# PART A

# STUDY

# 1

# INTRODUCTION

*David Blackman and Boris Rankov*

The term shipsheds was coined by E. P. Colquhoun in 1847 as a translation of the word 'Schiffshaüser' used by the German scholar H. N. Ulrichs in an 1843 paper on the 'Topography of the harbours of Athens' (see Chapter 2). It is an ugly word, but has been accepted because it is precise in its description of buildings used for the storage of warships in antiquity. Nevertheless, as this volume seeks to demonstrate, these buildings were rather more than covered slipways and were not just ship garages. On the shores of the inland sea which is the Mediterranean, the fastest and safest internal routes were usually maritime, and sea power was a prerequisite of military, political and commercial influence. This power relied on warships, and warships had to be kept safe and seaworthy when they were not in use, but always ready to be launched at short notice; the shipsheds which lined the military harbours of the Classical, Hellenistic and Roman world ensured that they were. Their importance was recognized in antiquity, and maritime states devoted large amounts of money to their construction and maintenance, and to providing them with a monumental façade which impressed both their rivals and contemporary writers. The major complexes, such as those at Athens and Carthage, were in fact amongst the largest secular building projects of their time.

Despite this, these buildings have often proved hard for modern scholars to identify and interpret, and their significance has not always been appreciated. They have sometimes been mistaken for warehouses, and vice versa, and many of the suggested identifications of sheds have proved illusory. The key diagnostic features have not hitherto been clearly defined, nor have they seemed to offer archaeologists the prospect of rich or important finds. Moreover, working at or just below water level brings practical problems of its own and requires a particular dedication from excavators. Meanwhile, some geologists at least have come to realize that buildings whose function required them to be located at the water's edge may provide valuable evidence for relative sea level at the time of their construction. It is not by chance that shipsheds have on occasion been discovered by geologists rather than archaeologists.

The purposes of this book are to set the shipsheds of the ancient Mediterranean in their historical context and to draw attention to the information available in literary and epigraphic sources which complement the archaeological evidence; to evaluate all the evidence in order to gain a better understanding of how the sheds functioned and what they were for – to help preserve fragile wooden warships and enable them to be slipped and launched quickly, safely and with relative ease; and to gather together and present what we know about those sites where shipsheds have been identified or proposed.

To this end, we have provided a series of comprehensive analytical chapters, followed by a Catalogue of the most secure sites, with tabulated summaries of their main features in a format standardized to facilitate comparisons; this is supplemented by a Miscellanea section in which we attempt to offer a graded evaluation of other sites for their plausibility as shipsheds, and both the Catalogue and its Miscellanea section are provided with comprehensive bibliographies. The format has resulted in some repetition of key information in different parts of the book, but this has been considered worthwhile in order to make the volume as useful as possible as a work of reference for historians of antiquity, and as a practical handbook for archaeologists and geologists who believe that they may have encountered the remains of shipsheds.

# 2

# RESEARCH AND INVESTIGATION OF ANCIENT SHIPSHEDS

*David Blackman*

The history of shipshed research, we may fairly argue, began with August Böckh and his publication of the considerable fragments of the inscribed Naval Lists of fourth-century Athens, found in 1834 on stones reused as gutter blocks in a late Roman building just south of the main harbour of Piraeus, where a royal storehouse was to be built. These texts gave us details of the organization of the navy, of the ships, and of their housing in shipsheds.

We are fortunate that the discovery was overseen by Ludwig Ross, by then Professor at the University of Athens, and already responsible for the oversight of all ancient remains discovered in the newly independent Greek state. Ross copied the inscriptions, and his copies were included in the publication by Böckh, which appeared with commendable rapidity for such a large task.[1] In addition to a long commentary on the texts, his fifteen introductory chapters included 'Locations and buildings' (VI) and 'Ships' (VII). In the former he discussed the use by ancient sources of the words *neorion* and *neoria* (64–6), shipsheds (67–8) and *skeuothekai* (68–73). He raised one of the questions that still preoccupy us, but in a simpler form: the inscriptions gave a maximum of 372 shipsheds, whereas Strabo referred (9.1.15) to a *naustathmon* 'worthy of the 400 ships which the Athenians used to send out'; Böckh suggested that Strabo's figure either was a rounding up or reflected the fifth-century situation. He firmly believed that each shipshed took only one ship, and that if all the Athenian fleet was at Piraeus, then any surplus ships must have lain in the open air; and he emphasized that the full figure of 372 shipsheds was only achieved under Lycurgus. He did not face the question of the shoreline available, and still followed Leake's mistaken identification of the harbours of Piraeus.[2]

