TROPIS V

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A PROPOSAL FOR BRONZE AGE AEGEAN SHIP-SHEDS IN CRETE

The site of Kommos in south-central Crete (fig. 1) has been under archaeological investigation for some 17 years since excavation started in 1976. The American School of Classical Studies at Athens, the Greek Antiquities Service, the University of Toronto and the Royal Ontario Museum are institutions under the auspices of which the work has been carried out[1].

Excavations revealed a Minoan town spread out on a hillside along the shore of the Western Mesara Plain (figs. 1-2). During the Bronze Age it was inhabited from chiefly c. 1900 B.C. to 1250 B.C.. that is from Middle Minoan IB through Late Minoan IIIB[2].

South of the area with the houses[3] lies a complex of huge Minoan civic buildings faced by ashlar masonry and orthostate blocks (fig. 3)[4]. The plan of the largest building, which is of Late Minoan I date, has an enormous court surrounded by rooms of various types, indicating that the building was of palatial style. Subsequently, in Late Minoan IIIA2 (during the period 1420/1380 - 1360/1325 B.C.), another structure was built upon its eastern wing. We have called this Building P (fig. 4), and it is on this that we focus on here. Although its plan, to be described, can be compared with plans of other Minoan buildings, its proportions and size are so far unparalleled. As was argued in the past[5], P may have served, at least in part, for the storage of ships during the non-sailing months in the winter. The closest parallels for plan and scale are. interestingly, ship-sheds of the Greco-Roman period. Those, however, were set directly next to the water and used for the storage of warships, especially triremes.

Building P was almost square, about 38.51 m east-west by 39.60 m north-south. The largest LM III building now known, it was of one story only and consisted of at least six broad, roofed galleries facing an open space to the west with no further structure between it and the shoreline[6]. The galleries are usually about 5.60 m in width, although the sixth, the last one on the south, is about 5.20 m wide[7]. While open and without doors on the west, the galleries were completely closed at the back, to the east, by a massive monumental ashlar facade with orthostates forming the lower courses (fig. 6). The orthostate facade was of LM I date and was reused. The long east-west gallery walls were built of masonry stabilized by a massive wooden framework of horizontal, vertical, and perhaps also transverse timbers joined together, as indicated by now empty gaps or chases in the walls. To judge from the masonry found fallen into Gallery 3 (fig. 7), the rooms were at least four meters high. Gallery 3, the only one completely excavated by us, had an earthen floor, blackened in places by burning, with a scattering of cooking wares as well as many fragments of short-necked amphoras which represent the latest use before abandonment. In the southeastern corner was a hearth, and along the southern wall were two ovens of clay, much larger than some of the same phase found in the Minoan houses[8].

Putting aside the matter of the huge scale temporarily, we must note that Minoan storage magazines provide the closest parallel for the plan of the successive, parallel galleries. Typically, these are long, narrow rooms set side by side and usually approached from a corridor that runs at right angles to them. Good examples exist in the Minoan palaces at Knossos and Phaistos (fig. 8)[9]. Those in the West Wing at Knossos are long and narrow and were intended for the storage of large jars or pithoi perhaps containing foodstuffs, in particular oil[10]. When it comes to size, however, those magazines are much smaller than the galleries of Building P. The larger ones at Knossos, for instance, are about two meters wide and nineteen meters long. Such a crucial difference in size is likely to be missed when one compares published plans, which are reproduced at various scales, rather than the buildings themselves.

A closer parallel for Building P is to be found at Nirou Khani, at Ayioi Theodoroi, where Spyridon Marinatos identified possible Bronze Age Minoan ship-sheds (fig. 9; Marinatos 1926:146). Excavated into the bedrock of a small peninsula is a large rectangular cutting over 46 m long, consisting of three separate parallel spaces ranging from 4.45 to 5.00 m wide (J. Shaw 1990: 425-426). The two on the north are submerged, being at least 1.80 m deep (bedrock is not visible except on the sides of the cutting) and are partially separated by a partition wall of bedrock a meter wide. The local relative sea level must have been considerably lower then than now since Minoan walls are submerged in the immediate area.

