Chapter 3
A History of Shipshed and Slipway Research and Excavations

The archaeological investigations of the Athenian naval installations in the Piraeus are nearly as old as the discipline of archaeology itself. Shipshed research began here effectively in the early years of the 19th century and has enjoyed some 190 years of discovery. The intriguing linear and parallel stone structures that slope upward out of the sea have attracted many pioneers in the field, including, among many others, Wilhelm Dörpfeld, who also worked with Heinrich Schliemann at Troy and Mycenae. Early scholars, in their contributions, helped shape research questions that are still relevant today, and they documented ancient structures that in several areas of the Piraeus have since been completely built over or utterly destroyed by modern urbanisation. It is a unique history, and one well worth preserving.

The first part of this chapter (Section 3.1) surveys the history of research and excavation in the three harbours of the Piraeus – Zea, Mounichia and Kantharos – from the earliest scholars interested in the topography of the harbours to the most recent archaeological excavations. This history spans the years 1821 to 2010 and concentrates on the essential contributions of each researcher. The second part (Section 3.2) surveys the research and excavations of shipsheds and slipways in the wider Mediterranean world in antiquity. As demonstrated by the following chapters, the study of the architectural and contextual details of these other sites has helped shed much light on the Piraean naval installations.

3.1. A History of Shipshed (and Slipway) Research and Excavations in the Piraeus

3.1.1. The Zea Shipsheds

The 19th Century

Several waves of German and English antiquarians and topographers arrived in the Piraeus beginning in the early 19th century, drawn to its three harbours by, among other things, the ancient ruins visible along the shoreline and under water. Among the first of these visitors was W.M. Leake, who investigated both Athens and the Piraeus and published his findings in *The Topography of Athens* (1821, 2nd edn. 1841;

Fig. 7).[1] In his 1821 publication Leake reports: "In the ports, particularly in port Munychia [Zea], are traced, in several parts of the beach, the foundations of walls running into the water at right angles to the beach, intended probably as places of shelter for small boats, or as foundations for boat-houses". In his 1841 edition he reports: "In the ports, particularly in Port Munychia [Zea], are traced, in several parts of the beach, the foundations of walls running into the water at right angles to the beach; the remains undoubtedly of ancient wharves or jetties".[2] Although Leake refrains from identifying the partly-submerged wall foundations as "boat-houses" in the 1841 edition, some of them were in all probability related to shipshed and slipway structures.

On F. Aldenhoven's map *Plan topographique d'Athenes et de ses environs* (1837) there are structure lines parallel to the shore in the southeastern and southwestern parts of Zea that may be related to shipsheds (Fig. 4).[3]

In 1841, the earliest traceable possible shipshed (or slipway) structures appear on a map of the Piraeus prepared by E. Schaubert for E. Curtius' publication, *Commentatio de portubus Athenarum*. Here, structures on the western side of Zea and the southern shore of Kantharos were identified as *neoria* (Figs. 8, 33).[4] The term '*neoria*' is probably used here to describe remains of 'shipsheds' and/or 'slipways' (see also pp. 3–4). Other unidentified structures illustrated on his map, particularly on the northeastern side of Zea, may also represent the remains of shipsheds or slipways.

Whatever ambiguity remained regarding the identification of these structures along the shore began to disappear in 1834, when construction workers digging through a late Roman or early Byzantine portico near Kantharos Harbour stumbled upon a cache of extraordinarily important finds: stone inscriptions now known as the Naval Inventories. These inscriptions were first published by A. Böckh in *Urkunden über das Seewesen des Attischen Staates* in 1840.[5] In addition to containing an abundance of information on the administration of the Athenian fleet of the 4th century BC, they also include information on the number of shipsheds lining the waterfronts of all three Piraean harbours.

The initial publication of the Naval Inventories in 1840 set the stage for H.N. Ulrichs, whose illuminating dissertation, *Topographie der Häfen von Athen* (1843, re-published in 1863), clears up a number of puzzles. He solidly identifies the location of Kantharos for the first time based on *horoi* (boundary stones) found there. To identify Zea and Mounichia, he correlates the length of the shoreline of each harbour with the number of shipsheds listed in the Naval Inventories.[6] These identifications remain valid to this day. Ulrichs also conducted first-hand observations of the submerged remains of possible shipsheds (or slipways) in Zea: "Substantial remains of the structures in the water, made of excellently fitted blocks, are present around the basin. At many places one can see, a little under the surface of the water, little stone embankments that run out from the shoreline alongside one another into the sea and without a doubt carried the individual shipsheds".[7]

On Ulrichs' 1843 map entitled *Athen mit seinen Häfen und Befestigungen* (Fig. 5), parallel lines run from shore into the basins of all three harbours,[8] but curiously none of these structures appear on the map that accompanies the 1863 re-publication (Fig. 6).[9]

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1. Leake 1841: 363–412, pl. 4, *Antiquities of Phalerum, Peiræus and Munychia* (about 1:17,000) includes the nautical survey of Captain Graves. On this map the symbol "+" marks areas along the shore as 'dangerous underwater rock of uncertain depth' and may in some instances show areas of submerged slipway and shipshed remains. Leake misidentifies Zea as Mounichia ("Munychia").
2. Leake 1821: 344; 1841: 412.
3. This is a very rare map reproduced by Papageorgiou-Venetas 2001: fig. 60. Aldenhoven misidentifies Zea as Mounichia, and Mounichia as Phaleron.
4. Curtius 1841: 1–49, esp. Schaubert's map (1841), entitled *Peninsula Piraica cum portubus subjectis* (*ca* 1:25,000). This is a very rare publication; the plan is reproduced by von Eickstedt 1991: fig. 5.
5. Böckh 1840. These were later republished in 1927 (with additional fragments unknown to Böckh) by J. Kirchner in IG *II*^{2}, 1604–1632, including a bibliography of earlier publications on the inscriptions.
6. Ulrichs 1843: 647–676 and pl. I; re-published in Ulrichs 1863: 156 (map), 158–183. On the Piraeus *horoi* see Garland 2001: 140–141.
7. Ulrichs 1863: 172: "Die Reste der Wasserbauten aus großen vortrefflich gefügten Quadern sind hier rings um das Bassin außerordentlich bedeutend. An vielen Stellen sieht man wenig unter der Oberfläche des Wassers kleine Steindämme, die vom Ufer aus parallel neben einander ins Meer laufen und ohne Zweifel die einzelnen Schiffshäuser trugen". Translation: S. Kennell.
8. Ulrichs 1843: pl. I. The map has been reproduced by von Eickstedt 1991: fig. 6.
9. Ulrichs 1863: 156 (map: *Die Häfen und Langen Mauern von Athen*).

In 1868 Curtius followed up his 1841 work with *Erläuternder Text der Sieben Karten zur Topographie von Athen*, which includes the map *Plan vom Peiraieus* drafted by C. von Strantz in 1862. On this, portions of Zea's shoreline are labelled as shipshed foundations (Fig. 9).[10] In a description of the map, Curtius writes: "Beneath this is the harbour of Zea with 196 shipsheds; their width varies between 4.30, 4.40, 3.90 [metres]."[11] It is not clear whether Curtius measured only three possible shipsheds, or found these measurements repeated in a number of structures.

In 1868 D. Pantazis also published a map of the Piraeus showing shipsheds in the same areas of Zea and Kantharos as Schaubert's map (that is, Curtius 1841; Figs. 8, 33).[12] The map is roughly traced from Schaubert, and Pantazis does not discuss the two sites in the text. As a result, Pantazis' map is not included in this study.

