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Harbors and Harbor Cities in the Eastern Mediterranean from Antiquity to the Byzantine Period: Recent Discoveries and Current Approaches

Hrsg. von
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The Evolution of Harbour Engineering in the Ancient Mediterranean World

John Peter OLESON

Abstract

The Mediterranean Sea provided nearly ideal conditions for seafaring in antiquity, and the many islands drew mariners out on boats from a very early period. With the acceleration of social and technological development in the Early Bronze Age, and the concomitant increase in long-distance trade, travel by ship became essential to the survival of the many cultures around the shores of the sea. As ships became larger, and the demands of trade more complex, harbours were needed to shelter ships and to provide easy access for people and goods. Early harbours depended on natural features of the shoreline or rivers that emptied into the sea, and these resources varied widely around the Mediterranean shore. By the late Bronze Age quays and other artificial enhancements were constructed, and advances in breakwater and basin design in the 8th and 7th centuries can be attributed to the Phoenicians and Carthaginians. By the Hellenistic period harbours could be well protected by large and sophisticated structures and enlivened with spectacular urbanistic embellishments. The Roman invention of hydraulic concrete transformed harbour design by allowing the placement of large, well-protected artificial harbours on nearly any shore, serving as nodes for large-scale, long-distance trade. Nevertheless, unenhanced natural harbours continued to serve local needs around the Mediterranean.

Özet

Akdeniz gemicilik için neredeyse ideal şartları sunmuştur ve çok erken dönemlerden itibaren birçok ada denizcileri kendine çekmiştir. Erken Tunç Dönemindeki toplumsal ve teknolojik gelişimlerin hızlanması ve aynı zamanda uzak ticaretin giderek artması nedeniyle, deniz kıyısındaki birçok kültürün ayakta kalmasında gemiyle yolculuk önemli bir gereksinim olmuştur. Gemiler ve ticaret hacmi büyüdükçe malların ve insanların erişimi için daha gelişkin limanlar gerekmiştir. Erken dönemlerde limanlar kıyıların doğal özelliklerine ve nehirlerin denize döküldüğü noktalara bağlıydı. Bu özellikler Akdeniz'de çok değişik şekillerde görülmektedir. Geç Tunç döneminde rıhtımlar ve başka yapay eklentiler inşa edilmiştir. M.Ö. 8. ve 7. yy'larda dalgakıran ve liman havuzu tasarımları Fenikelilere ve Kartacalılara atfedilmektedir. Helenistik dönemde limanlar gayet büyük ve gelişkin yapılarla korunmaktaydı

ve görkemli şehirsel bezemelerle donatılmaktaydılar. Romalıların icadı hidrolik çimento sayesinde büyük ve koruması iyi yapay limanlar hemen hemen bütün kıyılarda inşa edilebilir hale geldi, ve uzun-yol ve yüksek-tonaj ticaretin gelişmesi devam etti. Bununla beraber durumu iyileştirilmemiş doğal limanlar da Akdeniz'in bütün etrafında yöresel gereksinimlere karşılık vermeye devam etmişlerdir.

By at least the Early Bronze Age the inhabitants of the Mediterranean region had realized that travel and the transport of merchandise by sea offered significant advantages over conveyance by land: ships or rafts could carry very heavy weights; under the right conditions the wind provided powerful, sustained propulsion; and the ›pathless ways of the sea‹ required neither maintenance nor permission for passage. Ships soon became the largest and most complex machines in the ancient world. Small boats can be launched from land and beached upon arrival at their destination, as long as the beaches are not exposed to high waves. Throughout history, estuaries, river mouths, and protected coves facilitated these manoeuvres, which were simplified by the absence of large tidal changes in the Mediterranean and the restriction of most major storms to the winter season.