Leake in his first edition (1821) referred to wall foundations running into the water at right angles to the beach, particularly in Pashalimani (for him, Port Munychia): 'intended probably as places of shelter for small boats, or as foundations for boat-houses'. In his second edition (1841) he took account at a late stage (in footnotes 'of 1840' and addenda) of Ross's discoveries and Böckh's publication; he still placed ancient Kantharos and Zea within the main Drako harbour, as did Curtius, but accepted the new evidence that all three harbours were used by the Athenian navy; he explained that the *neosoikoi*, referred to in the inscriptions, 'were dry docks for the reception of the triremes, and were covered probably with roofs'. His plan showed underwater remains taken from the nautical survey of Lieutenant (later Commander) Thomas Graves, a Royal Naval hydrographer.[3] He does not seem to have made the connection with the wall foundations running into the water, which he now, surprisingly, referred to more vaguely as 'the remains undoubtedly of ancient wharves or jetties'. Leake had also visited Oiniadai in 1809; he identified the city and noted the spaces between the rock-cut buttresses: 'perhaps receptacles for boats'.[4]

Increasingly detailed plans of Piraeus were produced as the century advanced, notably as a result of German technical support for the new Kingdom of Greece.

[1] *Urkunden über das Seewesen des attischen Staates*, published in 1840 as a Beilage to, and third volume of, his great work *Die Staatshaushaltung der Athener*.

[2] He used the 1829 German translation (pp. 330ff.) of Leake's first edition (1821).

[3] W. M. Leake, *The Topography of Athens*, 1st edition, London 1821, 344; 2nd edition, 1841, 374 n.1, 412, 632–4, pl. IV. Graves' chart: T. Graves, *The Peiraeus or Port Drako* (British Admiralty Chart no. 1520, 1840, published 1843). For completeness we may add that already in 1676 Spon and Wheler had seen remains in 'Port Munychia' (in fact Zea), which they suggested were 'the foundations of vaults as of an Arsenal to house galleys': J. Spon and G. Wheler, *Voyage d'Italie, de Dalmatie, de Grèce et du Levant*, Amsterdam 1679, II, 176 (1724 edition II, 133–4).

[4] W. M. Leake, *Travels in Northern Greece* III, London 1835, 556, 561.

E. Curtius already marked *neoria* in what we now know to be Zea and Kantharos, on the map of Piraeus of 1841, which accompanied his dissertation and which virtually followed Leake's.[5] Curtius also reported[6] that the harbour bottom in Zea falls away sharply at a depth of 6 feet, but this has still to be evaluated; the British chart shows no such fall-away, but rather a bottoming-out around this level, except in the very centre of the harbour.

H. N. Ulrichs was also a Professor at the University of Athens; his 1843 article on the 'Topography of the harbours of Athens' correctly identified the three harbours for the first time, on the evidence of the numbers of shipsheds given for each harbour in the newly available Naval Lists, the evidence of *horoi* or boundary stones, and the length of the shoreline in what he proved to be Zea and Munychia. His plan shows parallel lines running into all three harbours, and he clearly interpreted the stone walls running into the sea in Zea, parallel to each other and at right angles to the shore, as 'supporting shipsheds'. His report of parallel stone piers on the south side of Kantharos harbour 'close to the find-spot of the Naval Lists' shows how that discovery was still causing academic excitement in Athens.[7]

Official German involvement came when plans were made by the surveyors of the German General Staff, as part of a project by the newly founded German Archaeological Institute (1873) to map the antiquities of Athens and Attica, published as *Karten von Attika* in 1881–3, with accompanying archaeological commentary.[8] The chief surveyor was G. von Alten, who also drew on the earlier nautical survey by Graves. His two plans, at different scales, showed the lines of many structures around the shores of Zea and Munychia. The archaeological commentary on Piraeus was written by von Alten and A. Milchhöfer, a distinguished classical archaeologist; von Alten concentrated on the fortifications, but also published plans of a group of shipsheds that he had identified in Munychia – at that time the 'only completely measurable shipsheds that survive of all the many shipsheds of antiquity' (14–15). He also saw, but did not measure, shipsheds in Zea (12). Milchhöfer analysed the topographical conclusions of their predecessors, and the ancient literary evidence, building on the commentaries of Böckh. He appreciated the work of Ulrichs, and does refer to the work of Graser, but the latter was fully considered only later by Wachsmuth.