In 1872, nearly 30 years after Ulrichs' tentative explorations around Zea's shore, B. Graser published *Meine messungen in den altathenischen kriegshäfen,* based on a three-day exploration of Zea and Mounichia. His was the first investigation to examine both dry and submerged structures, and his fieldwork contributes important information on the length of possible submerged shipshed (or slipway) structures, their individual widths, and the abundance of remains preserved under water.[13] Graser began his investigations at the bay of Phaleron, proceeded next to Mounichia, and then to Zea, where he was accompanied for a day by Mr. Dalmann from Hamburg, a hydraulic engineer.[14]

In addition to describing a large number of unidentified structures in both harbours, Graser identified the remains of nine possible shipsheds at Mounichia, and another 40 at Zea. Curiously, Graser's valuable report has found few readers in modern shipshed research and reference to it has only been made in passing.[15]

On the first day of investigations seawater destroyed Graser's metric scale; not to be put off, he instead employed a 1.345 m-long wooden stick that floated on the water's surface, with lead weights tied to each end to align the scale to the submerged architectural remains. Graser focused his measurements mainly on what he identifies as the width of the shipsheds, and reports his measurements to three decimal places.[16] He probably misunderstood some of the individual structures (e.g. ramps, open-passages, side-passages, colonnades, side-walls) and how they were related to each other. Therefore, it must be stressed that not all the structures recorded by Graser necessarily are remains of shipsheds or slipways.

In addition, there are some lacunae. For example, Graser refers to a drawing related to his investigation "the red A on my drawing", which unfortunately is missing in the final publication; the drawing would have given a better idea about the location of the architectural structures in question.[17] Even so, Graser's investigations provide useful information that will be discussed in the following chapters.

In the winter of 1876/77, G. von Alten prepared three maps of the Piraeus, which were later published in Curtius and Kaupert's *Karten von Attika, Heft I* (1881), plates II and IIa, and *Karten von Attika, Heft II* (1883), plate III. The most detailed of the three, *Die Halbinsel Peiraieus* (plate II), shows structures in the sea that von Alten identifies as shipsheds in the southeast, northeast, northwest and southwest parts of Zea (Fig. 10). In this present study these structures are classified as possible shipsheds (or slipways). All three maps provide important information on the topography of the naval installations at Zea.

In 1881, von Alten published what he presumes to be a shipshed next to a structure that he identifies as an ancient tower foundation on the southeast shore of Zea (Figs. 2, 13).[18] These correspond to structures

10. Curtius 1868: pl. II (von Strantz 1862), "Fundamente der Schiffshäuser".
11. Curtius 1868: 61: "Darunter der Häfen Zea mit 196 Schiffshäuser; die Breite derselben schwankt zwischen 4,30, 4,40, 3,90". Translation: S. Kennell.
12. Pantazis 1868: map on p. 237.
13. Graser 1872: 1–65. Graser states that he is working in the English foot unit (0.3048 m); his nouns are not capitalised in the text.
14. Graser 1872: 37–38.
15. See, e.g. Judeich 1931: 434, n.2, 439, n.2; Rados 1915: 82; Blackman 1995b: 231–232; 1996a: 114, n.6; Garland 2001: 156, 219; Baika 2003b: 359–360.
16. Graser 1872: 11–12. Accuracy to the third decimal point is probably unattainable using the described method, although he excuses himself: "but excessive precision can never do any harm" ("aber allzugrosse genauigkeit kann nie schaden").
17. See, e.g. Graser 1872: 45: "roth A auf meiner zeichnung".
18. Von Alten 1881: 12, figs. 2–3, pl. II.

classified as possible shipsheds recently surveyed in Area 3 by the ZHP (pp. 36–37).

In 1881, A. Milchhöfer reported shipshed remains along the eastern shore of Zea.[19] He also saw numerous unfluted limestone column drums with a diameter of about 0.60 m, which he believes could belong to a stoa that lay between the shipshed complex and the town. The column drums, he notes, are located all around Zea, but concentrated in the eastern part. In this last area were also found several marble eyes (*ophthalmoi*) of ancient ships.[20]

The following year, 1882, A. Meletopoulos mentions the remains of two possible shipsheds in his paper on the Arsenal of Philon, which he presented at a meeting of the Piraeus Philological Society. The presumed shipsheds were found on the northwest side of Zea on 20 April, 1882, during the excavations of the foundations for a house being built by a Mr. Loizos (Fig. 2). The short report includes a plan of the Piraeus (not to scale), a site plan, and three sections at a scale of 1:100 (Figs. 14–16).[21]

Dragátsis 1885–1899 (Dörpfeld 1885)

By far the most important publication to date on the Zea shipsheds is I.C. Dragátsis' *Ἔκθεσις περὶ τῶν ἐν Πειραεῖ ανασκαφῶν* ("Report on the Excavations in Piraeus"), the 1885 report on the rescue excavations of a section of shipsheds on the eastern side of Zea (Area 1; Fig. 2).[22] The shipsheds were exposed during roadwork, and Dragátsis directed rescue excavations between 1 March and 30 June, 1885. Dörpfeld joined the continuation of the excavations later the same year, between 11 November and 5 December. It was during the second campaign that the structures were identified as shipsheds and documented by Dörpfeld (Pls. 17, 20). In an appendix to the report, dated 29 September, 1886, Dragátsis describes two columns (τ and υ) in the colonnade dividing Shipsheds 18(χ)/19(φ), two ramps (18(χ) and 19(φ)), and a part of the back-wall (α–ο) behind Shipsheds 19(φ) and 20(π) (Pls. 15–17), all of which were exposed during roadwork on the land of a Mr. Bonis some weeks prior.[23] Dragátsis' report states that "…in order to complete the entire inquiry, it would have been desirable to investigate the lines continuing far into the sea, which can be seen early in the morning, especially when the waters are calm, since the light at that time of day is helpful".[24] These remains are not discussed further in the report, but on Dörpfeld's plan there are architectural structures highlighted in the sea (Pl. 17), thus demonstrating their *in situ* preservation at the time.

In the article *Meine Tätigkeit für die Griechische Archäologische Gesellchaft* in the centenary volume of the Greek Archaeological Society in 1937, Dörpfeld notes that his involvement in the 1885 excavations was to help Dragátsis and to draft a plan and two sections. In the very short section on the Zea shipsheds, Dörpfeld reports that the sea level had risen about three metres since antiquity, thus accounting for the continuation of the shipsheds under water.[25]

Dragátsis attempted to convince the owners of the land – Mr. Bonis (in the northern portion) and Mr. Kupa (in the southern portion), both marked in red on Dörpfeld's plan (Pl. 17) – to turn over those parts of their properties that contained shipshed remains to the Greek State. He also proposed that the rest of the excavated areas should be enclosed by a fence.[26] This may explain why the southern portion of the site was not built over until 1911, and the northern area remained untouched until the late 1950s (see below).

During the Second World War large parts of the Piraeus were destroyed, and the rebuilding of the town took place very quickly thereafter. In the 1950s I.A. Meletopoulos commissioned four photographs of the

19. Milchhöfer 1881: 23–72.

20. Milchhöfer 1881: 58. One *ophthalmos* is on display in the Archaeological Museum of the Piraeus (inv. no. 3465–2674). Such eyes appear in abundance in the iconography of ancient ships, both of war and commerce: see Carlson 2009.

21. Meletopoulos 1882: 15. The plan and sections follow the text without figure numbers. A copy of this rare publication was kindly given to the author by J. Berbili of the Hellenic Maritime Museum.

22. Dragátsis 1885: 63–71, pls. 2–3.

23. Dragátsis 1885: 70.

24. Dragátsis 1885: 70, "Εὐχῆς ἔργον θὰ ἦτο πρὸς συμπλήρωσιν τῆς ὅλης ἐρευνας νὰ ἐμελετῶντο αί ἐν τῇ θαλάσση ἐπὶ οὐ σμικρὸν κατατεινόμεναι γραμμαί, ἂς δύναται τις τὸ πρωΐ μὰλιστα νὰ παρατηρήσῃ ἠρεμούντων τῶν υδάτων, διότι τότε βοηθεῖ τὸ τῆς ὥρας ἐκείνης φῶς." Translation: P. Athanasopoulos.

25. Dörpfeld 1937: 11. The present author wishes to thank Dr. G.S. Korres for bringing this article to his attention.

26. Dragátsis 1885: 70.

Sirangiou 1 lot before it was built over (Figs. 59–62).[27] By a twist of fate, the upper ends of Shipsheds 16 (unnamed), 17(η) and 18(χ) were preserved, and remain so today, in the basement of the apartment block Sirangiou 1, which was built in the late 1950s. It is possible that I.A. Meletopoulos was in some way connected with the preservation of the site. The upper ends of the Sirangiou 1 shipsheds are extremely important because they provide solid reference points to the structures excavated in the sea (Pls. 2, 15).