At some point in the late 3rd or early 2nd millennium B.C., however, the obvious advantages of larger ships for long-distance trade triggered a search for ways to accommodate and protect a ship between voyages and during the loading or off-loading of cargo. We know nothing about the earliest stages of harbour design, and less than we would like about harbour design and construction during the Bronze Age, a period of intense maritime trade in the Eastern Mediterranean. The archaeological and literary evidence is richer for Phoenician and Greek harbours of the 8th through 5th centuries B.C., and overwhelming for harbours of the Hellenistic through Roman Imperial periods. My assigned task is to survey the whole period in a short article, so there has to be drastic abbreviation of the evidence, and a focus on major issues. The evolution of harbour design was driven by the changing characteristics of the ships that used the facilities, the economic needs of the individuals and groups that constructed them, and changes in available tools and techniques. The symbiotic feedback between the economy and technology is particularly marked in the history of harbour construction.

Hundreds of harbour sites of varying sizes and designs can be documented around the Mediterranean for the 400 years of most intense trade – approx. 200 B.C. to 200 A.D., and undoubtedly many smaller harbours have escaped detection[1]. The catalogue published by K. Lehmann-Hartleben in the early 20th century includes 303 harbours, and most of these he identified only from ancient literary references[2]. Subsequent archaeological research has added many more to the list. The scope of the topic explains why so few useful general studies of ancient harbors have appeared since Lehman-Hartleben's magisterial survey: Blackman 1982, 2008b; Casson 1995, 361–370; de Souza 2000; Flemming 1971; Frost 1972, 1974, 1995; Lehmann-Hartleben 1926; Reddé 1986; Reddé – Golvin 2005; Rickman 1988, 2008; Rougé 1966, 107 f. and 1974; Shaw 1972. A gazetteer of individual ancient harbors

1 Flemming 1971, 27–33; Wilson 2011.

2 Lehmann-Hartleben 1923, 240–287.

with the important bibliography can be found in Blackman 2008b, 664–665, and a collection of ancient sources regarding Greek and Roman harbors in Humphrey et al. 1998, 471–481.

Relief sculpture and paintings, particularly in Egypt, some royal archives, and a few shipwrecks provide us with ample evidence for the intensity of trade by sea in the Eastern Mediterranean during the Bronze Age[3], but the remains of the contemporary harbours are elusive[4]. The rise in relative sea level in the Eastern Mediterranean since the Bronze Age undoubtedly has obscured or destroyed many of the early harbour sites. The typical harbour sites probably were open or partly enclosed bays, anchorages in the lee of a promontory, or behind offshore islands or reefs[5]; other possible sites were river valleys, deltas, and lagoons[6]. The earliest harbour remains so far documented anywhere may be those of the late 3rd millennium B.C. at Lothal in India, where a basin was excavated close to the city walls and lined with walls of baked clay and bitumen. Channels intended for ships connected the basin with the Sabamati River and the Indian Ocean[7]. Similar facilities were constructed slightly later within the walls of Ur, on the Euphrates, and by at least 1800 B.C. along the Nile, at Thebes[8]. Large, slow moving rivers provide a relatively safe refuge for ships, and the alluvial soil along their banks could easily be excavated to provide docking space away from the current. This is probably the type of installation shown on a relief in the early 14th century B.C. tomb of Kenamun at Thebes: personnel using stepped ramps unload goods from Syro-Canaanite merchant ships moored bow to a platform or pavement[9]. Reliefs from the mortuary temple of Queen Hatshepsut at Deir el Bahri show Egyptian cargo ships loading goods at Punt, possibly Somalia[10]. The ships, however, are simply moored bow to a beach, and goods are being carried through shallow water and up gangplanks.

H. Frost suggested that during the Bronze Age, offshore islands and reefs along the Levant, such as those at Tyre, Sidon, and Aradus, were shaped by quarrying to serve as protection for large trading ships[11]. The situation at Alexandria was similar[12]. At all three sites wave-catching channels were cut in the kurkar bedrock, and the blocks removed were used for splash walls behind them. At Dor, south of Ptolemais/Haifa, several low islands just offshore provided partial protection and attracted ships from at least the Middle Bronze Age. A Late Bronze Age quay, its substantial wall and pavement just below present sea level

3 Wachsmann 1998.

4 Blackman 1982a, 90–93; Blue 1997; Casson 1995, 361–363; Frost 1972; Frost 1974; Frost 1995; Raban 1985; Raban 1991; Shaw 1972, 88–90.