Closer in scale and plan to Building P at Kommos, as noted earlier, are Greco--Roman ship-sheds, like those at Apollonia (fig. 8). As Blackman has described them in his fundamental study of Classical ship-sheds, the average size was 37 meters long (dry length), and somewhat less than 6 meters wide (Blackman 1968: 187-188 and 1987: *passim*). Such a measurement corresponds well With P's Gallery 3 (over 37 meters long and 5.60 meters wide). It was largely on the basis of the dimensions of the classical ship-sheds that the *Olympias*, a life size model of a trireme, was recently built. It is 36.8m long and 5.4m wide, with a height of 3.6 m from keel to canopy deck (Coates 1989:97), with a ratio of width to length of 1:6.8.

Before the discovery of the famous Fleet Fresco from Thera (fig. 10 for a detail), Marinatos estimated that the larger Late Minoan Aegean ships were thirty meters long (1933: 191-192). The larger ships on the fresco itself he later estimated as 33.75 m. long (1974a: 151)[11]. A ship of this length could well be accommodated within P's galleries or, for that matter, within the possible Minoan slips at Nirou Khani.

It is more difficult to estimate the width, or beam, of the large ships in the Theran fresco. The only actual Aegean ship now known is that of the 14th or early 13th century B.C. discovered at Uluburun off the shore of Turkey. The vessel was about 14m long and perhaps 4.5m wide, giving a ratio of width to length of about 1:3.1 (Bass, personal communication, after C. Pulak, of April 1, 1993). On this basis, if the larger Theran ships were over 33 meters in length, they could have been as much as ten meters wide. We know, however, that the Uluburun ship was a merchantman, and like all ships of its kind was made to be broad in order to accommodate cargo. Also, it is reasonable to assume that then, as now, there was a variety of ships that served different purposes. The clearest indication of this is to be found in the Theran fresco where we see small vessels propelled by oars, a ship that may have been a merchantman (the only ship with a sail as well as a possible cargo on deck), as well as the longer ships with their passengers, probably warriors.

Gillmer (1978: 125) conjectured that the longer Theran ships might have had a beam ranging from 3.7m to 4.8m, if they were twenty-four meters long. On the basis of the length suggested by Marinatos (33.75m, above), Gillmer's width range could be proportionately adjusted to 5.20m-6.75m. It is at least possible, therefore, that ships of that length and with medium proportions were set within Building P. These could have been the swiftest Minoan ships, on the analogy of the Greek triremes that were made for speed and that were c. 5.4m wide (as the *Olympias*, above), or less. Better estimates must await further discoveries, hopefully in the form of an actual ship, probably a wreck, in the Aegean. Or again, on the analogy of the slips in the classical ship-sheds, one might discover in Crete buildings with galleries such as those of P with features such as keel marks on the floors, or marine gear such as anchors and tools, that would prove the presence of Aegean Bronze Age ship-sheds, as is being argued here[12].

It is possible, therefore, that the galleries of P could have accommodated very long ships provided that they had the approximate width of the later Greco-Roman triremes. Or, as Maria Shaw proposed earlier (1985: 26), the galleries may have also been designed to contain two or more of the smaller vessels which could have fit easily into the space available. Among the smaller vessels may have been the ships, perhaps warships, shown in the "Shipwreck Scene", also from the fresco in the West House at Thera (Fig. 10; also Doumas 1992: Pl.26).

One apparent problem with the theory of ship-sheds being proposed is that Building P was set back from the shoreline, unlike the classical Greek ship-sheds that were set with sloping access ramps actually leading down below water level. At this point, however, the analogy between the Aegean Bronze Age and Greco-Roman situations no longer applies, for most Aegean Bronze Age harbors are set on relatively

open shorelines (e.g. at Kato Zakros in Crete, exposed to an east wind), on either side of a peninsula (e.g. at Hagia Irini on the island of Kea), or leeward of a small offshore island which would partially break the force of the waves (e.g. at Amnisos or Kommos in Crete)[13]. Greco-Roman harbors, on the other hand, such as those at Piraeus, were usually set in small bays, sheltered from the waves, bays that could be narrowed further by piers built out into the water. The result was that the ships and other facilities would be protected from enemy incursions. Also, structures such as quays, storehouses, and ship-sheds could be built at the actual shoreline and would not be endangered by wave action[14].