In *Die Stadt Athen im Altertum* (1890) C. Wachsmuth provides relatively detailed structural descriptions of the shipsheds excavated by Dragátsis and Dörpfeld (1885), particularly of the ramp construction,[28] and argues that the column drums and wall identified as elements of a stoa by Milchhöfer in 1881 belonged instead to shipsheds.[29]

In March 1891, a glass-plate negative photograph (PIR 6) was taken of the shipsheds excavated by Dragátsis in 1885 (Fig. 55; Pl. 32).[30] The structures in the photograph are identified by the present author as, from left to right, the upper ends of Phase 3 Shipsheds 20(π), 21(Δ), 22(N) and 23(Π) (see p. 75). The so-called Pasha's House in the background was built in 1890, just a year before the photograph was taken.[31] The photograph contains important architectural information on the back-wall, ramps, side-passages and colonnades of these shipsheds. Apart from a small section of the back-wall barely visible under the veranda of this house, which is still standing (at Sirangiou 2; Fig. 2), the upper ends of these shipsheds have been completely covered by a garden and other modern structures (Fig. 56).

The 1885 excavations have continued to play an essential role in the general research of shipsheds and ancient warships. This is not only because the structures are the first well-documented shipsheds from antiquity, but also because Dörpfeld's plan and sections are still among the finest scholarly publications dealing with such finds. Further, they are probably the only positively identified *trireme* shipsheds from antiquity in the Mediterranean (see pp. 172–173).

In 1892, the industrious Dragátsis identified three features found during the excavation of a Roman bath on the northwest side of Zea as the remains of shipsheds (Figs. 2, 18).[32] The excavation report provides only a brief description, but the detailed site plan (1:200) is useful for analysing these structures that are classified here as possible shipsheds.

In 1899, 14 years after his initial shipshed excavations at Zea, Dragátsis excavated an unknown number of possible shipsheds on the southeast side of Zea, adjacent to the 'Ziller neighbourhood', which is located on the southeastern side of Zea (Figs. 2, 10; exact location of excavation unknown). Here he found the back-wall of the possible shipsheds, and in the summary excavation report, published without any architectural plans, he merely mentions that it was constructed in the same way as the back-wall found in the 1885 excavation, with spur-walls placed at similar intervals. In his report Dragátsis complains of not locating any important finds such as inscriptions or sculpture. Nevertheless, he handed the catalogue and the finds to the General Ephorate of Antiquities: listed are a few bronze nails, some coins (badly preserved), and a marble eye from an ancient ship (*ophthalmos*).[33]

The 20th Century: Synthesis, Destruction and Puzzle Pieces

After Dragátsis and Dörpfeld's work at Zea the pace of new discoveries of naval installations in the Piraeus slowed somewhat, and research into its shipshed complexes entered a more analytical phase. Among the first to make use of the past eight decades of material was W. Judeich, who published his *Topographie von Athen* in 1905 (reprinted in 1931). His discussion incorporates the empirical evidence collected by von Alten, Dragátsis and Dörpfeld and makes important contributions toward analyses of harbour topography and

27. Piraeus Historical Archive, I.A. Meletopoulos Archive. The photos were located by I. Triantafillidis in 2007.
28. Wachsmuth 1890: 67–69.
29. Wachsmuth 1890: 66, n.3.
30. Deutsches Archäologisches Institut Athen, negative no. PIR 6. According to Dr. M. Krumme (pers. comm., 2005) Dörpfeld was either the photographer or its commissioner.
31. Mr. G.H. Tzivaniotis (current owner), pers. comm., 2008. The house was bought by his grandfather in 1911.
32. Dragátsis 1892: 17–29, esp. 22–23, pl. A. The excavation report bears no title, and is addressed to "the President".
33. Dragátsis 1899: 37–39.

the evidence of double-unit shipsheds (Fig. 11; see p. 150).[34]

In 1915, C. Rados described the shipsheds excavated by Dragátsis and Dörpfeld in 1885 as 45 m long, which is roughly the length of the longest structure on Dörpfeld's plan, the side-wall (λ).[35]

K. Lehmann-Hartleben's *Die Antiken Hafenanlagen des Mittelmeeres, Beiträge zur Geschichte des Städtebaus im Altertum* (1923, reprinted in 1963) remains an important monograph on ancient Mediterranean harbours.[36] He briefly mentions the Zea shipsheds, and this work will only be referred to here in the discussions of the double-unit shipsheds.[37]

The report of the annual general assembly of the Hellenic Maritime Museum foundation, held on 21 March, 1965, mentions 13 column drums belonging to shipsheds.[38] They were found in 1964 during the dredging work related to the construction of the modern marina on the northwest side of Zea, next to the *Rowers' Club* (Όμιλος Ερετών), built in 1885 (Fig. 2). The drums are described as made of local Piraeus stone, in all probability meaning the yellowish-grey limestone found throughout the Piraeus. They were offered to the museum by ΟΛΠ (the Organization of the Piraeus Harbour), who also transported the columns and placed them near the museum next to the sea. According to the report, the board members knew that substantial remains of shipsheds were preserved in the sea, and it also mentions that the shipsheds had been severely damaged and built over during the marina works. The goal of the new board was to assist with the preservation of the shipsheds by any means possible, which they considered an important part of the country's cultural heritage. Unfortunately, their efforts were fruitless, as the lower parts of the shipsheds and slipways were completely destroyed during the construction of the modern marina. In 2002, the 13 columns drums, now in 14 parts, were documented by the ZHP with the kind permission of the Hellenic Maritime Museum (pp. 90–96).

At about the same time as the construction of the marina in the mid-1960s, a wall was exposed during demolition work on the building lot at Akti Moutsopoulou 33 on the southeast side of Zea (Fig. 2). T.A. Arvanitopoulou reports that the structure was preserved to a height of two courses and identifies it as forming part of the shipsheds (most probably the back-wall) in this area.[39] The wall was damaged during the work in the 1960s, and the present preservation of this structure remains unknown. Arvanitopoulou reports that the possible shipsheds continued under the street, and the remains of these structures were visible in the water in front of Akti Moutsopoulou 33.

According to Arvanitopoulou, the owners of the Sirangiou 1 building lot were paid by the archaeological council to preserve the shipsheds. As mentioned above, I.A. Meletopoulos was also somehow involved with the preservation of this site. Arvanitopoulou also reports that until 1911, the shipsheds in front of the Pasha's House at Sirangiou 2 were still visible, and that remains of these shipsheds could be seen in the sea at the time of publication.[40] Arvanitopoulou confirms that the 13 column drums mentioned in the report of the 1965 annual general assembly of the Hellenic Maritime Museum foundation (see above) were raised from the sea in front of the rowing club during dredging work by ΟΛΠ; she adds that the work took place in August 1964.[41]

In 1968, D.J. Blackman published the first general discussion in English on shipsheds in antiquity.[42] He covers most of the published material at that time on the shipsheds in Zea, as well as the naval installations in Mounichia and Kantharos. He also adds historical sources to the discussions. A number of his subsequent articles include a discussion of the architecture and function of the Zea shipsheds. His contributions will be discussed at points throughout this study.

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34. Judeich 1931: 437–440 (Zea), figs. 56a–56b, pl. III.
35. Rados 1915: 82. Mr. Lucien Basch kindly provided this reference. On Dörpfeld's plan (1885: pl. 2) the wall (λ) is 46.34 m (*MoP*: 0.04 m).
36. Lehmann-Hartleben 1963.
37. Lehmann-Hartleben 1963: 113–114, pl. XII.
38. Unpublished handwritten document. A copy was kindly provided by Mrs. J. Berbili of the Hellenic Maritime Museum.
39. Arvanitopoulou 1966: 27–42, esp. 38–39, fig. 9. On the probable back-wall of the shipsheds, see p. 38.
40. Arvanitopoulou 1966: 38.
41. Arvanitopoulou 1966: 40.
42. Blackman 1968: 181–192. Later articles add to his original 1968 article: 1973a (esp. 128); 1990b (esp. 43–44); 1995b (esp. 227–228, 231–232); 1996a; 2003 (esp. 80–82, 87).

