge hulls shows that their craft was developing towards larger and sturdier vessels. Nevertheless large galleys, due to their design and need for speed, had a limited draught. Even the largest ones did not exceed 1.6 m,[29] whereas ships of great size appear to have been very few and had a marginal role in the development of trade and harbours. It was the clientele of shipbuilders that prevented them from creating large vessels *en masse*, since, apparently, contemporary ship owners and merchants based their trade on smaller, more versatile cargoes and equally small, but cheaper vessels, whose loss would be handled easier by them.

Change in ship tonnage and design becomes evident in the archaeological record of the Late Republican Roman period, with the boom in ship sizes documented in a series of shipwrecks of over 300 t. These correspond to the *myriophoroi* (10,000-amphorae carriers) mentioned in ancient sources and attested in a series of shipwrecks (Albenga, Madrague de Giens, Mahdia, and possibly Antikythera).[30] It is estimated that ships of such great tonnage would have a length of about 40 m and a draught of 3.5–4 m. Shipwrecks also document much sturdier hulls, often double-planked, with dense framing and often

8 Casson 1971, 366; Oleson – Hohlfelder 2011, 814–816.

9 Rostovtzeff 1941, 1135–1136; Reger 2007, 461–462. 467.

10 Reger 1994, 26–29.

11 acheco 2020.

12 Alcock 2007, 677; Scheidel 2007, 42–43.

13 Arnaud 2015.

14 Arnaud 2015, 67–71.

15 Strabo, 10,5,2–3; Pausanias, 8,33,2. Cf. Bruneau 1968, 698–700.

16 Boetto 2010, 114–124; Nakas 2020, 4–6.

17 Gibbins 2001, 290.

18 IG XII, Suppl. 348; Launey 1933, 394–401; Blackman 1995, 75–79.

19 Casson 1971, 171–172; Parker 1992, 89; Boetto 2010, tab. 1; Nantet 2016, 139–142.

20 Casson 1971, 183–184; Nantet 2020, tab. 5.3.

21 Pulak et al. 1987; Steffy 1994, 42–59; Bonino 2003, 183–221. Although there are various known shipwrecks from the Hellenistic period, most have not been fully excavated or are known only through their cargoes and can thus not provide sufficient evidence on their original size (Nantet 2020, tab. 5.1).

22 Hadjidaki 1996.

23 Tchernia et al. 1978, 102–107.

24 Steffy 1994, 40–77; Pomey 2011, 22, 40–53; Beresford 2013, 11–12.

25 Whitewright 2017, 230.

26 Basch 1987, fig. 880.

27 Murray 2012, 3–12; Pomey 2020, 28.

28 Athenaeus, Deipnosoph. 5,206d–209; cf. Casson 1971, 184–186.

29 Morrison – Coates 1996, Appendix D.

30 Wallinga 1964, 3–6; Nantet 2016, 115–116.

protected by lead sheathing.[31] Meanwhile ship iconography becomes richer and portrays ships with two, and rarely even three, masts, elaborate overstructures, gangplanks, etc.[32] The existence of at least one 'mega-freighter' of 1,200 tons, the Isis, visiting Piraeus around AD 150, is attested by literary evidence.[33] During the imperial period, different types of sail are also introduced, including the lateen, settee, and spritsail, though most likely for smaller vessels.[34]

Nevertheless, the use of large-tonnage ships in the Roman Imperial period is neither universal nor even. The *myriophoroi* shipwrecks belong to the very specific time period of the first half of the 1st century BC, and come from the equally specific region of Southern France and the Ligurian Sea.[35] No shipwrecks of similar tonnage have been dated to the following centuries, whereas literary sources make few mentions of them.[36] Around the middle of the 1st century BC, Hero of Alexandria, in his method of calculating the capacity of several merchantmen reports ships of c. 58, 95, and 144 t but nothing bigger.[37] Shipwreck data, especially from the Aegean, firmly documents the use of small and medium capacity ships in the region throughout the Roman Imperial period.[38] On the other hand, the common appearance of two masts in iconography is a deliberate representation of the extraordinary and rare larger vessels in contrast to the ordinary medium and small sized ones, whereas the use of two masts even in small capacity vessels has been attested by shipwrecks, e.g., at the Saint Gervais 3 shipwreck that was no more than 17 m long.[39] It appears that, although shipbuilding technology was steadily progressing towards hulls that were sturdier, easier to build, and cheaper,[40] the 'backbone' of the commercial fleet in the Roman Empire continued to be ships of small and medium capacity,[41] operating side-by-side with larger ships being employed in specific routes and for specific bulk cargoes like grain.[42]