5 Shaw 2006, 51–59.

6 Flemming 1971.

7 Blackman 1982a, 90–92; Shaw 1972, 89; cf. Leshnik 1968.

8 Blackman 1982a, 92; Kemp – O'Connor 1974.

9 Wachsmann 1998, 42–60.

10 Wachsmann 1998, 18–29.

11 Frost 1971; Frost 1972; Frost 1973; Frost 1974; cf. Blackman 1982a, 92; Marriner et al. 2008; Poidebard 1939; Raban 1995.

12 Goddio 1998; Goddio – Bernand 2004.

(b. p. s. l.), survives along the south edge of the tel at Dor[13]. Remarkably, an Egyptian papyrus document records a visit to this very harbour by the priest Wenamun sometime around 1100 B.C.[14]. He went on to Byblos, where the harbour consisted of a small natural bay, a rare feature along the Levant[15]. The frescoes found at Akrotiri, which seem to date to the 17th century B.C., show several coastline settlements, but no artificial ports[16]. The ships not at sea seem simply to have been beached. Some Late Minoan structures on the beach at Kommos have been identified as shipsheds[17]. Near Pylos, geophysical prospecting has identified a basin excavated in the coastline, apparently designed for ships serving the Mycenaean palace[18]. In summary, during the Bronze Age, harbours generally were passive in character, consisting of naturally sheltered beaches and bays, or at their most elaborate, of basins excavated in riverbanks and shorelines.

Although these same designs, and some of the same harbours, continued in use into the Iron Age, new sites were made available to shipping from the 9th or 8th centuries B.C. by means of walls built into the sea as breakwaters[19]. The Phoenicians, the greatest maritime traders in this period, seem to have pioneered this technique, and the earliest structures appear at sites they occupied: Tabbat al-Hammam in Syria, Tyre in Lebanon, and Athlit in Israel[20]. These breakwaters were constructed with blocks of the local kurkar bedrock on gravel foundations, the blocks laid with their short ends facing out to increase their resistance to displacement. Although disruption of the shoreline currents with breakwaters could cause problems with siltation, Phoenician engineers discovered how to channel wave water into the basin behind a breakwater, fostering a current that helped keep the anchorage clear. Such rock-cut channels can still be seen at Sidon and Dor[21]. The Carthaginians, Phoenician colonists, carried all of these techniques with them to the Western Mediterranean. Offshore islets augmented with early breakwater walls can be seen at Apollonia and Leptis Magna in Libya, while artificial basins were excavated in the soil of the coastline at Carthage and Motya, and in the bedrock at Mahdia[22]. In the Carthaginian context these in-shore basins were termed cothons.

While the low, unbroken coastlines and sandy beaches of the Levant and North Africa fostered use of the designs described above, the broken, karstic landscape of the Aegean offered innumerable naturally protected bays. As a result, artificial harbour structures become common in this region only in the 7th and 6th centuries B.C., as competition

13 Raban 1985; Raban 1987.

14 Casson 1991, 47–53.

15 Wachsmann 1998, 40–41.

16 Wachsmann 1998, 86–91.

17 Shaw 2006, 124–125.

18 Zangger 1997, 613–625.

19 Blackman 1982b, 182–193; Casson 1995, 363–370; Shaw 1972, 90–94.

20 Braidwood 1940; Raban 1985; Haggi 2010.

21 Poidebard – Lauffray 1951.

22 Laronde 1996; Bartoccini 1958; App. Hann. 8, 14, 96; Cintas 1973; Hurst 1994; Hurst – Stager 1978; Isserling 1974.

for trade and resources became intense. The earliest such structure that can be dated is the long rubble-mound breakwater at Samos, attributed by Herodotus to Polykrates, who ruled around 530 B.C.[23]. Only a commercially successful tyrant could afford such expenditure. A similar structure at the rich sanctuary of Delos may be as early as the 7th century B.C.[24]. Piraeus, the port city of Athens, is a good example of the typical Greek harbour, or *limen*, of the Classical period, in which several natural bays were enhanced by the provision of breakwaters – *chomata* – built out from shore[25]. These provided a safe anchorage – *hormos* – that might be fitted out with quays if the traffic warranted it. A commercial harbour – *emporion* – required porticoes, offices, and warehouses, while a naval base – *neorion* – was supplied with shipsheds – *neosoikoi* – for the military ships, and arsenals – *skeuothekai* or *hoplothekai* – for their gear[26].

