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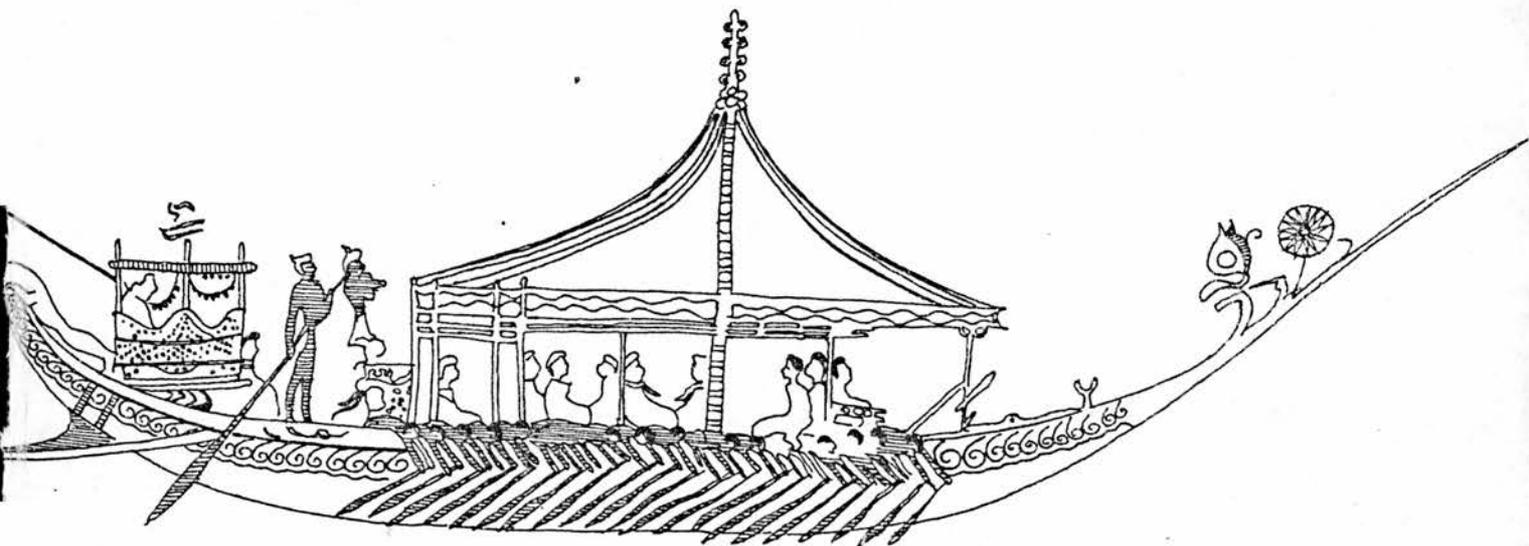
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ANCIENT HARBOURS OF CRETE



A thesis submitted to the University of St. Andrews
for the Degree of M. Litt.

Dimitris Sotirakis

1990



Abstract

The present thesis discusses ancient and modern evidence, results of surveys and excavations, and research conducted by the author concerning Cretan harbours of antiquity. In particular, it deals with the ports' physical and geographical setting, methods of construction, their hinterland and foreland and their relation to the city that sustained them.

The discovery and study of many ancient harbours of Crete though, presents difficulties, because today they are found either uplifted and buried under the soil or under the water. These phenomena of subsidence and uplift appear in Crete and are caused possibly by the subduction of the African, under the Aegean tectonic plate.

Crete is situated in between Africa, Asia and Europe. Thanks to this exceptionally favourable location, the island was in contact with the surrounding cultures from very early on. Therefore, construction of artificial harbourworks make their appearance in the Bronze Age thanks to a commercial rise and the destruction of natural harbours, following the last glaciation. Subsequent civilizations left their mark upon the Cretan coastline, reinforcing and extending preexisting harbourworks, and building new ones, especially at Roman times.

Most of the Minoan harbourworks were simple structures, greatly dependant upon the natural features of the coastline. Therefore, harbourworks of Bronze Age Crete were built mainly on the northern and eastern coastline. The inhospitable southern was left relatively uninhabited. The Greeks and mainly the Romans acquiring the technical knowhow, were able to create harbours wherever it was convenient from the strategic and commercial point of view. Therefore, relatively large ports were built in south Crete, in order to facilitate commerce with Egypt and the cities of the Syropalestinian coasts.