Hellenistic harbours in the Aegean

A main characteristic of the Hellenistic harbours of the Aegean is the fact that very few of them were actually new establishments. The majority of harbour cities were pre-existing, their harbours were already in use, and there are very few harbour works that can be safely dated in the Hellenistic period, as a series of examples shows.

In the case of Thasos there has been no evidence for any harbour work built during the Hellenistic period both in the military and commercial harbour sectors, although the city was prosperous and the harbours used intensively.[43] A similar situation is observed in Kos, where construction works in the harbour appear to have stopped during the same period and the harbour, although still operating, as inscriptions verify, was improved by no further infrastructure.[44] The commercial and military harbours of Piraeus also appears to have been neglected in terms of infrastructure after the end of the 4th century BC and the decline of the maritime power of Athens, and no new shipsheds or other types of harbour works were erected.[45] Delos is another interesting case. Despite the island's growing importance as a commercial centre that culminated with the establishment of the free port by the Romans in 166 BC, the main protective harbour work, the "Great Mole" was, according to literary evidence, a Classical or even Archaic construction,[46] much like the similar rubble moles at Samos and Klazomenai.[47] Delos' harbour infrastructure mainly concerned the landfill around the Main Harbour, the maintenance of the pre-existing mole, and the embellishment of the maritime façade of the sanctuary of Apollon through the construction of porticoes (e.g., Philipp's Portico), the paving with gneiss slabs (the Agora of the Competaliasts), and the erection of votives.[48] The other harbours of Delos, the Merchant Harbour, Skardanas, and Gourna, were equally simple foundations, harbour works being limited in coastal retaining walls (not quays, since they originally stood at a distance from the water) and large buildings of commercial character, with the possible exception of Gourna, where a sizeable ashlar quay was built.[49] Similarly, other important urban centres of the period like Miletos and Ephesos, despite their monumental development, especially concerning public spaces, were equipped with no harbour works in the sea. In Miletos, the protective moles closing the entrance to the city's main harbour, the Lion's Harbour, most likely were built in the Archaic period,[50] whereas the early Hellenistic harbour of Ephesos remained an open, unprotected beach.[51] Rhodes was one of the few harbours where harbour works can be dated to the Hellenistic period. According to stratified pottery finds, some of the city's shipsheds were built in the middle of the 3rd century BC, as well as parts of the harbour fortifications, as the island

31 Pomey – Tchernia 1978, 233–237.

32 Basch 1987, 1018–1062.

33 Lucian, Navigium 5–9; Casson 1971, 186–188.

34 Whitewright 2017, 228–230.

35 Nantet 2016, 139–142.

36 Scaevola, Digest, 50,5,3; cf. Nantet 2016, tab. 38.

37 Hero of Alexandria, Stereometrica 1,54; 2,51–52; De mensuris 17–18.

38 Parker 1992, figs. 3–5; Leidwanger 2020, 48–49.

39 Beltrame 1996, 135.

40 Pomey – Rieth 2005, 168–169; Olaberria 2014, 355–361. 364–366.

41 Gibbins 2001, 294.

42 Nakas 2020, 4–5.

43 Grandjean – Salviat 2000, 29–31. 52–57.

44 Blackman – Rankov 2013, 368.

45 Garland 1987, 45–53. 59.

46 Duchêne et al. 2001, 147; Hellmann 1980.

47 Tölle-Kastenbein 1976; Votruba et al. 2016, 672.

48 Bruneau 1981, 110–111.

49 Zarmakoupi 2015, 124–126; Zarmakoupi – Athanasoula 2018, 98 fig.10.

50 Brückner et al. 2014, 70.

51 Ladstätter 2016, 253–257 fig. 2.

remained one of the most important naval powers in the Aegean.[52]

As already noted, very few harbours in the Aegean were new establishments. One of them was Elaia, the harbour of Pergamon. It was developed in the early 3rd century BC by the Attalids, who created a wholly new harbour and a city.[53] The harbour included two fortified rubble moles that protected an enclosed military harbour (λιμήν κλειστός), as well as an open beach that, most probably, served as the city's commercial harbour. The harbour appears to have been a rather simple establishment, lacking the monumentality and grandiosity of Pergamon, but remaining a well-protected and functional military and commercial harbour.