Milchhöfer raised the question of the organization of the shipsheds in the dockyards, noting the boundary stones of the *trittyes*, the three divisions of each of the ten tribes (57–8). His suggested distribution of the shipsheds into thirty *trittys* groups (*Karten*, Blatt IIa) has since been regarded as pure hypothesis, and his linking of the boundary stones with the shipsheds was firmly rejected by Wachsmuth, whose interpretation, since generally accepted, is that the stones marked the assembly-points for crews, who would have been called up by *trittys*. There are, however, some indications of grouping within the Piraeus shipsheds, which could have been for organizational as well as practical purposes (see Chapters 3 and 10). Milchhöfer also (57) appreciated the problem of fitting 196 shipsheds into the Zea shoreline of 1,120 m – very tight if we assume an average shipshed width of 6 m, and impossibly so given that the ancient shoreline must have been significantly shorter with the undoubted rise in sea level since antiquity.[9]

In the meantime B. Graser had walked (and apparently waded) along the shores of the harbours of Piraeus, and measured thirty-eight shipsheds in Zea and nine in Munychia, and saw a number more. This was a remarkable series of observations and measurements, indicating some variety in the dimensions of shipsheds, with some wider and some narrower than the standard. Sadly he published no plans, though he refers in his text to 'my drawing', and his

[5] Curtius does not refer to *neoria* in the text, and his map was produced by Schaubert: see Catalogue 16: Piraeus, note 47 and Fig. B16.2.

[6] According to Graser 1872: 21.

[7] Ulrichs 1843a, with pl. I, conveniently reproduced by von Eickstedt 1991: fig. 6. His text appeared also in a Greek version in the same year (1843b), later in which he died prematurely. The German text appeared in English translation by E. P. Colquhoun in 1847: here we find what seems to be the first appearance in English of the terms 'ship sheds' (15, 16), 'ship-sheds' (17) and 'ships' sheds' (20). Ulrichs 1863 is a reprint of the 1843 text, with a less informative plan. One wonders whether Ulrichs knew Leake's work: his wording is very similar to Leake's (1st edition, 344).

[8] Curtius and Kaupert 1881: Bl. II–IIa; 1883: Bl. III.

[9] See Chapter 5, note 16; Catalogue 16: Piraeus, with relevant texts.

work was underestimated for a century. Blackman urged the need for re-evaluation of his work, and this has been done in recent years by B. Lovén and by Rankov.[10]

Through the mid nineteenth century, however, no serious excavation of shipsheds took place. In 1859 C. E. Beulé made a privately funded excavation of Punic shipsheds in the Circular Harbour of Carthage, on the island and on the outer edge, but his report was short and without detailed plans.[11] Only when H. R. Hurst recommenced excavation at the site in 1974 could Beulé's work be defined and evaluated.

A new era opened with the excavation by I. Dragatsis of a line of shipsheds exposed during roadworks on the eastern shore of Zea harbour in 1885.[12] This excavation was sponsored by the Archaeological Society of Athens, and was joined by Wilhelm Dörpfeld, who held an influential position in Greek archaeology. This was a rescue excavation conducted to the highest level for its time, and the results provided a reference point on ancient shipsheds for nearly a century. The results were published fast, if briefly, with a fine plan and sections by Dörpfeld, which set standards for future publications.[13] A photograph of the site in 1891 is probably to be attributed to Dörpfeld (Fig. A2.1).[14] Supplementary excavations were carried out by Dragatsis and Angelopoulos in 1899–1900, but were less well published.[15]

By the late nineteenth century investigations had started at other major ports. Carthage has been mentioned; at Syracuse shipshed foundations had been found on the north shore of the Little Harbour, and briefly published by Cavallari and Holm in 1883. The width measurements look doubtful, and no length measurements were obtained; but the site was preserved.[16]