As to the question of whether weight would present a problem in hauling ships some 150m or so up from the shore, we only have to turn to the transportation of extremely heavy building blocks in architecture, of which we have actual examples. At Kommos itself, the largest orthostate block in the north facade of J/T weighs about 3,150 lbs. At Phaistos the largest block is about 9,850 lbs[15]. In the Treasury of Atreus at Mycenae, the estimated weight of the lintel blocks is some 100 tons[16].

The point here is that while Greco-Roman harbor installations could be built right next to the water or, in the case of the ship-sheds, actually *into* the water, many Bronze Age Aegean installations such as houses, warehouses, or possible ship-sheds, were built sufficiently back from open shorelines so as not to be destroyed by the waves during stormy weather[17]. At Kommos, for instance, the winter waves can now reach some 20-30 meters up on the shore, a vertical distance of some 2-3 meters. Buildings could be constructed, therefore, only inland (east) of that point. On the other hand, protected shores might still be the locations of Aegean ship-sheds, if Maria Shaw's identification of a building with successive, high-celinged rooms shown in the miniature fresco from the West House as a shipshed is correct (Fig. 10, upper left; M.C. Shaw 1985: 23). Indeed, the rooms in the fresco are very similar to the way Building P would have appeared when seen from the west, from the sea (Fig. 5)[18].

As discussed in more detail elsewhere, at Kommos there has been since LM I an increase in local relative sea level of about three meters, and there is evidence to suggest that a substantial part of the change took place between LM IB and LM IIIA2 when Building P was constructed, a period of perhaps seventy years[19]. One of the chief indicators of the time period during which at least some of the change occured is the otherwise unnecessary raising of the floor level within LM I Building J, near the shore, by at least a meter during LM IIIA2 (J. Shaw 1984: 274 n.41; for the date see also J. Shaw and M. Shaw 1993:187). It was probably after LM I and before LM IIIA2 that the western portion of palatial Building T (Building P's predecessor) was largely destroyed by the sea. This made it possible later for P's galleries, when they were built, to be accessible directly from the seashore without any intervening construction, for there was no further construction there during LM III.

As postulated by Gifford, local relative sea level in the Kommos area continued to rise until it reached its present level, with P's floor presently at +3.30m -+3.60m.[20] During the time that P was being used, therefore, its floor level was at +5.30m -+6.30m. This meant that the building was not threatened by the waves which would have reached then up to at least c. +4.00m. The distance from the building to the sea was about 130 meters, calculated as the distance from the present shoreline (80 meters) plus the 30 to 50 meters to be added when the shoreline was further out. This

might seem a long distance to drag ships gradually on rollers or over oiled skids up the some 5-6 vertical meters of incline to the building, but it would have been possible as long as there were sufficient ropes, skids, props and manpower available[21]. A somewhat analogous scene of bringing ships up from the sea is recorded in the *Iliad* (I. 485-486):

> But when they had come back to the wide camp of the Achaians they hauled the black ship up on the mainland, high up on the sand, and underneath her they fixed the long props[22].

In our previous publications we have stressed that Kommos, especially after LM I, was increasingly in contact with areas to the east (Cyprus, the Syro-Palestinian coast, and Egypt), our evidence being the foreign pottery discovered on the site. Much of this pottery has recently been published by L. Vance Watrous in *Kommos* III (1992:149-184). Commercial relations seem to be evident. There are, however, other aspects of Building P to discuss. As we have seen, smaller merchant craft could have been stored there during the winter, non-sailing months, but the longer, sleeker craft may have been stored there as well. It has been argued (Prytulak 1982; Morgan 1988: 117; Doumas 1992: 48-49) that the relaxed passengers in the longer craft in the Theran fresco were probably warriors and it is likely that the ships could have been used for military action. Also, on the basis of the analogy with the later Greek triremes, made for speed and not for carrying cargo, the military aspects of such ships may have been considered to be primary. Indeed, unless Bronze Age Aegean ship-sheds are to be considered exceptions to the rule, ships houses in special buildings have usually been military. One can cite the Greco-Roman ship-sheds themselves or the later Venetian *arsenali* (Papadopoulos (ed.) 1972: Pl. 235 (those at Channia)), covered Royal Navy yards (Coad 1983: 42) or, for that matter, Nazi submarine pens. Would the Minoans of south central Crete have initiated a building as large as Building P for purely commercial reasons? Perhaps, but the effort made may have been more closely connected with military expeditions and/or the defence of the southern coast of Crete.