Concerning the technology employed in the Hellenistic harbours of the Aegean, there seems to have been little progress from previous construction methods. Archaeological evidence points towards the use of rubble moles crowned with ashlar walls built above the surface of the water, a method known from the Archaic period and conventionally called the 'Greek method' of building harbours.[54] Moles or quays built with ashlar blocks underwater, a method known from earlier and contemporary harbours in the Levant (e.g., the Early Iron Age harbours of Atlit and Tabbat el-Hammam, and the Hellenistic harbour of Amathus),[55] is only know from the auxiliary harbour of Gourna at Delos, but the structure is too destroyed to allow the proper study of its construction technique. An interesting and unique feature is the dumping of large unworked blocks as landfill at the centre of the harbour at Elaia[56]. These would consolidate the area in order to allow reclamation and it was an easy and cheap solution for harbour engineers.

Another important element is the lack of any dredging operation. Dredging has been verified in contemporary harbours in the Levant (Tyre, Sidon) and the Western Mediterranean (Naples, Marseilles), but is absent in the Aegean, at least according to our present knowledge.[57] Despite the excavations and coring researches in Hellenistic harbours like Delos, Ephesos, and Elaia no traces of dredging have been found and dredging is not mentioned in written sources.

One final aspect of harbour construction is patronage. The existence of powerful and wealthy rulers, especially in the East, during the Hellenistic period, had allowed substantial funding to be directed towards the construction of cities, sanctuaries, fortifications, and other types of public works in the Aegean. However, royal patronage seems to have been mainly directed towards sanctuaries and votives, especially in sanctuaries like Delphi or Delos, of important political symbolism but of little practical use. The case of Delos is a good example of that: the famous sanctuary was constantly receiving donations in money and grain, lavish monuments were erected (e.g., Philipp's Portico facing the Main Harbour), but the reclamation and consolidation works around the harbour were, according to inscriptions, funded only by the sanctuary's treasury.[58] The only harbour works associated with royal authorities were related to the harbour city of Elaia and the construction, by Attalos II around 150 BC, of the great mole in order to protect the harbour of Ephesos from siltation. This, nevertheless, had the opposite effect and accelerated the siltation of the whole bay.[59] This negligence of Hellenistic rulers towards harbours in the Aegean, with the exception of the Attalids, could be explained by the political fragmentation and instability of the region, in which cities and regions changed hands very often, not allowing rulers to invest in the construction of substantial harbours, even as military bases. A good parallel from an adjacent area is the harbour of Amathus which was never completed, since Demetrius, who had most likely commissioned it, had lost control over the island before construction works were finished.[60]

Roman harbours in the Aegean

Similarly to the Hellenistic period, there are very few harbours that were new foundations in the Roman Aegean, their great majority having survived the Roman conquest and continuing to be used in various ways.

Amongst the very few harbours that can be considered new establishments in the Roman Aegean are the harbours of Kenchreai on the western coast of the Peloponnese, and Chersonesos in central Crete. Kenchreai, although already used in the Hellenistic period as a natural harbour and anchorage, as written sources testify, was built as an artificial harbour in the 1st century AD according to stratified excavation finds.[61] The project included two large rubble moles, a continuous ashlar quay, as well as the well-planned local settlement, equipped also with substantial storage facilities.[62] In Chersonesos, the harbour was founded in the same period, but the moles were built with the use of maritime concrete, a rare occurrence in the Aegean. This impressive building project has been related to the wealthy Capuan families who, under Augustus, had acquired large tracks of Crete and exploited its agricultural production.[63] These families needed a

[52] Philemonos-Tsopotou 2004, 131; Blackman – Rankov 2013, 513.

[53] Pirson 2014, 349–356; Seeliger et al. 2018, 10–12 fig. 9.