Much more information was provided by the partial excavation by the American School in 1900–1 of the rock-cut shipsheds at Oiniadai, with rapid publication by J. M. Sears and plans and (partly hypothetical) sections by B. Powell. This site had already been visited by Leake in 1809, and the shipsheds had been firmly identified by L. Heuzey in 1860. As we shall see, this site has recently been completely excavated.[17]

For a long time shipsheds were less the object of fieldwork or excavation than of historical and topographical debate. Outstanding was the early work of C. Wachsmuth on Athens.[18] With the new evidence from the 1885 excavation he re-evaluated the observations of Graser and von Alten, and also the earlier plans. He found Graser's descriptions, though detailed, to be misleading, and thought that von Alten's intelligent comments were not fully justified by the evidence available. He did, however, pick up Graser's observation that the Munychia shipsheds seemed to be oriented towards the harbour entrance, rather than the centre of the harbour, to prevent ships just launched from hitting the slipways opposite; and he noted Graser's observation of the varied width of the shipsheds and of the considerable submerged length of the slipways – indicating a rise in sea level – adding that the 1885 excavation showed a considerable length of slipway above water level. He rejected Milchhöfer's suggestion that the *trittys horoi* were connected with the shipsheds (see above). He also noted that the remains already reported (by 1890) from Oiniadai and Syracuse had now been made comprehensible by the results of the 1885 excavation in Zea.

Other studies of the topography of Piraeus included discussion of the shipsheds, but did not add much to our knowledge. For example E. Angelopoulos, who worked with Dragatsis and supervised dock construction in the 1890s, continued to contest Ulrichs' correct identification of ancient Zea with modern Pashalimani, and placed Zea in a hypothetical enormous basin at the north end of the main harbour. He did, however, make the good point that the length of shoreline available in Pashalimani was not sufficient to house the 196 shipsheds attested by the Naval

[10] Graser 1872; Blackman 1991: 114 n.6; Lovén *et al.* 2007; Lovén 2011; Rankov in Catalogue 16: Piraeus.
[11] Beulé 1861: 85–118 ('Les ports') and planche IV (schematic plan). See Catalogue 5: Carthage.
[12] Dragatsis 1885.
[13] For discussion see Blackman 1968; Lovén 2011; Catalogue 16: Piraeus.
[14] The photograph was presumably taken for the German Institute, which still has the glass plate. It may include Dragatsis in the background.
[15] See Lovén 2011; Rankov in Catalogue 16: Piraeus, covering also other minor work, e.g. by A. Meletopoulos in 1882 and Dragatsis in 1892.
[16] See Catalogue 23: Syracuse.
[17] See Catalogue 15.
[18] *Die Stadt Athen im Altertum* II.1, Leipzig 1890, 60–75 on Piraeus.

FIGURE A2.1 The upper ends of some of the Dragatsis/Dörpfeld sheds in Zea harbour, with some columns re-erected, viewed from the north-west in 1891; the taller figure wearing a hat in the background may be Dragatsis himself (photo: Deutsches Archäologisches Institut, Athen, Pir. 6).

Lists, which he calculated would need 1,274 m; he even doubted whether Tourkolimano would have had room for the eighty-two shipsheds attested for Munychia, but this was less plausible.[19]

The monumental work on the topography of Athens by Walther Judeich contained a short but solid discussion of this question already in the first edition of 1905. This led to a debate with Karl Lehmann-Hartleben, who replied in his *magnum opus* of 1923, with a further reply by Judeich in his second edition.[20] Judeich maintained that the problem can only be solved by assuming that some of the sheds housed two ships, one behind the other, and cited the group of shipsheds 'with a common roof' referred to as nearby in the inscription giving the building specifications for Philon's Arsenal. Lehmann-Hartleben argued that such double shipsheds would have raised serious technical problems, and that the problem is solved if we assume that some of the shipsheds were narrower; he adduced in support the apparent evidence from Syracuse and Carthage for shipsheds 2.50 and 2.70 m wide (which we can now dismiss). The shipsheds 'with a common roof' were, in his view, simply illustrated by Dörpfeld's reconstruction of the Zea shipsheds with two shipsheds under each saddle roof. Judeich was not convinced by the evidence from Syracuse and Carthage, and insisted

[19] E. Angelopoulos, *O Peiraieus kai oi limenes autou*, Athens 1898.
[20] W. Judeich, *Topographie von Athen*, 1st edition, Munich 1905, 384–6 n.12; 2nd edition (1931) 439 n.5. Lehmann-Hartleben 1923: 113–14.

that nearly all the shipsheds must have been for triremes, with dimensions similar to those found in 1885. Both scholars quoted Diodorus (14.42.5) on Dionysios I in the early fourth century building shipsheds 'mostly taking two ships' (but this reference does not seem to decide the question either way). The debate still continues (see below).