That security at Kommos was a concern is reflected in the architecture of both the LM I and the LM III Buildings J/T and P. In the case of J/T, only one doorway has been identified in the north facade, which is some 40 meters long and built so solidly as to make it practically impregnable. The entire east facade (Fig. 6) was doorless and similarly built. Both these facades prevented entrance into Building P, leaving the west and south as the only other points of access. On the west, naturally, lay the seashore, while the south area may have been protected by the slope leading up to Building P. Perhaps Kommos repeats what seems to be a pattern of Aegean coastal towns, which although not completely surrounded by a wall, such as at Kea (J. Shaw 1990: 422 [Fig. 2], could have been protected by walls that were simultaneously parts of buildings. Such might be the function of the blue wall in the arrival town in the Fleet Fresco from Thera, which had only one doorway (M. Shaw 1986: Fig. 1 and Pl. 3a); or in the town in the Master impression from Chania which clearly had a fortification wall pierced by two tall and impressive doorways at the two ends (Hallager 1985: Fig. 11); and, finally, the coastal town seen in the rhyton from Mycenae, which has a solid wall on the waterfront and two doorways[23]. The walls discussed were defensible, even if

they cannot be called, strictly speaking, “fortification” walls, since some were marked by windows.

At Kommos itself we have now examined the area adjacent to the hillside, but the largely unexplored area to the southwest might well have contained in LM III other installations connected with seafaring, for instance warehouses for trade materials, or buildings for housing ships’ gear. Such areas along the shore, including parts of the large space west of Building P, might have been used for ship building, outdoor storage for ships, etc[24]. It is also possible that during LM I, before part of the shore-side buildings were destroyed by the sea, a functional predecessor to P existed where now there is only sand and consolidated beachrock. Perhaps such a building has a plan similar to that of P, with P being a later version of a known type. It is also reasonable to argue that since Kommos was not the only harbor town of Crete or, for that matter, of the Aegean, that in the future similar structures might be discovered at Amnisos or Katsamba (the harbor towns of Knossos), or at Chania, Mafia, Palaikastro, Kato Zakros, or elsewhere. On the Mainland of Greece they might appear in the future along the Mycenaean shoreline of the Argolid, or on the shore near Iolkos, or at Phaleron near Athens, or at Gythion near Sparta, or along the ancient shoreline near Pylos.

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NOTES

1 We are also especially grateful to the Social Science and Research Council of Canada and the Institute for Aegean Prehistory for their invaluable financial support. A number of preliminary excavation reports have appeared over the years in *Hesperia*. The latest (1993) under the pint authorship of Joseph and Maria Shaw provides references to earlier reports.

2 For the pottery see now Betancourt 1990 and Watrous 1992, passim).

3 The area will be published as Vol. I, part 2 (in press) in a series being published by Princeton University Press.

4 Above these buildings on the west was built, during Greek times, a rural sanctuary with a long history, beginning C. 1020 B.C. and continuing through early Roman times.

5 The argument was first developed in M. Shaw 1985. See also J. Shaw 1986, 1990, and J. Shaw and M. C. Shaw 1993: 129, 188.

[6] During 1993, a pottery kiln was discovered southwest of P's Gallery 6, on an accumulation above the main LMI court. The kiln is LMI I date, however, and its upper structure was razed during LM III down to the level planned for P's court.

[7] Some time after its construction, Gallery 6 was blocked at its entrance by a north-south retaining wall.

[8] A more detailed description of Gallery 3 is in J.W. and M.C. Shaw 1993: 170-177. Hearths and oven are part of a widespread phenomenon during LM III at Kommos, for they appear also in the last phase of houses in the town and south of Building P. A separate study on these hearths discusses the appearance of similar structures on other LM III sites in Crete (M.C. Shaw 1990 *passim*).