In 1973, O. Alexandri conducted rescue excavations on the remains of three shipsheds on a building lot owned by Mr. Tsopanoglou-Doufeksi at the corner of Akti Moutsopoulou 7 and Neorion St. (Area 9; Fig. 2).[43] The report includes a site plan and three section drawings (Figs. 19–20), all of which are of reasonable quality. Alexandri's excavation is particularly important because it provides key information on the topographical layout of the shipsheds on the northeastern side of the harbour (pp. 43–45).

Since Alexandri's publication, several synthetic studies of various qualities have appeared on the Zea shipshed complex. R. Garland's *The Piraeus* (1987), for example, includes a useful topographical and historical introduction to the peninsula during the Classical and Hellenistic periods.[44] K.V. von Eickstedt's *Beiträge zur Topographie des Antiken Piräus* (1991) is the most comprehensive work to date on Piraean topography. It contains a very useful catalogue and bibliography on the shipsheds in the Piraeus.[45] W. Hoepfner and E.-L. Schwandner's *Haus und Stadt im Klassischen Griechenland* (1994) presents two possible topographical reconstructions of the shipshed complex at Zea.[46] Both are clearly primarily based on von Alten (Fig. 10) and Dörpfeld (Pl. 17), but Hoepfner and Schwandner do not present the data on which their reconstruction is based (Fig. 12). G.A. Steinhauer's 'Ancient Piraeus' in Steinhauer *et al.*, *Piraeus, Centre of Shipping and Culture* (2000) provides important information on Piraean topography.

Finally, between 1997 and 2002, J.F. Coates published a series of studies on operations involving the Zea shipsheds to derive slipping and launching curves of the *trireme* reconstruction, *Olympias,* thus adding data to the functional aspects of the Zea shipsheds.[47]

In 2002 and 2004, M. Petritaki conducted rescue excavations on an unknown number of shipsheds just north of those preserved in the basement of Sirangiou 1. The excavated area is now protected by a schoolyard built above it, and the ancient structures are visible underneath through large, panoramic windows. In 2003, S. Michaloupoulou exposed the upper end of Shipshed 20(π)'s ramp structure and other remains of shipsheds during rescue excavations in a trench dug by the gas company in the road next to the eastern sidewalk of Akti Moutsopoulou (in Areas 1–2). In 2004, K. Axioti conducted rescue excavations in the area of the modern quay (in Areas 1–3, 6) in advance of a modernisation of the marina prior to the Olympic Games in Athens that year. In 2005, D. Kourkoumelis conducted extensive underwater investigations of the deeper parts of the whole harbour basin in conjunction with modern harbour works. The above-mentioned investigations have not yet been published.

The present author has directed the Zea Harbour Project in its survey and excavations of shipsheds, slipways and harbour fortifications on land and under water in the harbours of Zea (since 2001) and Mounichia (since 2005); the ZHP underwater excavations are the first conducted in the Piraeus.

3.1.2. The Mounichia Shipsheds

Mounichia has been much less explored than Zea. In 1837 Aldenhoven may have illustrated remains of shipsheds in the western and southwestern sides of Mounichia (Fig. 4).[48]

On the map of Mounichia prepared by Schaubert in 1841 there is nothing to indicate any shipshed (or slipway) structures along the shoreline (Fig. 23).[49]

The "+" symbols that indicate 'dangerous underwater rock of uncertain depth' on Leake's 1841 map of Mounichia may represent submerged shipshed or slipway remains (Fig. 22).[50] But it was not until Ulrichs' 1843 map of Mounichia that parallel structures are shown running from the shoreline into the sea on the northern and southwestern sides of the harbour basin (Fig. 5); the 1863 map in the reprinted version does not illustrate any features in the sea (Fig. 6).[51] Ulrichs' original lines probably illustrate remains of shipsheds (or slipways) or, less likely, other structures.

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43. Alexandri 1979a: 151, figs. 34–35.
44. Garland 2001: esp. 154–156.
45. Von Eickstedt 1991: esp. 61–81, 147–149, pl. II/2.
46. Hoepfner & Schwandner 1994: figs. 14, 39.
47. Coates 1997; 1999; 2002; cf. also his unpublished report (n.d.): *On slipping and launching triremes from the Piraeus shipsheds and from beaches.*
48. Papageorgiou-Venetas 2001: fig. 60.
49. Curtius 1841: Schaubert's map entitled *Peninsula Piraica cum portubus subjectis.*
50. Leake 1841: pl. 4.
51. Ulrichs 1843: pl. I; 1863: map (p. 156).

Like Schaubert's (1841) map, von Strantz's map of 1862 also lacks notation of any features that may have been related to shipsheds or slipways (Fig. 24).[52] Graser, however, found nine possible shipsheds in Mounichia during his brief investigations in 1872: three on the eastern side, three on the northeastern side and three on the northwestern side.[53]

In 1881, von Alten recorded the remains of possible shipsheds in Mounichia. His brief text includes a topographical sketch plan (Fig. 30), drawings of three architectural elements (Fig. 28), a site plan and a longitudinal-section (Fig. 29).[54] Von Alten's map of the Piraeus (dated to 1876/77) contains important information on the topographical layout of the shipshed complex in Mounichia (Fig. 25).[55]

In 1899, H. Angelopoulos and Dragátsis excavated shipsheds in Mounichia Harbour. The summary excavation report includes no plans, but contains some useful information on the architecture of these shipsheds.[56] Rainfall had exposed a wall on the northwest side of the harbour, and Dragátsis also reports that column bases were visible before the excavation: "The remains that had been visible for some time, one part because of the rains and another through the removal of the soil [i.e. excavations] to the north of Mounichia" were similar to the Zea shipsheds, with "the same walls, the same periods of construction, and the same dimensions as the remains in Zea (Pashalimani)."[57] Paved areas and additional column bases were discovered during the excavation.

Based on comparison with the Zea shipsheds, Dragátsis identifies the structure as the back-wall of this part of the Mounichia shipshed complex: "This wall, which was very similar in construction to the ones already found at Zea, formed the back part of one of the sections of shipsheds that were shown in the earlier excavation of Zea [most probably the 1885 excavations] to have been divided into sections approximately 70 m wide".[58] Dragátsis further notes: "And all these [column bases/column base foundations] are entirely similar to the ones found earlier in the western part of Pashalimani [Zea Harbour]. There too [i.e. in Pashalimani] were square columns constructed of stone blocks placed on top of each other".[59] It is not clear if Dragátsis is referring to the remains found in his 1892 excavation of the Roman bath (Fig. 18) or the remains documented by A. Meletopoulos in 1882 (Figs. 2, 14–16).

Dragátsis' section is followed by a brief report by Angelopoulos on the same shipsheds. He reports that the work described above was carried out in the period of 28 December, 1898, to 25 January, 1899. The shipsheds here, according to Angelopoulos, are located on the western side of the harbour, whereas Dragátsis locates them to the north-west. Angelopoulos further reports that the wall, which he describes as a straight back-wall, measures 62.30 m in length and was located 60 m from the 1898/99 shoreline. In the vicinity he saw remains of ten shipsheds, each 6.25 m wide. On the northern side of the tenth shipshed (i.e. parallel to the colonnades) was found an inclined area paved with irregular stones. This area was not fully excavated. Angelopoulos suggests that the ships were loaded and unloaded from here, and that the sailors boarded and left the ship from this paved area.[60] In other words, this was a working area, and perhaps the structure in question was a side-passage or a passageway between two sections of shipsheds (pp. 156–157). Dragátsis and Angelopoulos did not excavate the possible shipsheds that von Alten documented in 1881 (see above).