Lehmann-Hartleben's book, whose sub-title ("Contribution to the Study of Town Planning in Antiquity") reveals his particular interest, contained summaries of all that was then known about shipsheds. He allows only one site in his chapter on the Archaic period (Samos); for the Classical period he discusses at length the concept *neorion*, and for Classical shipsheds devotes his main attention to Piraeus and Oiniadai, the only shipsheds known then in detail. He notes considerable advances in the Oiniadai shipsheds, though he does not think they are much later: notably the upswing of the upper ends of the ramps, adapted to the ships' sterns, and the proximity of storage space. For the Hellenistic period he concentrates on Carthage; and he has a short discussion of Roman *navalia*. His exhaustive site catalogue contains all the evidence then known: literary, iconographic and material.[21]

Köster in a popular book referred only briefly to shipsheds (or 'boathouses').[22] F. Miltner covered the same material as Lehmann-Hartleben in his Pauly-Wissowa article on *neorion*.[23] Despite the title he wrote only on shipsheds, and though he summarized well the existing evidence, he added little new to the discussion, apart from suggesting (from his study of the development of warships in the Geometric period) that Polycrates' shipsheds at Samos may not have been the first. The early structures would, he thought, have been mainly of timber. He dismissed Lehmann-Hartleben's idea of very narrow shipsheds, and on the dispute between Lehmann-Hartleben and Judeich he pointed out the objections to both views; but his suggested compromise – pairs of ramps without a colonnade between – is not confirmed by any evidence from Piraeus, nor is his idea of triple ramps at Carthage confirmed by the recent excavations there, but only in the (contested) hypothesis for Thasos. He noted the lack of material evidence for Roman *navalia*.

There was sadly little follow-up to these comprehensive surveys until the development of underwater archaeology at the end of the 1950s. Exceptions were the investigation on land at Sounion by E. J. A. Kenny in 1935 (published in 1947), after the virtually unpublished excavation by G. M. P. Oikonomos in 1923; and the excavation by the Italian Soprintendenza in Rhodes city in 1940–2, the material from which was lost, and perhaps also the draft publication. The site was identified as shipsheds by Greek archaeologists in the 1950s, and was reinvestigated from 1971 (see below).[24]

A. Poidebard had from the 1930s pointed the way in the study of shallow-water sites, using divers and appreciating the value of air photographs, but it was the development of SCUBA that provided new possibilities for harbour surveys below as well as above the surface. N. C. Flemming led a Cambridge student diving team that in 1958–9 surveyed the site of Apollonia, port of Cyrene, and identified and planned remains of shipsheds. Study of evidence for sea level changes had for some time made geologists interested in the remains of ancient harbours and submerged coastal sites. Flemming and other geomorphologists, and on the archaeological side Blackman and others, appreciated the particular value of shipsheds (as well as certain other features such as fish-tanks) in providing fairly precisely measurable evidence of relative changes in sea level. Lively discussion took place from the Colston Symposium in Bristol in 1971 to the Athens Conference of 2003.[25] The interest of geomorphologists such as Flemming and Pirazzoli has led to the discovery and study of a number of (particularly rock-cut) shipsheds since then.

By the early 1960s a number of large-scale excavations of ancient harbours, both silted up on land and under water, had started; but shipsheds had not attracted particular attention. J. S. Morrison, however, in his continuing

[21] Lehmann-Hartleben 1923: 57, 105–19, 138–47, 183–4; Katalog 240–87. His article on 'harbour' ('limen') in Pauly-Wissowa is, he recognizes, virtually a summary of his recently published book: *RE* XIII: 547–70, with 563–4 on shipsheds.