[9] Identifications and sources for the plans in Fig. 8 are to be found in J. Shaw 1986: 263, and note 95 there.

[10] For a discussion of materials possibly stored in Building P see J. Shaw 1986: 266.

[11] By comparison, the ships appear to be smaller than the funerary boat. a millennium older, discovered near the Great Pyramid of Khufu in Egypt. The boat recovered there is 43.4 m Iona and 5.9 m wide (Jenkins 1980: 108). Of some significance for the main theme in our text is that there were during the Second Millennium B.C. actual storehouses (ship-sheds) for boats in Egypt. The earliest is mentioned in a papyrus in the British Museum (BM 10056, from the time of Tuthmosis III), and concerns Peru-nefer in Lower Egypt where a large sea-going military vessel was stored. A later example (Anastasi IV, 8,4, still New Kingdom) concerns a covered shit-shed for a sacred vessel at Resynu See Glanville 1933: 37 and Caminos 1954: 159 Here we correct the mistake in J. Shaw 1986: 267 and note 108 there, where only one site is mentioned. We thank Professor Ronald J, Leprohon for bringing this to our attention.

[12] Of particular interest is that during 1993 two stone anchors of a composite, perhaps Cypriot, type, were found below the floor of P in an LM IIIA1/LM IIIA2 context, along with sherds of Cypriot, Canaanite, and Egyptian provenience.

[13] For Aegean Bronze Ace harbors, see J. Shaw 1990 *passim*.

[14] For Greco-Roman harbors see J. Shaw 1972: *passim*, and D. Blackman 1982, especially 190-193.

[15] For estimates and comparative material see *MAMAT* p. 44, n.l.

[16] Wace 1949: 31.

[17] Harbors in the Syro-Palestinian area may have been situated inland near estuaries and marshy areas (Raban 1991: *passim*). In riverine Egypt quays were built along the Nile (Shaw 1990: 429) and large harbors were excavated from the shoreline (Blackman 1982: 92).

[18] A building shown near the shore in the miniature painting from Kea might be of the same type as the "shipshed" building from Thera (J. Shaw 1990: Fig 20), but the painting is fragmentary.

[19] J. Gifford in *Kommos I*, 1 (in press), Chapter 3 and Pl. 3.19 there; J. Shaw 1986: 267 and note 106.

[20] There is a slight slope, east down to west, of 0.15 m. from +3.44m, down to 3.30m in Gallery 3, the one gallery that has teen cleared completely.

[21] Concerning the slope, David Blackman (personal communication of June 6 1993) has noted that 5 to 6 meters of vertical distance over 100-200 meters of horizontal distance would produce a nice gradient for ships hauling. 1:20, has notes, is the standard gradient for modern ships: Classical Greek ones tended to be 1:10 or steeper and mechanical aids would have been required. Of some interest is the discovery in Middle Kingdom Mirgissa in the Sudan of a mud-paved road surface over 200 meters long. It had tranverse beams of wood embedded in it, over which snips were drawn in order to avoid different parts of the Second Cataract. The slight gradient was 7: 1000 (Vercoutter 1970: 179, 204).

[22] Translation by R. Lattimore, *The Iliad of Homer*, Chicago, 1951.

[23] M.C. Shaw 1986: 112. The idea that such walls may be .not atypical of coastal towns is discussed in the same article.

[24] For a summary of maritime capabilities during the period, as deduced from the Linear B tablets, see Palaima 1991: 308