One development of the intensely competitive Classical period was the *limen kleistos*, a harbour basin enclosed within city walls, its mouth narrow enough to be blocked with a chain to keep out enemy vessels[27]. Knidos provides a well-preserved example[28]. Some of these ›closed harbours‹, such as Mounychia at the Piraeus and the circular harbour at Carthage, were specifically military ports devoted to the expensive triremes and other oared war vessels that had to be stored out of the water in shipsheds[29]. The separation of military from commercial harbours reflects both the growing disparity in the design of warships and merchant ships after the 8th century B.C. and the increasing sophistication of maritime technology in general.

Despite this general increase in sophistication, small beach harbours remained common. Homer describes the ideal harbour of the fortunate Phaeacians as beaches on either side of a projecting headland, with a channel connecting the two[30]. The unique location of Corinth, next to the narrow isthmus that connected the Peloponnesos with the mainland of Greece, ensured its prosperity from the Bronze Age through the Byzantine period. The city controlled the land trade that used the isthmus and attracted as well sea traders who wished to avoid the long and risky voyage around the southern tip of the Peloponnesos[31]. Goods could be bought and sold at both Kenchreai, the Aegean harbour, and Lechaion, the harbour on the west-facing Gulf of Corinth[32]. The fact that the Lechaion harbour involves a ›cothon‹ basin raises interesting questions concerning the influence of Phoenician or Carthaginian harbour technology on Corinthian engineers. In the 6th century B.C., possibly under Periander, a paved roadway 8 km long, the *diolkos* (›haul across‹), was

23 Hdt. 3, 60.

24 Duchêne – Fraisse 2001; Paris 1916.

25 Garland 1987.

26 Blackman 1982a; Blackman 1982b; Blackman 2008a; Blackman 2008b; Blackman – Rankov 2014; Casson 1995, 362 f.

27 Lehmann-Hartleben 1923, 65–74.

28 Lehmann-Hartleben 1923, 126–127.

29 Blackman 2008a; Blackman 2008b, 657–660; Blackman – Rankov et al. 2014; Morrison et al. 2000.

30 Hom. Od. 6, 262–269.

31 Strab. 8, 6, 20.

32 Scranton et al. 1978; Paris 1915; Rothaus 1995.

built across the isthmus, allowing teams of oxen to haul ships or their cargoes across on dollies[33].

The Etruscans, a major Mediterranean sea power until around 400 B.C., for the most part accommodated their ships in river mouths and lagoons, or beached them. The Arno, Ombrone, Marta, and Tiber rivers are all associated with important Etruscan cities, and they formed routes to the interior of the peninsula. Ships bound for Pisa or Rusellae could anchor in large natural lagoons adjacent to the habitation area[34]. Near two of the mouths of the Po River, the trading centres of Adria and Spina were built on artificial islands, like an ancient Venice[35]. Rubble-mound breakwaters gave partial protection to anchorages at Pyrgi and Graviscae, while at Populonia a breakwater constructed of large stone blocks on top of a rubble mound foundation provided extra protection to a deep natural bay[36]. These harbours handled the export of vast amounts of grain, iron blooms, and minerals to the Greek world, paid for with olive oil, wine, fine ceramics and other manufactured goods, and silver.