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52. Curtius 1868: 61, pl. II (von Strantz 1862).
53. Graser 1872: 66. East: I, II and III; north-east: IV, V and VI; north-west: VII, VIII and L. Graser's compass directions are incorrect (see p. 45).
54. Von Alten 1881: 14–15, figs. 7–9.
55. Curtius & Kaupert 1881: pl. II. See also Curtius & Kaupert 1883: pl. III.
56. Angelopoulos 1899: 39–41 (the report is not titled); Dragátsis 1899.
57. Dragátsis 1899: 38, "Καὶ ἐπὶ τῶν πρὸ καιροῦ φαινομένων λειψάνων, τὸ μὲν ἕνεκα τῶν βροχῶν τὸ δὲ διὰ τὴν ἀποκομιδὴν χωμάτων, πρὸς τὸ βόρειον τῆς Μουνιχίας" and "οἱ αὐτοὶ τοῖχοι, οἱ αὐτοὶ οἰκοδομικοὶ χρόνοι πρὸς τὰ ἐν τῇ Ζέᾳ (Πασᾶ-λιμάνι) λείψανα, αἱ αὐταὶ διαστάσεις". Translation: P. Athanasopoulos.
58. Dragátsis 1899: 38, "Ὁ τοῖχος οὗτος, ὁμοιότατος τὴν κατασκευὴν πρὸς τοὺς προυπάρχοντες ἐν Ζέᾳ, απὲτέλει τὸ ὀπίσθιον μέρος ἑνὸς τῶν τμημάτων τῶν νεοσοίκων, οἵτινες ἐδείχθη καὶ ἐν τῇ προγενεστέρᾳ ἀνασκαφῇ τῆς Ζέας ὅτι ἦσαν εἰς τμήματα κεχωρισμένοι, τμήματα πλάτους ἑβδομήκοντά που μέτρων". Translation: P. Athanasopoulos.
59. Dragátsis 1899: 38, "Καὶ αὗται πᾶσαι εἶνε πληρὲστατα ὅμοιαι πρὸς τὰς ἐν τῷ δυτικῷ μέρει τοῦ Πασᾶ-λιμανοῦ ἀνευρεθείσας ἄλλοτε. Καὶ ἐκεῖ ἦσαν τετραγωνικοὶ κίονες ἐκ δόμων λίθων τελειμένων ἐπ' ἀλλήλων". Translation: P. Athanasopoulos.
60. Angelopoulos 1899: 39–41.

Beginning on 1 September, 1900, Dragátsis and Angelopoulos continued the excavations in Mounichia. The work was stopped for an unknown period because Angelopoulos went abroad, and it ended in late November of that year. Nothing new was found except for a structure identified as a quay in the northern part of the excavation.[61] Dragátsis remained absolutely convinced that the shipsheds in Zea and Mounichia were from the same period. This is the last excavation report from Dragátsis' hand. He was a pioneer in shipshed research, and if he had not involved Dörpfeld in the 1885 excavations, essential information on the shipsheds in the Piraeus would certainly have been lost.

Judeich briefly sums up the previous research, and as at Zea, his topographical map of Mounichia is primarily based on von Alten's map of 1876/77. However, it should be noted that he adds a hitherto-unknown group of possible shipsheds on the western side of Mounichia (Fig. 26; p. 49).[62]

Forty years later, in 1947, I.A. Meletopoulos reports very briefly on possible shipsheds at two locations in the west/south-west and southwestern part of Mounichia, and marks both on his topographical map (Fig. 17). Both sites were uncovered some years earlier during road construction related to the re-housing of Greek refugees from Smyrna.[63] The west/south-west site is probably identical to the hitherto-unknown group reported by Judeich above.

In 1967, during the construction of a well measuring 7.5 m in diameter, two walls (T_1 and T_2) were found, oriented at right angles to each other (Fig. 31). The site was excavated by A. Liangouras, who identifies Wall T_2 as the possible remains of a shipshed. The short report is relatively detailed and includes a plan and a section. The excavated area is located 18 m from the shoreline in the area where Navarchou Votsi St. connects with Akti Koumoundourou (Fig. 21).[64]

Hoepfner and Schwandner's 1994 reconstruction of the shipshed complex at Mounichia (Fig. 27) is primarily based on von Alten's plan (Fig. 25), with details drawn from Judeich's 1905 work (Fig. 26).[65]

In 1997, 1999 and 2006, M. Petritaki of the 26th Ephorate of Prehistoric and Classical Antiquities excavated remains of four shipsheds on the northwest side of Mounichia.

Since 2005 the ZHP has conducted underwater archaeological investigations at Mounichia, the primary objective of which is to document the remains of the harbour fortifications. In the course of this project, promising submerged architectural structures, in all probability related to shipsheds or slipways, were also found in the northern, northwestern and southeastern parts of the harbour basin.

3.1.3. The Kantharos Shipsheds

Kantharos, although the largest of the three Piraean harbours, has been the least explored. On the southern side of the harbour are a group of structures identified as *neoria* on Schaubert's 1841 map. The remains, which may be shipsheds (or slipways) are illustrated as eight parallel lines running from the shoreline into the harbour basin (Fig. 33).[66] Leake's 1841 map shows "+" symbols that indicate 'dangerous underwater rock of uncertain depth' around the entire harbour basin (Fig. 32); the few "+" symbols in the southern part of the harbour may or may not be related to shipsheds or slipways.

In his 1843 publication Ulrichs reports that he saw several parallel structures similar to those in Zea on the south side of the harbour (Fig. 5).[67] Von Strantz's map of 1862 lacks any features that may be related to shipsheds or slipways.[68] To the west of the *neoria* area on Schaubert's map (1841), Milchhöfer identifies "shipsheds belonging to seven trittyes" in a caption on von Alten's 1876/77 map (Fig. 34).[69] In 1905, Judeich briefly mentions the shipsheds and refers to the structures noted as *neoria* on Schaubert's map (1841).[70]

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61. Dragátsis 1900: 37–39.
62. Judeich 1931: 434, pl. III.
63. Meletopoulos 1947: 72–73, fig. Δ.
64. Liangouras 1967: 142–143, fig. 9, pl. 108b.
65. Hoepfner & Schwandner 1994: fig. 14. The data on which their reconstruction is based are not presented.
66. Curtius 1841: Schaubert's map *Peninsula Piraica cum portubus subjectis* (metric scale).
67. Ulrichs 1863: 181.
68. Curtius 1868: 61, pl. II (von Strantz 1862).
69. Curtius & Kaupert 1881: map pl. IIa: *Die Halbinsel Peiraieus*, "Schiffshäuser von 7 Trittyen".
70. Judeich 1931: 449, n.4.

Nearly 70 years later, in 1973, Alexandri conducted rescue excavations in a ditch dug by ΟΑΠ (a sanitation service). The excavations focused on a wall that Alexandri identifies as a part of a Kantharos shipshed. Her summary report includes no plans or sections.[71]

In their 1994 publication, Hoepfner and Schwandner reconstruct two groups of shipsheds on the southern side of Kantharos (Fig. 35).[72] The eastern-most group is based on Curtius' 1841 map (Fig. 33).

Due to extensive harbour construction, the areas most likely to have accommodated the Kantharos shipsheds (or slipways) have been completely overbuilt, and any seaward elements of the shipsheds have probably been dredged away.

3.2. General Research and Excavation History of Other Shipshed and Slipway Sites

The shipsheds in the three harbours of Zea, Mounichia and Kantharos are by no means structures unique only to the Piraeus; several shipshed sites have been identified throughout the wider Mediterranean. Positively identified slipways, however, have been found outside Zea only at Marseille and Sitea (see below).