[54] Casson 1971, 336–367; Rickman 1996, 285; Blackman 2008, 643–644.

[55] Pritchard 1978, 60; Haggi – Artzy 2007, 76–80; Empereur – Koželj 2017, 114–115.

[56] Seeliger et al. 2013, 80.

[57] Marriner – Morhange 2007, 177–180; Morhange – Marriner 2010.

[58] Bruneau 1981, 110–111; Duchêne et al. 2001, 147–153.

[59] Strabo 14,1,24; Kraft et al. 2011, 32; Steskal 2014, 333–334.

[60] Empereur – Koželj 2017, 114–115.

[61] Scranton et al. 1978, 37.

[62] Scranton et al. 1978, 39–46.

[63] Brandon et al. 2021, 89–101; Gianfrotta 2011, 191–192.

good harbour to allow the export of local agricultural products and were also wealthy enough to fund such an expensive harbour. They also had the necessary connections with the main source of Campanian pozzolana for maritime concrete to import it.

Harbour works as well as land infrastructures in the rest of the Aegean during the Roman Imperial period appear to be few. In most harbours of mainland Greece there is no evidence for any new substantial harbour works, and despite the fact that many important coastal cities continued to operate as harbours (e.g., Piraeus and Delos) archaeological and written sources give no evidence for any new infrastructures in the sea.[64] In other cases such as Salonica modern buildings have totally obscured ancient structures.[65]

Ionia and the eastern Aegean present a somehow different picture, especially after the Antonine period. Large programs of monumental refurbishing of the maritime façade of harbour cities take place in Kos, Rhodes, and Ephesos. They include agoras, porticoes, and monumental gates of little practical use but important symbolic significance: the tetrapylon of Rhodes, the great propylaeum at Kos, and the series of free-standing gateways in Ephesos.[66] These programs, however, are not related to the operation of harbours as ship havens but focus mostly on the embellishment of their surrounding space, under the generous patronage of emperors or local elites in Ephesos, whereas in the case of Rhodes the monumental archway was actually built on the city's shipshed complex, rendering it useless.[67] It is only in Kyme where an ashlar breakwater appears to have been built in the first half of the 1st century AD[68]. A unique example of a lighthouse dated in the Roman Imperial period is that of Patara, built under Nero.[69]

These truly impressive new building projects at the harbours cities of Ionia were not paired with any known works in the sea. What did, however, take place in the region were some extensive and copious dredging projects in harbours that siltation could rend useless. In Ephesos, the proconsul of Asia Marcius Barea Soranus in AD 61 and the *prytanis* C. Licinius Maximus in the early 2nd century AD had funded major dredging operations, Marcus Aurelius in AD 129 had diverted the river Cayster to the north, whereas the asiarch M. Aurelius Artemidorus had spent considerable sums for dredging the city's harbour between AD 222 and 238.[70] Geophysical and written evidence does not verify dredging in other important harbours of the period, like Alexandria Troas or Miletos, although in the latter the continuous use of the city's harbours suggests that some dredging must have taken place.[71]

Another form of harbour infrastructure that appears in some of the Roman harbours of the Aegean and is also connected with state intervention are large *horrea* warehouses, related, most likely, with the *annona* grain supply system of the Roman Empire. Such establishments are found at Patara (Hadrian's *horrea*), Kenchreai (the extended storage facilities to the south of the harbour basin), and Maroneia.[72] All such facilities are located on the mainland, in areas where the agricultural production of the hinterland could easily be collected, stored, and then shipped towards Rome or, later, the Danube for the *annona militaris* during the late empire.[73] As it happened with the monumental harbour works, the storage facilities, with the exception of Kenchreai, cannot be related with any extensive Roman program of harbour construction.
An interesting aspect of the harbours of the Roman Aegean is the possible emergence of what has been coined 'opportunistic' harbours.[74] These are harbours that have either very rudimentary infrastructure on land and in the sea or none at all and are natural havens and anchorages not related to any substantial coastal settlement. Areas of intense economic activity in the late Roman period such as the Datça peninsula in Karia, as suggested by Leidwanger,[75] were never equipped with any artificial harbours. A similar condition is noted by the same scholar in contemporary Cyprus.[76] Further examples on the opposite coast of the Aegean are the agricultural Roman villa at Palaia Epidauros where no harbour remains were related to the coastal establishment,[77] or the two rubble breakwaters at Porto Raftis in Attica, which most likely date in the Roman Imperial period and are rudimentary structures built to facilitate the export of local agricultural production.[78] Unfortunately, 'opportunistic harbours' are difficult to be located and require intensive land and underwater surveys to show maritime activity in regions where, due to their geographical configuration, every cove and every shore can be a potential harbour or haven for small capacity vessels. Such harbours can be considered secondary, serving smaller settlements as well as limited hinterlands and markets in comparison to the main or terminal harbours of maritime networks that played a more substantial role in long-hole trade routes and in the supply of larger cities and wider