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ILLUSTRATIONS

Fig. 1 The area of the west Mesara in Crete (T. Boyd).
Fig. 2 General plan of Kommos site (G. Bianco, 1992).
Fig. 3 Southern area at Kommos (G. Bianco, 1993).
Fig. 4. Schematic plan LM IIIA2 Building P (G. Bianco, 1992).
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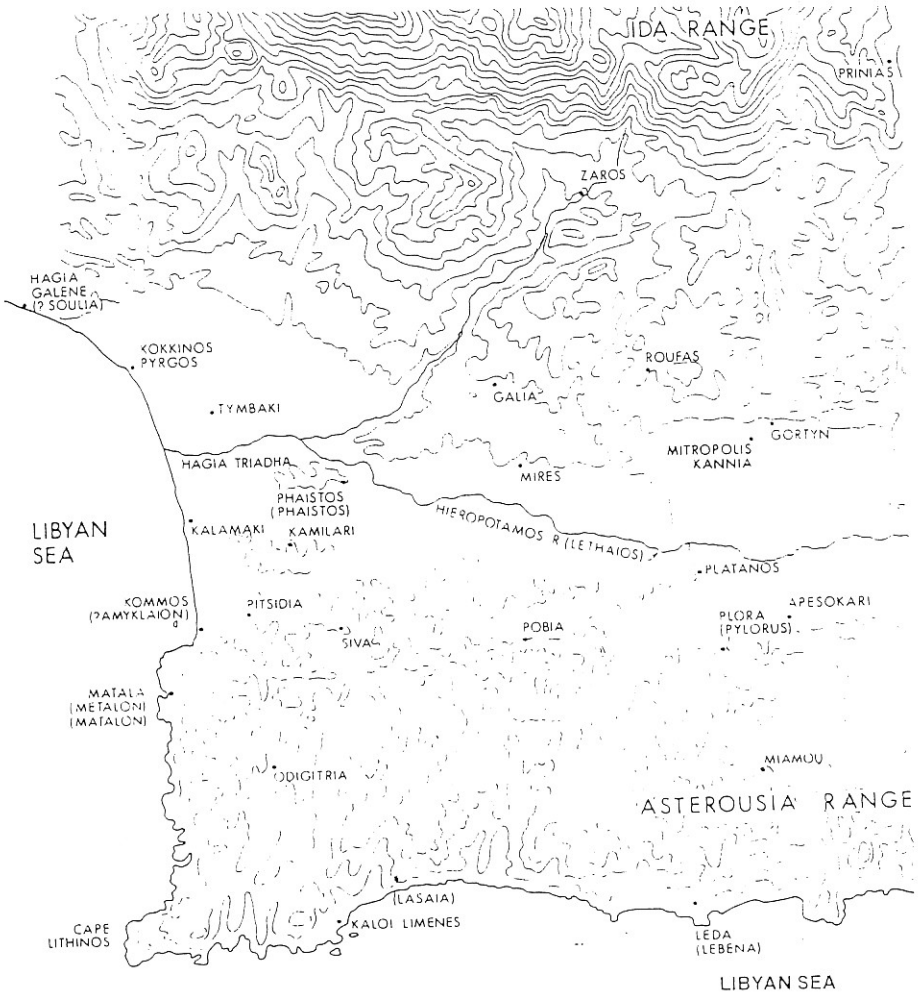
Fig. 8 Comparative plans of Bronze Age and later buildings intended for storage (J. Shaw, G. Bianco).
Fig. 9 Plan of Nirou Khani (after S. Marinatos, 1926, 144).
Fig. 10 Shoreside scene with ships, soldiers, and buildings. Miniature fresco from West House at Akrotiri, (after S. Marinatos, 1974, Pl. 7).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HAGIA TRIADHA
MIRES
PHAISTOS (PHAISTOS)
KALAMAKI
KAMILARI
HIEROPOTAMOS R (LETHAIOS)
LIBYAN SEA
PLATANOS
KOMMOS (?AMYKLAION)
PITSIDIA
APESOKARI
PLORA (PYLORUS)
POBIA
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MIAMOU
ODIGITRIA
ASTEROUSIA RANGE
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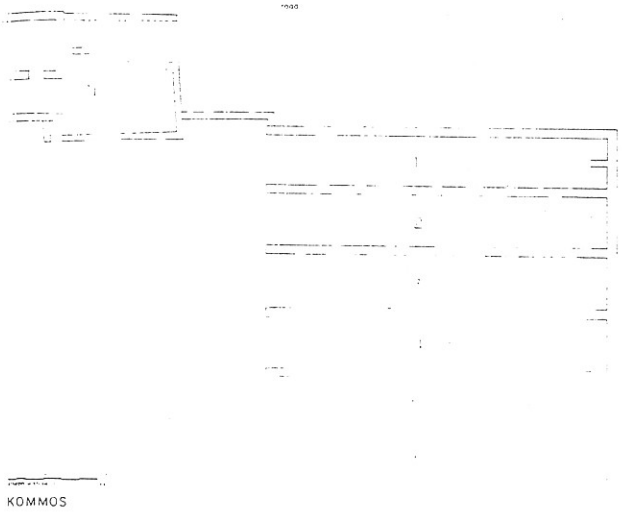
LIBYAN SEA