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Abbreviations

- A.A.A. : Arheologica Analecta ex Athinon.
A.B.S.A. : Annals of the British School of Athens.
A.D. : Arheologicon Deltion.
A.E. : Arheologici Efimeris.
A.J.A. : American Journal of Archaeology.
B.C.H. : Bulletin de Correspondence Hellenic, (ed.) Raban A.
H.A. : Harbour Archaeology. Proceedings of the 1st
international workshop of ancient Mediterranean.
Caesarea Maritima, (ed.) Raban A.
I.J.N.A. : International Journal of Nautical
Archaeology.
K. : I.P. : Kriti : Istorika ke Politismos.
K.H. : Kritika Hronika.
M.A. : Maritime Archaeology, (ed.) Muckelroy K.
M.A., C.P. : Marine Archaeology. Colston Papers (ed.) D.
Blackman.
M.T. : Minoan Thalassocracy. Myth or Reality ? (ed.)
Haag R., Marinatos N.
P.A.E. : Practica Arheologicis Eterias.
P.K.S. : Practica Arheologicou Sinedriou.
Scr. Med. : Scripta Mediterranea, (ed.) Shaw J., Shaw
M., Proceedings of the Kommos Symposium.

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I. Introduction

In the course of history, throughout the Mediterranean region, military or commercial dominance was inevitably based upon sea power. Accordingly, the commercial and naval fleets had to have effective harbour installations in order to exercise and maintain their supremacy. In the case of an island, the need of possessing adequate harbours is even greater. It is evident that no matter its size, an island is always in need of products or natural resources unavailable on its soil. It is hard to perceive the existence of an insular population without good harbour facilities, for harbours simply mean contact with the outside world.

Thanks to Crete's exceptionally favourable location, situated between the continents of Europe, Asia and Africa, the island as early as the Bronze Age, became the cradle of an important and in many respects original civilization. This was the Minoan, that was mainly a maritime civilization, expanding to the Cycladic islands and establishing colonies and *emporia* almost throughout the Mediterranean coasts. After the Minoans, the Greeks of the Classical and the Hellenistic periods as well as the Romans, have all left their traces upon the Cretan coastline, building and reinforcing harbours during the heyday of their civilizations. Especially busy were the Romans, between the 1st c. B.C. and 1st c. A.D., extending older and building new harbours all over the Mediterranean and of course on the island of Crete also. Towards the end of the 1st c. AD, therefore, I found it convenient to end my study.

The passage of so many distinct cultures through the island of Crete and their concern for constructing harbourworks, makes the study of Cretan harbours interesting.

An artificial harbour is designed to keep an area of constant depth always sheltered and in Crete, harbour designers were constantly concerned with the protection of

their harbours from the prevailing north and north-western winds that blow strong throughout the summer. Accordingly, the problem of protection of the harbours from the winds, sluice canals and desilting arrangement, the creation of mooring and landing facilities, warehouses, internal basins, shipyards as well as beacons, have all been thought of and solutions have been provided by engineers of the aforementioned civilizations. Also, an adequate network of roads are also vital connecting the various major inland settlements and towns with the harbours. The study therefore of harbours and harbourworks can only make sense in relation to the city plan, wind direction, morphology of the coast, and access channels. Nevertheless, their foreland and hinterland and the population that sustained them are also features worth considering.

One very positive feature for the construction of harbourworks in Crete, as indeed is the case with almost the entire Mediterranean, is the lack of tides. The work of harbour builders under these circumstances is appreciably easier and the preservation of the harbours is exceptional. However, this great advantage is more than offset by the fact that the Mediterranean and especially Crete is one of the most tectonically active regions of the earth. Therefore, tectonic activity has resulted in the subsidence of thousands of miles of coastline and uniquely for Crete, also uplift. In this respect, most of the harbours are either submerged, covered by sand and silt or water, or are found inland -some times many metres- buried under the soil. Therefore, the discovery and study of Cretan harbours of antiquity is made very difficult. Other difficulties that hinder the ports' discovery and complicate the matter further are : extensive overbuilding of harbourworks by subsequent generations which in many cases extend to modern times. Also, one finds constant dismantling of the structures and use of their architectural members in the construction of later structures. This, especially took place in the Byzantine and Venetian eras. (Fig.1) The lack of aerial photographs that are valuable for the discovery

of submerged structures in conjunction to the very limited underwater surveys and excavations, exacerbates already existing problems. Dating the structures is in most cases a problem if these are not related to dated features ashore. Also, sometimes it is very difficult to distinguish artificial structures under water from natural formations, for the latter are usually covered by a thick layer of marine growth.