64 For the harbour of Piraeus during the Roman Imperial period, see Garland 1987, 53–57; Grigoropoulos 2016; for Delos, see Bruneau 1968, 698–700; Roussel 1916, 338.

65 Leivadioti 2009, 37–43.

66 Bouras 2012; Bouras 2014; Feuser 2020, 258–265.

67 Blackman – Rankov 2013, 513.

68 Esposito et al. 2002, 33–34.

69 Koçak 2019, fig. 3.

70 Tacitus, Annales 16,23; IvE 2 Nr. 274; IvE 7,1 Nr. 3066. 3071; cf. Wilson 2011, 51.

71 Brückner et al. 2014, 87.

72 Feuser 2020, 277–280; Rickman 1971, fig. 31; Rizos 2015, 294–296 figs. 7–9.

73 Rizos 2015, 296–298.

74 Leidwanger 2013.

75 Leidwanger 2020, 167–172.

76 Leidwanger 2013.

77 Kritzas 1972.

78 Kraounaki 2002, 103–104 fig. 5.

areas.[79] Secondary harbours would operate quite differently within trade patters, being the foci of redistribution networks, which would involve ships of small capacity, tending to the needs of smaller costal communities in contrast to the bigger ships that operate on the direct routes between great exporters of goods and urban centres with their large markets.[80]

This discrepancy between main and secondary harbours can also be traced in Latin literary sources. Vitruvius, Ulpian, Seneca, and Isidorus of Seville clearly mention the existence of two distinct types of harbours: the simple *statio*, a harbour or anchorage not equipped with any substantial infrastructures, and the *portus*, a advanced and better protected harbour with adequate infrastructures for ships and merchandize. The term *angiportus* or "alley" for especially narrow and well-protected harbours is also attested by Ulpian.[81] Such descriptions seem to reflect well the condition of the Aegean harbours of the period in which there were many simple, natural anchorages where ships could be accommodated for short periods and others, better protected, with all the necessary infrastructure in which, according to Isidorus of Seville, ships could "spend the winter". The term *portus*, according to Ulpian, also refers to the organized markets that operated there, favoured them to be frequented by larger vessels, and made their administrators invest more in the construction of harbour works.

A final important aspect of the Roman harbours of the Aegean is the technology employed for their construction. What is evident through the examination of the available data is the lack of use of maritime concrete, a state-of-the-art technology introduced by the Romans in the early imperial period and used in many harbours around the Mediterranean.[82] With the exception of Chersonesos, where the use of maritime concrete has been attested by field research and coring,[83] there is no harbour in the Aegean where this technology has been used during this period. Although concrete structures have been documented in harbour works in Kyme or Alexandria Troas[84] these have not yet been proven to have been erected under water but could be dry-land structures. It appears that in the Aegean the predominant method of building harbours was the old 'Greek' method of rubble breakwaters with ashlar quays built above the surface of the water, like the ones at Kenchreai, Kyme or Porto Raftis.[85] This simplicity or 'poverty' of harbour technology was, on the one hand, related to the lack of regular state funding for the harbour works in the region and, on the other, with the operation of pre-existing harbours, which could still serve contemporary trade as they were. Another factor for this situation must have been the geography of the region, in which, thanks to the many natural havens and bays, mariners could choose between a variety of anchorages and not rely on artificial harbour networks, as was the case in southern France or northern Africa.[86]

Conclusion

The Hellenistic and Roman Aegean was not a 'harbourless' sea in terms of the sheer existence and operation of harbours. The islands and coasts of the archipelago were full of harbours and harbour cities that were intensively used by contemporary mariners, most of which having already been in use in previous periods. The geography of the region allowed also the operation of a great number of natural harbours of various sizes and types (gulfs, open beaches, deltas, estuaries, etc.), which were easily used as simple, 'opportunistic' harbours, each time there was need for ships to load and unload their cargoes or seek protection.