General research on shipsheds began in 1923 with Lehman-Hartleben's *Die Antiken Hafenanlagen des Mittelmeeres* (see above), in which he presents a number of Classical and Hellenistic shipshed sites in the Mediterranean.[73] A decade later F. Miltner discusses *neorion* in a Mediterranean-wide context in the *Pauly-Wissowa* encyclopaedia.[74] More recently, Blackman's numerous articles and conference papers have dominated the discourse on shipsheds over the past 42 years, beginning in 1968.[75] Blackman's work provides significant insights, but he does not clearly distinguish between the terminology of shipsheds and slipways (resulting in some confusion in the research), and he sometimes includes sites that can be defined only as possible shipsheds or possible slipways.[76]

K. Baika and the present author have published articles and conference papers on shipsheds (including slipways) and their architecture and function.[77] To date, Baika's doctoral thesis *ΝΕΩΣΟΙΚΟΙ* (2003), the author's M.A. thesis *Græske Skibshuse – arkitektur og funktion* (2001), and his doctoral thesis *The Zea Shipsheds – Topography and Architecture* (2009) remain the most comprehensive studies in Mediterranean shipsheds and slipways. Lovén 2001 and Baika 2003 are unpublished, and this present publication is based on Lovén 2009.[78]

Most of the research on shipsheds and slipways, however, has been dominated by generalist approaches that take little or no account of apparent differences in architectural designs. The main problem with such approaches is that they often force a view of shipsheds (and slipways) only as static building complexes, and not as intricate and individual architectural structures. As a result, essential data on individual architectural features are very often not included in the published material.[79] These fundamental problems in shipshed and slipway research will be addressed throughout this study.

There are several shipshed sites (and at least two slipway sites) throughout the Mediterranean that offer important clues to help illuminate the architecture of similar structures found at Zea and Mounichia. What follows is a brief review of the research into shipshed and slipway sites, arranged in chronological order of

71. Alexandri 1979b: 144–145.
72. Hoepfner & Schwandner 1994: fig. 14. The data on which their reconstruction is based are not presented.
73. Lehmann-Hartleben 1963: 105–121, 142–143.
74. Miltner 1933: 2471–2474.
75. Blackman 1968; 1973a; 1973b; 1977; 1990a; 1990b; 1995a; 1995b; 1996a; 1996b; 1999; 2003; 2004; Blackman, Knoblauch & Yiannikouri 1996; Blackman & Lentini 2003; 2004; 2006a; 2006b; Blackman & Simossi 2002.
76. Best exemplified by Blackman 1996a: 115–117; 1999: 65–68; Blackman, Knoblauch & Yiannikouri 1996: 402, n.74; Blackman & Simossi 2002: 139–140. Blackman classifies the inclined rock-cut features at Agios Georgios and Emporeio on the island of Alimnia as shipsheds. He himself notes that there is no evidence of a superstructure, an observation that clearly calls for a more cautious classification. In 2003, Blackman (p. 85) classifies the features at both sites as slipways. Although this term may be more correct, there is no evidence of a ramp structure to support the identification. It is the present author's opinion that the sites at Alimnia can only be classified as 'possible slipways'.
77. Baika 2002; 2003a; 2006a; 2006b; 2006c; Lovén 2008; forthcoming, a; forthcoming, b; Lovén *et al.* 2007; 2008; Lovén & Nielsen 2010.
78. Lovén 2001; 2009; Baika 2003b.
79. For example, the critical dimensions in the ramps of the otherwise well-published Mandraki shipsheds at Rhodes are missing (Blackman, Knoblauch & Yiannikouri 1996: 63–64, n.22).

investigation, beginning with the first archaeological work carried out in Carthage. Those publications most relevant to the study of Zea's Area 1 (Group 1, north) shipsheds and slipways are evaluated and analysed in the following chapters.

Carthage, The Circular Harbour (Tunisia, 1859)

M. Beulé has the distinction of carrying out the first shipshed excavations in the history of archaeology. At Carthage, he excavated Punic shipsheds along the outer edge of the Circular Harbour and on Ilôt de l'Amirauté in the centre, but produced no plans.[80] H.R. Hurst continued the excavation of the Circular Harbour, where he carried out extensive excavations on Ilôt de l'Amirauté from 1974–1980, and again from 1982–1983 (Figs. 37–38). A series of preliminary reports of these works have been published, but the excavations still await final publication.[81] Hurst also excavated remains of shipsheds along the north/northeastern edge of the Circular Harbour, which he published in 1994 (Figs. 40–41).[82] Hurst established the lower end of shipshed 4 in the southeastern side of Ilôt de l'Amirauté (Fig. 37).[83]

Oiniadai (Western Greece, 1900)

Ancient Oiniadai lies in the western part of Acarnania at the strategically important entrance to the Corinthian Gulf. The shipshed complex at the site was recognisable here in 1436, when it was sketched by Cyriacus of Ancona.[84] Some four centuries later, in April 1809, W.M. Leake, prior to publishing his work on the topography of Athens (see above), visited the site and wrote in his travel diary that this building complex may have been designed for ships.[85]

A few decades later, in the middle of the 19th century, L. Heuzey investigated the complex and identified the structures as shipsheds.[86] To date, six shipsheds have been discovered, all located in the northeastern part of the northern harbour, which today is completely silted up. They were first excavated by J.M. Sears in December 1900 and May 1901. The expedition opened two test trenches across the complex, a longer trench simultaneously exposing parts of shipsheds 3 to 6, and a shorter trench uncovering parts of shipsheds 1 and 2. A wider longitudinal trench covering half of shipsheds 2 and 3's upper ends and a small part of the colonnade dividing shipsheds 3 and 4 was also excavated (Fig. 44).[87] Sears' precise and well-illustrated report on this relatively small excavated area remains the main publication on the Oiniadai shipsheds. In 1989, 1991, 1992 and 1995, L. Kolonas fully excavated the terrestrial parts of the site, and the preliminary results were published in report form.[88] Both Kolonas and Sears stopped their excavations at the groundwater level, leaving unexcavated what would have been the lower ends of the shipsheds.

Sounion (Mainland Greece, 1923)

Two shipsheds are located on the western side of Cape Sounion, below the acropolis. In 1923, G.M.P. Oikonomos completely excavated the shipsheds on land, but published no plans or information about the stratigraphy.[89] In 1935, E.J.A. Kenny published a site plan and sections of the terrestrial portion of the shipsheds; he also notes that the ramps continued into the sea (Figs. 42, 47–48).[90] H.R. Goette discusses the shipsheds in his monograph on the site and adds some observations on the chronology of the complex.[91] In 2004 and 2006 Baika investigated the shipsheds both on land and in the sea; these investigations have not yet been published.[92]

Mandraki, Rhodes City, Rhodes (Dodecanese, 1940)

An Italian expedition excavated the upper parts of four shipsheds on the southeast side of Mandraki Harbour, in the city of Rhodes, in 1940–1942. Noth-

80. Beulé 1861: esp. 99–113.
81. Hurst 1975; 1976; 1977; 1979 (the section "The reconstruction of the stone shipsheds", pp. 28–32, is co-authored with S. Gibson); Hurst 1981.
82. Hurst 1994; see Blackman's review (1995c).
83. Hurst 1979: 26–27.
84. Sears 1904: 227.
85. Leake 1967: 556–561.
86. Heuzey 1860: 448.
87. Sears 1904: 227–237. B. Powell drew the site plan (pl. IX, see Fig. 44), longitudinal-section (pl. X, see Fig. 45), and cross-section (pl. XI, see Fig. 43). Here the shipsheds are numbered 1–6 on the site plan.
88. Kolonas 1990; 1996; 1997; 2000.
89. Oikonomos 1923: 510.
90. Kenny 1947.
91. Goette 2000.
92. Dr. K. Baika, pers. comm., 2010.

ing was published and all information on these excavations seems to have been lost. The buildings were first identified as shipsheds by I.D. Kondis in 1953, and then subsequently mentioned by D. Bradford in 1956 and by G. Konstantinopoulos in 1966.[93] Blackman and P. Knoblauch investigated and surveyed the exposed architectural remains in 1971, returning to the site in 1976 to check the survey. The 1971 investigation also saw the opening of test trenches by Konstantinopoulos. In 1992, A. Yiannikouri cleaned the profiles of the 1940–1942 excavation area and successfully carried out excavations to extract stratified material.

The results of the latter investigations were preliminarily published in a number of articles between 1972 and 1995. The final publication, which is one of the most comprehensive on shipshed sites to date, appeared in 1996.[94] Knoblauch's plans and sections of the shipsheds are among the very best published (Fig. 49). In Knoblauch's text, the individual architectural structures are presented and treated in detail.[95] The major part of these shipsheds, however, remains unexcavated.