[22] A. Köster, *Das antike Seewesen*, Berlin 1923, 132–3: he suggested that the ships were hauled up the slips with rollers and block-and-tackle.

[23] *RE* XVI: 2471–4, quoting Böckh, Wachsmuth, Judeich, Lehmann-Hartleben and Köster.

[24] See Catalogue on these sites.

[25] See Blackman 1973; 2005; and references there.

studies on the ancient trireme, had like Graser realized the importance of shipsheds in providing firm evidence for the dimensions of the ancient warships that were housed in them, and particularly their beam. He invited Blackman, then recently graduated, to contribute a chapter to his forthcoming book (with R. T. Williams) on *Greek Oared Ships 900–322 B.C.* (1968). This reviewed the literary evidence available and attempted to summarize the archaeological evidence already known in 1965, the date of writing: basically Piraeus, Oiniadai, Apollonia and Sounion, with brief references to the other sites. It emphasized the importance of taking into account relative change of sea level, which had already been noted by some nineteenth-century researchers at Piraeus. This short chapter has since been used as a basic work of reference on the subject. Blackman has tried to update it in various articles and chapters in books,[26] but the time has long since come for a full and detailed review of the subject: hence the initiative which led to this project and publication.

Since 1965 the archaeological evidence for shipsheds has gradually accumulated. The first shipsheds identified in Corcyra were excavated in the North Harbour in 1966. The architect Paul Knoblauch carried out land and underwater research at the naval harbour of Aegina (1964–6), and identified at least six shipsheds, submerged except for the top of their back wall; previous reports by F. G. Welter had gone almost unremarked. Knoblauch's experience of harbour survey grew with work at Kyme in Aeolis, Phaselis and Side; and when Blackman was asked by the Ephorate of Antiquities to study the unpublished remains from the Italian excavation in Rhodes city, he invited Knoblauch to join him as architect; this study continued from 1971 to 1992, in co-operation with A. Yiannikouri of the Ephorate. The plans and sections produced by Knoblauch were of the highest quality, with great attention to detail; sadly, he died a few weeks after approving the final proofs of the publication (1996). Blackman and Knoblauch were also able to identify as belonging to shipsheds some remains on the west side of the military harbour found earlier during rescue excavations by the Ephorate. This is a case that we hope will be repeated elsewhere, as knowledge of shipsheds becomes more widespread – one of the aims of this publication.[27]

Study of a particular type of shipshed – slipways cut in the rock – was resumed with the excavation of a single slipway at Setaea in north-east Crete by C. Davaras in 1967; K. Baika is now continuing the investigation, also of its submerged part. At Matala in southern Crete Blackman followed up a report by J. W. Shaw and surveyed another single slipway, and again Baika has now surveyed the submerged part, but the rock-cutting on land has mostly been filled in and covered. In 1976 came the first certain discovery of shipsheds beyond the Greek world to the east: at Dor in Palestine Linder and Raban surveyed three rock-cut slipways. Further finds of similar slipways were published by Flemming and Pirazzoli in 1981: at least three at Rethymnon, now also being studied by K. Baika, along with her work at Sounion.[28]

In 1974 Henry Hurst, after careful preparation and study of the subject, and with years of experience of urban archaeology and excavating complicated stratigraphy, started major excavations at Carthage, on the Ilot de l'Amirauté and on the north-eastern edge of the round military harbour. These excavations set new standards for attention to the detailed stratigraphy of shipsheds, and for the quality of the architectural reconstructions by Sheila Gibson. A number of questions remain open, as we await the final publication of the Ilot site: if the shipsheds found date only from the second century BC, where were the earlier shipsheds?[29] What was the nature of the lower ends of the shipsheds? Do we see a Punic tradition in the form of the shipsheds? And in the ships that they housed?

Other rock-cut slipways were discovered on the island of Alimnia (ancient Eulimna), off the north-western coast

[26] Notably Blackman 1973; 1982; 1987; 1989; 1991; 1993; 2003; 2008a; 2008b.

[27] For these and the following sites, see the detailed description and bibliography in the Catalogue. Further possible discoveries are discussed in the Catalogue: Miscellanea, which has grown greatly as our study has continued.

[28] See Catalogue for all these sites; and Chapter 12. Rock-cuttings, discovered in 1969 in the bank of the River Neda in Arcadia, have been interpreted as remains of shipsheds; this is possible: see Catalogue: Miscellanea.