The marked increase in prosperity and sea trade during the Hellenistic period, the concentration of wealth and power with the monarchs of large kingdoms, and the growing size of warships and merchant vessels resulted in the construction of increasingly large and elaborate harbours. Alexandria, the outlet for all the wealth of Egypt, was particularly splendid[37]. A causeway 1,250 m long connected the offshore island of Pharos with the mainland, forming two large basins that were further protected by exterior and interior breakwaters and enhanced with quay walls and dry docks[38]. A canal connected the western basin with Lake Mareotis and the Nile. In the mid-3rd century B.C. Ptolemy II (283–246 B.C.) hired Sostratos of Knidos to build a lighthouse 100 m tall on Pharos to guide mariners to the harbour, which otherwise was difficult to find on such a low-lying coast[39]. Pliny the Elder[40] reports that Sostratos also was the first to build harbour-side colonnades, at Knidos, another indication of a new focus on the harbour as a hallmark of urban sophistication. The harbour of the maritime power Rhodes was equally elaborate, incorporating several basin and a colossal bronze statue of the god Helios, designed by Chares of Lindos around 280 B.C.[41]. The growing self-consciousness and complexity of harbour engineering in the mid-3rd century B.C. is symbolized by Philo of Byzantium's »*Handbook of Harbour Construction*« – *Limenopoiika* – of which we unfortunately have only the title[42]. Nevertheless, it remained difficult for engineers to predict the behaviour of sediments behind breakwater or jetty walls. In the mid-2nd century B.C., King Attalos Philadelphos (159–138 B.C.)

33 MacDonald 1986; Pettegrew 2012; Raepsaet 2008, 592–594.

34 cf. Bruni 2003; Naumann 1963.

35 Kracht 1995.

36 Oleson 1977; McCann 1977.

37 Strab. 16, 1, 6–10; Goddio 1998.

38 Athen. 5, 204c. d.

39 Brodersen 1992; Giardina 2010.

40 Plin. nat. 36, 83.

41 Plin. nat. 34, 41; Brodersen 1992.

42 Blackman 2008b, 643.

attempted to improve the harbour of Ephesos by building jetties at the mouth of the Cayster River, but according to Strabo he only managed to clog the harbour basin with sediment[43].

There was no real further progress in harbour engineering until the development of hydraulic concrete by the Romans around 200 B.C.[44]. Unlike the standard mortars and plasters used in the Mediterranean world since the 6th or 7th millennium B.C.[45], hydraulic mortar substitutes a pozzolanic additive for the relatively pure silica sand. The additive contributes alumino-silicates, allowing the mortar to set underwater. Roman engineers who built in the sea used a sand-like volcanic ash, *pulvis puteolanus* (»powder from Puteoli«), as their pozzolanic additive. Several passages in Vitruvius' *De architectura*[46] describe this material and outline the methods of harbour construction both with and without hydraulic mortar. Vitruvius[47] also provides our only detailed description of the wooden formwork into which Roman concrete was poured[48]. As Vitruvius makes clear, only the use of hydraulic mortar allows the concrete to be placed in forms filled with seawater.

Roman engineers quickly realized the special suitability of this material for the construction of hydraulic installations, bridge footings, and harbour structures. The mastery of hydraulic concrete, combined with other engineering innovations, enabled Roman engineers to construct harbours nearly anywhere political, economic, or military considerations dictated, and not simply where advantageous physical features existed. These harbours were a major factor in the success of the Roman imperial system.

It is likely that this great technological advance was first achieved in the region around the port city of Puteoli (modern Pozzuoli) at the north end of the Bay of Naples[49], and the breakwater there may be the earliest harbour structure built with this material. Strabo[50] describes the advantages of the local pozzolana, which he renders in Greek as *ammokonía*: »Puteoli has become a great trade centre, since it has man-made harbours – thanks to the natural quality of the volcanic sand. Measured out in proper proportion to the lime, the sand forms a strong bond and cures solidly. In consequence, by mixing the sand-ash with the lime, they can run breakwaters out into the sea and turn open beaches into protected bays, so that the largest merchant ships can moor there safely.«

Concrete piers or breakwaters could be placed on a sandy seabed, but more frequently they were laid on top of submerged rubble foundations of the type built by Polykrates or the Etruscans in the 6th century B.C. Pliny the Younger[51] provides a unique eyewitness

43 Strab. 14, 1, 24. On dredging harbours see Höckmann 2007.

44 Blake 1947, 308–318; Blackman 1982b, 196–197; Brandon et al. 2014; Gazda 2001; Lechtman – Hobbs 1987; Lugli 1957; Oleson 1988; Oleson et al. 2004; Oleson et al. 2006.