During rescue excavations in 1963, K. Phatourou exposed four pier colonnades on the northwest side of Mandraki and identifies the structures as shipsheds.[96] Two of these piers were still accessible in the basement of the Hotel Regina when Blackman and Knoblauch surveyed them in 1976.[97] No clear evidence of the ramp was found, and hence they are classified here as possible shipsheds.

Apollonia (Libya, 1958)

On the northeastern side of the harbour of Apollonia in eastern present-day Libya, N.C. Flemming identified ten partially-submerged shipsheds in 1958 and 1959 (Figs. 50–51); this was the first time that shipsheds were investigated under water using SCUBA (Self Contained Underwater Breathing Apparatus), and Flemming was able to establish the lower ends of the shipsheds. He also found structures on the northwest side of the harbour, which he presumes may be the remains of shipsheds.[98] A. Laronde continued the investigation of the harbour area.[99] The complex has not been excavated, and according to Flemming large parts of the site are covered by later buildings and sediment.

Corfu City, Corfu (Ionian Islands, 1966)

Possible shipsheds have been excavated at two sites in the area identified as Alkinoos Harbour on the Kanoni Peninsula on the east coast of the island of Corfu. G.S. Dontas excavated the first site (Corfu B) in 1966. He found a colonnade that may have been related to a shipshed.[100] Two colonnades, possibly also related to shipsheds, were uncovered by K. Preka-Alexandri at another site (Corfu C) in the same harbour during rescue excavations in 1991.[101]

In 1990–1991, the remains of a colonnaded building (Corfu A) were found during rescue excavations on the Kanoni Peninsula, in an area equated with the harbour of ancient Hyllaikos. The first building phase is classified as a possible shipshed, but it will be demonstrated in this present study that the last phase of the superstructure is not indicative of a shipshed (see pp. 123–124).[102]

Aegina City, Aegina (Saronic Islands, 1964)

From 1964 to 1966 Knoblauch undertook major land and underwater surveys of the naval harbour of ancient Aegina, producing detailed plans and sections of six or perhaps seven possible shipsheds.[103] No remains of ramps have been recorded, which is why the buildings are classified as *possible* shipsheds, although in this instance the buildings are most probably shipsheds based on their location in the northwestern side of the well-defined military harbour. Apart from the crown of the back-wall, the possible shipsheds are presently submerged. Knoblauch calculates that since

93. Kondis 1958; Bradford 1956: 67; Konstantinopoulos 1968: 439–441, pl. 481 α–β.
94. Blackman 1977: 686–687; 1990a: 499; 1990b: 42–43; 1995a: 74; 1995b: 230–233; Blackman, Knoblauch & Yiannikouri 1996.
95. The final editing took place on his deathbed, Mr. D.J. Blackman, pers. comm., 2000.
96. Phatourou 1967. There is no scale on the plan.
97. Blackman, Knoblauch & Yiannikouri 1996: 374.
98. Flemming 1965; 1971.
99. Sintes 2010. At the time of publication, the present author only had access to this article, which was kindly provided by Dr. C. Sintes.
100. Dontas 1968: 85–87.
101. Preka-Alexandri 1996.
102. Kanta-Kitsou 1996; 1997.
103. Knoblauch 1969; 1976: fig. 17 (topographical plan of the naval harbour) and fig. 19 (shipsheds).

their construction, probably in the Classical period, there has been a sea level rise of *ca* 1.55 m (as of 1966).[104] Earlier, in 1938, F.G. Welter reported submerged remains as shipsheds in Aegina's naval harbour. Along the northwest mole, Welter describes the presence of nine shipsheds and 15 more that were adjacent to the southeast mole.[105] The complex has not been excavated, nor have the lower parts been surveyed in detail.

Sitea (Crete, 1967)
A rock-cut slipway was discovered east of the north-eastern Cretan town of Sitea by G.M. Katapotis, then Mayor of Sitea, who reported it to the archaeological authorities. In 1967, K. Davaras excavated the landward portion of the slipway site, but carried out no investigations in the sea.[106] During a preliminary survey of the site in 2002, K. Baika found the continuation of the slipway into the sea;[107] in 2005 she digitally surveyed the exposed structure on land and under water.[108] The submerged part of the structure has not been excavated.

Arcadia (Peloponnese, 1969)
In 1969, F. Cooper located two possible shipsheds on the bank of the Neda River, west of Phigalia near the western coast of the Peloponnese.[109] If the roofed structures were built for ships, they are the only material evidence in the Mediterranean of shipsheds built on a river. The buildings have not been excavated.

Matala (Crete, 1970)
J. Shaw located a possible slipway at Matala and reported it to Blackman, who investigated and surveyed the site in 1970–1971.[110] In 2005, Baika continued the investigations of the site, including the submerged parts of the structure. The site has not been excavated.[111]

Dor (Israel, 1976)
E. Linder and A. Raban investigated three possible shipsheds in the lagoon at Dor, on the coast south of Haifa, in 1976. Their findings are published in brief reports. Raban notes that a number of post-holes in the top surface of the raised rock-cut features dividing the structures were probably related to a superstructure, but this cannot be verified by the published plans.[112]

Alimnia (Dodecanese, 1980)
In 1980, A. Sampson surveyed two possible slipway sites on the small island of Alimnia, north-west of the island of Rhodes. At Emporeio, on the eastern side of the island, he documented remains of 11 possible slipways. In the main harbour at Agios Georgios, on the western coast, remains of ten possible slipways were also found.[113] Blackman briefly investigated the two sites in 1991 and verified Sampson's measurements.[114] In 1997, A. Simossi and Blackman conducted limited terrestrial excavations at the site of Emporeio, and also surveyed the site under water. No definite remains of the possible slipways were found in the sea, however. [115]

Rethymnon (Crete, 1981)
N.C. Flemming and P. Pirazzoli briefly visited the site on the northern central coast of Crete in 1981 and found remains of three possible shipsheds.[116] Baika surveyed the site in 2003 and 2005.[117]

Naxos (Sicily, 1982)
During the initial excavations of the site on the eastern shore of Sicily in 1982–1983, structures were located but not identified as shipsheds, and the results of this campaign were not published. Blackman was shown the site in 1997 by M.C. Lentini, who presumed that the structures were related to the ancient harbour. From 1998 to 2006, Blackman and Lentini excavated four shipsheds and documented at least two building phases. The lower portions of the shipshed complex

104. Knoblauch 1976: 79; Welter (1938a: 38, 103–104) proposes that the shipsheds were constructed in 482–481 BC.
105. Welter 1938a: 8–39; 1938b.
106. Davaras 1967; Davaras does not state when G.M. Katapotis found the possible shipshed.
107. Baika 2003a.
108. Dr. K. Baika, pers. comm., 2010.
109. Cooper 1972.
110. Blackman 1973b.
111. Dr. K. Baika, pers. comm., 2006.
112. Raban & Linder 1978; Raban 1995; 2003: 93, fig. 15.4.
113. Sampson 1988.
114. Blackman 1996a; 1999.
115. Blackman & Simossi 2002.
116. Flemming & Pirazzoli 1981.
117. Baika 2003b: 521–524. Dr. K. Baika, pers. comm., 2010.

are covered by a dirt road and modern buildings, and have therefore not been excavated.[118]

Kition (Cyprus, 1987)
Excavations of this Phoenician harbour site on the southeastern coast of Cyprus began in 1985 under the direction of M. Yon. Remains of shipsheds were found during the third campaign in 1987, and from that year until 1999 a total of six shipsheds were documented. The initial results have been published in preliminary reports and an archaeological guide, and those by O. Callot, S. Hadjisavvas, and Yon are the most informative.[119] According to the excavators, the total length of the shipsheds' superstructures has been established.[120]