[29] Hurst (2010: 31–2 and n. 19) has returned to his initial interpretation of underlying timber structures as a possible earlier phase of shipsheds; he has been influenced by the discoveries of timber slipways at Marseilles.

of Rhodes: a chance discovery in 1980 by A. Sampson during his excavation of a prehistoric site on the island. At his suggestion Blackman was invited by the Ephorate to study the remains of ten and eleven slipways (it is not certain whether and how they were roofed) on two separate bays. After initial investigation from 1991 he collaborated with A. Simossi of the Ephorate of Maritime Antiquities in 1997 in underwater survey of one of the bays and limited excavation; this work remains to be completed. This site was probably a naval station of the Rhodian fleet, apparently used later as a commercial way-station.

Simossi had also studied in 1988 the harbour of Samos, and carried out underwater sondages to investigate the famous breakwater built by Polycrates; she and previous investigators were not, however, able to find any trace of the shipsheds which he built, and which are still generally regarded as the earliest.[30]

From 1984 to 1993 a Franco-Hellenic co-operation project, directed for most of the years by J.-Y. Empereur and A. Simossi, carried out underwater research inside the ancient military harbour of Thasos, and discovered some remains which have been interpreted as shipsheds, with (it is suggested) an unusual layout in groups of three; the possibility of an earlier phase beneath became more plausible as other similar finds were made at other sites. Finds elsewhere in the harbour and just outside, in the early years of the project, have been interpreted as harbour ramps and ship-supports. Continuing excavation on shore promises to define further the layout of the military harbour and the shipsheds, for which there are currently different proposals. There are strikingly close links between the military harbour and the agora.

A new chronological dimension was added to the subject with the discoveries of Joseph Shaw (who had long experience of harbour research since his work at Cenchreae in the 1960s) and Maria Shaw, excavating a Minoan site at Kommos on the coast of the Mesara plain in southern Crete (from 1976). In the mid 1980s a row of six long, narrow, roofed galleries was revealed (Building P), over 37 m long and 5.60 m wide, dating to the Late Minoan IIIA2 period (fourteenth century BC); Maria Shaw first suggested in 1985 that they could be interpreted as shipsheds, though they lay well inland.[31] Some, including the writer, were slow to accept this interpretation, but have been convinced that it is plausible by recent similar discoveries at the port of Knossos,[32] and with the proviso that here 'shipsheds' mean 'sheds for ship storage', for example for winter storage well away from the shore, rather than 'covered slipways'.

The second major shipshed excavation started at Kition in Cyprus in 1985 as a general excavation of the harbour basin, directed by M. Yon. Remains of shipsheds were found and carefully excavated (1987–99). Again the presence of a skilful and imaginative architect, O. Callot, has enriched the study, and the discussion of, for example, the reconstruction of the superstructure. The extent of the harbour basin was investigated also by geomorphological and sedimentological studies, the importance of which has been highlighted by the French team here, as also at Marseilles. This has now become a standard feature of harbour research.

A major French research project at the site of Apollonia, directed by A. Laronde (1986–98), included a reinvestigation led by C. Sintès of the shipsheds studied by Flemming. The remains still visible (fewer than thirty years before) were surveyed in detail, generally supplementing rather than changing Flemming's conclusions, and a new chronology for the harbours and the shipsheds has been proposed. The possibility of modular construction has been suggested.

In 1987 considerable remains of shipsheds were found on the south-east side of the North Harbour of Corcyra (Kokotou site); these remains were briefly reported at the time and are now being studied by K. Baika. In 1990–1 a single shipshed was found during rescue excavations on the eastern side of the South Harbour at Corcyra: the only

[30] Possibly earlier than Polycrates (see Chapter 3); but I doubt.

[31] J. W. Shaw and M. C. Shaw, *Kommos* V. *The Monumental Minoan Buildings at Kommos*, Princeton, NJ and Oxford 2006, 851–2 and n.12, giving full bibliography. They remained properly cautious: '[The hypothesis] remains to be proved by the definitive discovery of sufficient nautical equipment connected with such galleries.' See now Blackman 2011 and references there.

[32] See below, pp. 12–13 and notes 37–9.