However, the Aegean remained 'harbourless' in relation to the number and nature of harbour works created during the Hellenistic and Roman Imperial periods. Archaeological evidence indicates that, with few exceptions, there was little effort and few resources invested by the authorities to create and properly maintain large, monumental harbours even during the Roman Imperial Period when the region was unified and benefited from the long period of peace. Most harbours remained simple, equipped with pre-existing protective works, mainly rough but sturdy rubble moles, whilst the efforts to improve their operation were focused on land infrastructure, often very monumental, which would do little to improve the capacity of harbours to accommodate and protect larger numbers of ships. Local communities were, in a way, depended on their own limited resources to improve their harbours, since the necessary royal patronage was not regular and was subject to ever-changing political conditions and opportunism.

This 'negligence' in harbour construction, however, should not be seen as a sign of general abandonment and neglect. It reflects the conditions of sea trade and traffic during the period studied, when the Aegean was only a part of long-haul networks supplying the great cities and when the largest part of the regional trade was based on local, short-haul networks. These networks mostly employed ships of small and medium tonnage that

[79] Rostovtzeff 1941, 1263; Bouras 2016, fig. 1.

[80] Hopkins 1983, 94–96; Leidwanger 2020, 71–76.

[81] Vitruvius, De Architectura 5,12,55; Ulpian, Digest 50,16,59; Isidorus of Seville, Origines 14,8,39–40. Cf. Rougé 1966, 117–118; Flamerie de Lachapelle 2014.

[82] Brandon et al. 2021, 223–235.

[83] Brandon et al. 2021, 89–93.

[84] Esposito et al. 2002, tbv. X; Feuser 2011, 261–265.

[85] Scranton et al. 1978, 17; Hohlfelder 1985; Esposito et al. 2002, 28–32; Kraounaki 2002, 103–104.

[86] Morel 2007, 505; Schörle 2011; Wilson 2011, 49–51 fig. 2,25; Robinson et al. 2020, 103–104 figs. 2–4.

were easier to handle and required less space and infrastructure. Thanks to their small size and draught they could easily use open anchorages or beaches and required less deep and elaborate harbours, allowing authorities and benefactors to focus on land projects and not in actual harbour works. Thus the 'harbourless' sea with few great artificial harbours was quite adequate for the local trade. Local communities had adopted a more 'down to earth' approach in developing harbours, focusing on simpler land infrastructure and not in more technically elaborate and expensive structures under the sea. Such an approach also corresponded with the parallel operation of main and secondary harbours, the former serving large cities and hinterlands and collecting/distributing larger volumes of goods, and the latter the local communities and their small-scale networks, operating as provisioning and repair stops of ships moving between the main harbours.

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Der Meeresboden ist ein faszinierendes Archiv der Menschheitsgeschichte. Das gilt auch für die Nord- und Ostsee. Auf und in ihrem Grund sind nicht nur Schiffwracks zu finden, sondern auch Besiedlungsspuren aus urgeschichtlichen Zeiten, in denen Teile dieser Meere noch Festland waren.

Das Kulturerbe unter Wasser ist jedoch bisher nur unzureichend geschützt. Wertvolle Spuren drohen durch Kies- und Sandabbau, den Bau von Windkraftanlagen, die Verlegung von Kabeln und durch Fischerei für immer verloren zu gehen.

Um für die Bedeutung des kulturellen Erbes in Nord- und Ostsee zu sensibilisieren, hat die Nationale Akademie der Wissenschaften Leopoldina das Diskussionspapier „Spuren unter Wasser – Das kulturelle Erbe in Nord- und Ostsee erforschen und schützen“ veröffentlicht. Darin stellen die Autorinnen und Autoren den Wert des Unterwassererbes dar und empfehlen Maßnahmen für einen effektiven Schutz der Kulturgüter.