Kos City, Kos (Dodecanese, 1987)
Rescue excavations in the harbour area of Kos City at the northeastern edge of the island, directed by K. Kantzia in 1987 and 1988, exposed parts of a shipshed and possible remains of two other shipsheds (Fig. 52).[121] Structures from the Roman harbour front covered the remains but were removed. The lower and upper portions of the shipshed are covered by modern structures, and have not been excavated. In 2002, due to Kantzia's untimely death, E. Brouskari (who completed the investigations) and Blackman were entrusted with the final publication of the shipshed structures.[122] Earlier, in 1980, on a building lot south of the site, a wall was excavated which Kantzia misidentifies as the back-wall of the shipsheds in her 1992 report.[123]

Thasos City, Thasos (Northern Greece, 1988)
The possible remains of shipsheds were found in 1988 during the Greek-French underwater excavations in the northwestern side of the naval harbour of Thasos on the north coast of the island.[124] As at Aegina, the structures are most probably shipsheds based on their location within a well-defined military harbour, but they are classified here as possible shipsheds due to lack of evidence of a ramp structure. During dredging work in the western part of the harbour in 1983 two possible ramp blocks were found.[125]

Abdera (Northern Greece, 1991)
In the Thracian coastal city of Abdera, Ch. Samiou-Lianou in 1991 excavated an inclined colonnade of a possible shipshed, along with tiles belonging to a roof structure. As no remains of the ramp structure were located, the building cannot be securely identified as a shipshed.[126]

Loryma (Turkey, 1995)
The possible remains of shipsheds were found at Loryma in southwest Turkey during surveys directed by W. Held in 1995 and 1998–2001. A magnetometer survey revealed six parallel structures spaced 12–13 m apart. The anomalies between each of these structures may indicate sub-divisions. This is the first time that remote prospection has been used to document possible shipsheds. A number of inclined slots were found cut in the rock face delineating the site towards the west. If they are related to the aforementioned structures, they probably held elements that supported an inclined roof. The site has not been excavated, and no underwater survey has been conducted.[127]

Marseille (France, 1992)
A number of unroofed slipways were excavated at the Place Jules-Verne site in the ancient harbour of Marseille in 1992–1993 (Fig. 54), and possible shipsheds were found to the north-east in 1996–1997 during excavations at Place Villeneuve-Bargemon (Fig. 53).[128]

118. Blackman & Lentini 2003; 2004; 2006a; 2006b.
119. Karageorghis 1989; Papageorghiou 1990; 1991; Christou 1994; 1997; Yon, Callot & Salles 1996; Callot 1997; Hadjisavvas 1998; 1999; 2000; Yon 2000; 2006. See also Blackman's summary: 1996b.
120. Yon 2000: 102, figs. 2, 10a; Hadjisavvas 1999: 618.
121. Kantzia 1992. There is no north arrow on site plan. Lianos (1999: 268, fig. 6) has published a plan of the site including spot-heights and a north arrow.
122. Blackman 2004.
123. Papachristodoulou 1988. According to the north arrows on the two site plans, the wall appears to be running nearly parallel to the superstructure of the shipshed rather than perpendicular, and hence it is clearly not the back-wall.
124. Archontidou-Argyri, Simossi & Empereur 1989; Empereur & Simossi 1990; 1991; 1992; Simossi 1995.
125. Lianos 1999.
126. Chrusanthaki 1991; 1992; Samiou-Lianou 1999.
127. Held, Berger & Herda 1999; Held 2003.
128. Hesnard 1995; Hermary, Hesnard & Tréziny 1999; Hesnard, Moliner, Conche & Bourion 1999; Hesnard, Bernardi & Maurel 2001.

The lower parts of the possible Place Villeneuve-Bargemon shipsheds were destroyed by dredging in the Roman period. Both excavations are particularly important because well-preserved timber constructions (transverse sleepers and possibly rollers) were found on the ramps.

Syracuse (Sicily, 1999)

Possible shipshed structures have been reported in the Small Harbour of Syracuse both on land and under water as early as 1883.[129] Over a century later, in 1999 and 2001, B. Basile excavated the possible remains of shipsheds on the northeast side of Ortygia. Basile opened a narrow trench, *ca* 200 m in length, and uncovered parts of 25 walls belonging to two building phases. Because a very limited area of each possible shipshed was excavated, the results are more applicable for developing a better understanding of the topography of ancient Syracuse than for an architectural analysis of the city's possible shipsheds.[130] At another nearby site, located on the mainland near Via Diaz, Basile recorded the remains of an additional ten possible shipsheds.[131]

Other Possible Sites

The possible remains of shipsheds at Caesarea (Israel) and possible slipways on Antikythera in the Ionian Islands, Kea in the Cyclades, and at two sites in Ptolemais (Cyrene, eastern Libya) are only briefly mentioned in publications.[132] Remains of a possible slipway at Halikarnassos (modern Bodrum, Turkey) have not yet been investigated in detail.[133]

Summary

In total, some 36 Mediterranean sites outside the Piraeus, from Marseille in the west to Dor in the east, host the remains or possible remains of shipsheds and slipways generally dating to the Classical-Hellenistic periods. Nine of these can be securely identified as shipshed sites: Apollonia, Carthage (Ilôt de l'Amirauté), Carthage (Circular Harbour, north/north-east), Kition, Kos, Naxos (Sicily), Rhodes (Mandraki), Oiniadai and Sounion. The respective investigation levels of these 36 sites vary from conjecture, to survey, to partial excavations, to full excavations and publication. Their current status is summarised as follows:

No excavations were conducted on the shipsheds at Apollonia, on the possible shipsheds at Aegina, Arcadia, Dor, Loryma and Rethymnon, or on the possible slipways sites at Agios Georgios (Alimnia), Antikythera, Kea, Matala and Ptolemais.

Partial excavations have been conducted on positively identified shipsheds at Carthage (Circular Harbour, north/north-east), Kos and Rhodes (Mandraki), and possible shipsheds at Abdera, Caesarea, Corfu (Corfu B), Rhodes (Hotel Regina), Syracuse (Ortygia) and Thasos. A possible slipway was partially excavated at Alimnia (Emporeio).

Extensive excavations have been carried out on identified shipsheds at Carthage (Ilôt de l'Amirauté), Naxos (Sicily), Kition, Oiniadai, Sounion, the possible shipshed sites at Corfu (Corfu A first phase, Corfu C), Marseille (Place Villeneuve-Bargemon) and Syracuse (Via Diaz). Slipways were extensively excavated at Marseille (Place Jules-Verne) and Sitea.

At Oiniadai, Sounion and Kition, excavations of the shipsheds were halted at sea (or modern groundwater) level and hence essential information on the lower parts of these sites is currently lacking. Excavation of the slipway at Sitea was also stopped at sea level. Survey work ceased at the shoreline at the sites of Loryma (possible shipsheds) and Alimnia (Agios Georgios, possible slipways). Underwater surveys were conducted on the submerged shipsheds at Apollonia, Sounion and on the slipway at Sitea; the possible slipways at Alimnia (Emporeio) and Matala, and the possible shipsheds at Aegina were also investigated in the sea. Underwater excavations were carried out on the possible shipsheds at Thasos.

Awaiting final publication are the excavations at Carthage (Ilôt de l'Amirauté), Corfu, Kos, Kition, Marseille, Naxos and Oiniadai. No or very little published material is available on the excavations of the terrestrial portions of the Sounion shipsheds (Oikonomos

129. Cavallari & Holm 1883.
130. Basile 2002.
131. Basile 2002: 165–167.
132. Caesarea (Raban 2003); Antikythera (Flemming & Pirazzoli 1981); Kea (Manthou 1991); Ptolemais (Kraeling 1962).
133. Dr. P. Pedersen, pers. comm., 2007.

1923), on the upper end of the Mandraki (Rhodes) shipsheds (The Italian Expedition, 1940–1942), and on Beulé's work at Carthage in 1859. Important information from these three excavations has most probably been lost.

Knowledge of many of the slipway, shipshed, possible shipshed and possible slipway sites throughout the Mediterranean is still very limited. This overview of the present state of research into this topic has made clear that several excavations – some completed 15 to 30 years ago – are still awaiting final publication. The potential and necessity of future archaeological investigations and publication of past excavations is clearly immense.