45 Gourdin – Kingery 1975; Kingery et al. 1988.

46 Vitr. 5, 12.

47 Vitr. 2, 6, 1.

48 Brandon 1996; Brandon 1999; Brandon et al. 2014, 14–23, 189–222; Oleson 1988; Schläger 1971.

49 Brandon et al. 2008; Brandon et al. 2014, 233–236; Jaschke 2010; Lechtman – Hobbs 1987, 89; Oleson et al. 2004; Piromallo 2004.

50 Strab. 5, 4, 6.

51 Plin. epist. 6, 31, 15–17.

account of this type of breakwater under construction at Centumcellae, modern Civitavecchia, in the early 2nd century A.D.: »The technique by which the mole is built has got to be seen. A wide barge brings enormous stones right up to it and throws them in one on top of another. Their weight keeps them in position, and little by little a sort of rampart is constructed. A kind of stony hump can already be seen rising above the water which breaks the waves that beat upon it and tosses the spray high in the air with a great roar; the sea all around is white with foam. Masses of concrete will be laid on top of the stones, and as time passes it will come to resemble an island.«

Making use of the new concrete technology, by the mid-2nd century B.C. Roman harbour engineers began to construct large and successful harbour installations at sites along the shelving Italian coastline that otherwise would have remained unprotected. The harbour of Cosa is the earliest well-studied example[52], and hundreds of others followed the spread of Roman power throughout the Mediterranean and into the Atlantic[53]. The ROMACONS project has provided evidence that all the harbours employing hydraulic concrete made use of pozzolana imported from the region around Puteoli, attesting to an enormous, otherwise undocumented, trade in this specialized construction material[54].

Portus, the port of the city of Rome, was formed by two immensely long concrete breakwaters that framed an artificial barrier island with a lighthouse; the main basin was partly excavated into the shoreline and served as an anchorage[55]. An enormous hexagonal basin with quays for unloading ships was excavated into the soil south of the main basin; it was connected to both the main basin and the Tiber by canals. There are strong parallels with the Carthaginian ›cothon‹.

Sebastos, later called Portus Augusti, the artificial harbour built for King Herod's port city of Caesarea Maritima in Palestine, has the distinction of being the first and one of the largest completely artificial harbours constructed in the ancient Mediterranean[56]. Roman harbour engineers supervised the project, and its successful completion marked a real breakthrough in the technology of harbour construction. The two breakwaters, 500 m and 200 m long and 60 m wide, were composed of enormous blocks of concrete laid on a foundation of imported river stones. Our recent fieldwork at Sebastos has shown that approx. 20,000 tons of pozzolana were imported from the Bay of Naples some 2,000 km to the west; equally enormous amounts of lime, rubble, and timber had to be brought in from around the Levant. Because of the exposed shoreline, many of the concrete blocks were cast in single-use barge forms, which were floated out to the intended site, and quickly filled with mortar and aggregate until they sank in position[57].

52 Brandon et al. 2014, 63–69; Ciampoltrini – Rendini 2004; McCann et al. 1987.

53 Blackman 1982a; Blackman 1982b; Blackman 2008b; Brandon et al. 2014.

54 Brandon et al. 2014; Oleson et al. 2004; Oleson et al. 2006.

55 Keay et al. 2005.

56 Brandon 2008; Branton – Oleson 1992; Hohlfelder 1996; Hohlfelder 1997; Hohlfelder 2000; Hohlfelder 2003; Hohlfelder et al. 2007; Holum – Hohlfelder 1988; Oleson et al. 1994; Raban 1989; Raban 2009.

57 Brandon 1996; Brandon 1999; Brandon 2008; Brandon et al. 2014, 208–222.

Pozzolana was also imported for the renovation of the harbour of Soli/Pompeiopolis on the south coast of Turkey[58]. This Hellenistic harbour site had been renovated by Pompey the Great in the 1st century B.C., then some sort of further renovation or rebuild took place under Antoninus Pius, who commemorated the act with a coin showing two long breakwaters reaching out into the sea. These structures were 320 m long and framed a basin 180 m wide. It is not completely clear whether the impressive breakwater visible today was built in the 1st century B.C. or the 2nd century A.D., but the method of construction was innovative. Instead of wooden forms, large rectangular compartments approx. 30 × 20 m were built of stone blocks, and the concrete was placed inside, pozzolanic concrete below sea level, and non-pozzolanic concrete above. The results were both impressive and durable.