Fig. 1

Fig. 2

Fig. 3

Fig. 4



KOMMOS

Fig. 5

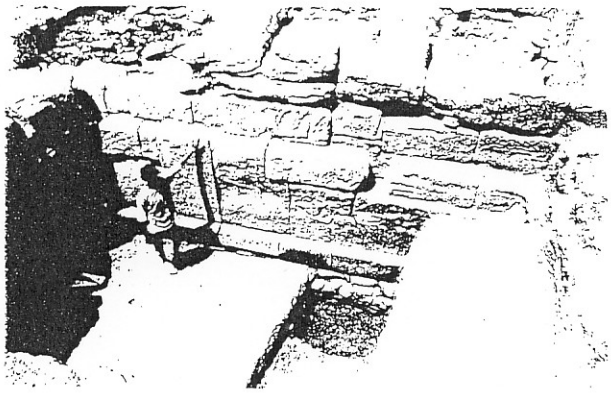


Fig. 6

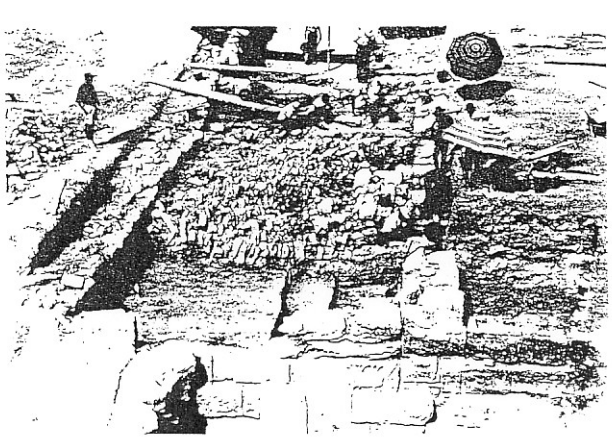


Fig. 7

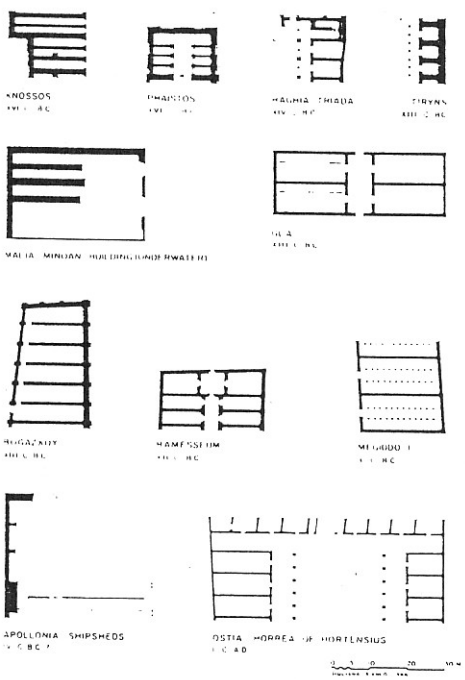


Fig. 8

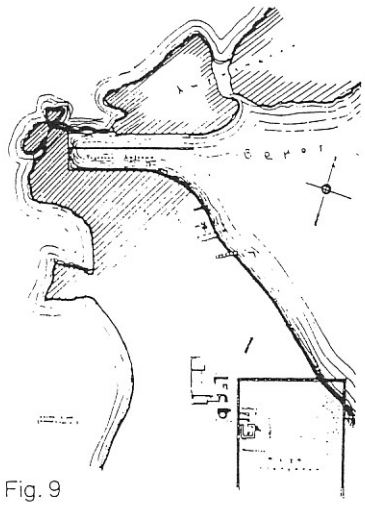


Fig. 9

Fig. 10