The evolution of harbour design in the ancient Mediterranean world can be linked both to changing political and economic needs and to the development of new construction technologies. Simple natural anchorages met the needs of the earlier ancient mariners and in fact never fell completely out of use. Throughout the course of ancient Mediterranean history, they were employed where necessary and appropriate for meeting the maritime needs of coastal communities[59]. Even today at the small, coastal towns that neighbour the ruins of ancient Aperlae[60], one can see small cargo craft anchoring near shore to facilitate the off-loading of sacks of charcoal or cases of soft drinks. The crew slips over the side into the shallow water and wades ashore carrying their boat's cargo on their shoulders. This simple solution to the absence of permanent harbour installations must have been repeated daily in ancient coastal settlements throughout the Mediterranean.

Such *ad hoc* solutions to problems faced by small communities sustained by regional coastal trade, however, did not suffice for the larger hubs, gateway port-cities such as Sebastos that were the emporia for international trade. When a greater requirement for maritime transport led to the building of larger ships to meet this demand, advances in technology permitted more sophisticated building in the sea. With new materials and techniques, poorly protected natural harbours like Alexandria or Puteoli could be enhanced, and new harbours could be constructed on a grand scale, resulting in the massive projects at Sebastos, Portus, Pompeiopolis, and the harbours of Constantinople[61].

58 Brandon et al. 2010; Brandon et al. 2014, 95–102.

59 Blackman 2008b, 645–646.

60 Hohlfelder 2005a; Hohlfelder 2005b.

61 Covington 2009; Müller-Wiener 1994.

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Ancient Shipsheds

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Abstract

The paper concentrates on evidence for ancient shipsheds from the coast of Turkey and the eastern Aegean. It describes definite and possible new evidence, and urges research into some important sites such as Knidos and Kyzikos. It stresses the importance of shipsheds as a diagnostic feature of ancient military harbours, providing evidence not only for the dimensions of ancient warships but also for the naval strategy of coastal cities, and in particular of cities on offshore islands such as Rhodes and Samos, with their mainland possessions (*peraiai*). In conclusion, the paper emphasizes the anonymity of ancient dockyards in Turkey, compared with those of later periods.

Özet

Yazı, Anadolu ve Doğu Ege kıyılarındaki antik gemi barınaklarına dair bulgular üzerinde yoğunlaşmaktadır. Belirli ve olası bu yeni bu bulguları tanımlamakla birlikte, Knidos ve Kyzikos gibi önemli kentleri araştırmaya teşvik etmektedir. Askeri limanların saptanmasında gemi barınaklarının önemi, bu barınakların sadece savaş gemilerinin boyutları hakkında değil, aynı zamanda kıyı kentlerinin ve özellikle Rhodos, Samos gibi kıyıdan uzak adalar ve ait oldukları anakaranın (*Peraiai*) deniz stratejisi hakkında bilgi verdiği vurgulanmaktadır. Son olarak, daha geç dönemlerle karşılaştırarak Türkiye'deki antik tersanelerin anonim olduğu belirtilmektedir.

This paper will concentrate on Turkey and the eastern Aegean. We are hearing expert presentations on a number of sites during this seminar; I shall mention some other sites where there is new information or there are questions to be asked, notably on the subject that has always been of particular interest to me: ›shipsheds‹ – covered slipways – a diagnostic feature of ancient military harbours or dockyards. A team of us are writing a book on »Shipsheds of the Ancient Mediterranean«, which we hope to finish this year. We have just heard a presentation by Bjørn Lovén, on his major investigation of the military harbours of Piraeus. Kalliopi Baika, another member of our team, has (as we have also heard) worked on a number of shipshed sites, mainly rock-cut but including also Corcyra. Maria