A fair amount of our knowledge about ancient Cretan harbours derives from classical literature. Unfortunately, apart a chapter written by Vitruvius in the 1st c. B.C., no ancient technical handbook concerning harbour construction survives to our days. However, we are lucky to have a number of *Periploi* or coastal Pilots, similar to modern *Portolana*. These were practical books providing valuable sailing directions, details concerning harbours, anchorages, watering points and the distance in between. The most valuable for our purpose are those attributed to Scylax of Caryanda geographer and explorer of Darius I, dating in its surviving form to the 4th c. B.C., and the one of the *Stadiasmus, Maris Magni*, perhaps of the 3rd c. A.D. The latter provided information about the watering points and the distances in *stades*. In the works of the classic writers important comments about harbours can also be found.

Unfortunately, unlike a number of ancient depictions especially of the Roman era of various Mediterranean harbours found on coins, lamps, reliefs, mosaics and wall paintings, none refers to the island of Crete.

Important information of harbourworks may be found however in the works of Medieval travellers as well as explorers of the previous centuries.

The first large scale survey of ancient harbours, based primarily on literary evidence, was that conducted in 1923 by K. Lehman Hartleben. As D. Blackman stresses, the result "was a monumental piece of work and remains an important reference book". A number of other books and articles with a variety of subjects, refer directly or indirectly to

Cretan harbourworks. Among them, of greatest interest is the great work of Sir Arthur Evans, "The Palace of Minos", published between 1921 and 1935. This was one of the major sources for my thesis, for the Minoan period. The book of H. Frost - this tireless student of Mediterranean harbours -, "Under the Mediterranean", contains a lot of interesting information about ancient Cretan harbours, drawn from her own research, conducted for the most part, during the middle of our century. The study of E. Hadjidaki of Mediterranean harbours was also valuable. The most important contemporary work on ancient harbours however, constitutes the survey conducted by D. Blackman on the major sites around the Mediterranean. His excellent work came out in 1982 and was based upon literary evidence and personal research.

The bulk of our knowledge of ancient Cretan harbours however, derives mainly from surveys and excavations, which nevertheless are very limited so far to form a conclusive view about the whereabouts of the harbours. The most important of all excavations, I believe, are those initiated by the Department of Classical Antiquities of Western Crete, under the directorship of the marine archaeologist Elpida Hadjidaki. These were conducted from 1986 to 1988, concentrating on the late Classical \Hellenistic harbour of Phalasarna. The ancient harbour and town, being destroyed and deserted sometime during the 1st c. B.C., and being buried under the soil about 100 m. away from the sea, proved to be exceptionally well preserved and a wonder of harbour design. New evidence will come to light during the following summer, when excavations will resume again. Another excavation that had aimed to elucidate the Minoan harbour installations at Ayioi Theodoroi (Nirou Khani), was conducted in 1926 by the ephor of Antiquities (then) of Crete, Spyridon Marinatos. Unfortunately, today, a great deal of the Bronze Age installations have been overbuilt by a hotel and a chapel. An excavation that took place in 1939 by V.Theophanides at the entrance of the bay of Souda, revealed a part of a sea-wall which the

excavation's director dated to Roman times. Excavations of almost a decade (mid 70's - mid 80's) were conducted at the very important Minoan harbour-town of south Crete, Kommos, by Professor J. Shaw and a team of archaeologists and scientists. Although the excavations were expertly concentrated on the city, nevertheless, evidence of buildings related to the Minoan harbour were excavated, as well as a grand road, leading from the town to the port. Future excavations concentrated entirely on the immediate harbour, would undoubtedly be of great value, since Kommos was the outlet of Minoan Crete to the Lybian sea. Of equal importance are considered a number of surveys conducted in the summer of 1955 by a team of volunteers under the leadership of J. Leatham, among various sites of the Cretan coastline. It is interesting to note that a number of these were carried out underwater. The resultant plan of their survey of the Roman harbour of Hersonisos is of great value for the student of ancient harbourworks. The team also explored and surveyed a number of harbour features and their remarks for relative sea-level changes are very important. Another survey and study of great importance is the one conducted by a team, lead by Dr. Veit Sturmer at the Minoan harbour sites of Ammnisos, and Malia.

Interest in the remains of ancient Cretan harbours was stimulated by the study of evidence for relative sea-level changes in historical times. Accordingly, a number of sites have been added. Thus, N. Flemming and P. Pirazzoli published in 1981 an article, the result of many years laborious work, of surveys and explorations of many coastal Cretan sites. Their article includes Palaikastro, Zakros, Pseira, Matala, Phalasarna among others. Both authors being experts in the study of geomorphology, their results are extremely important for the student of relative sea-level changes and coastal sites. Of equal importance may be considered the study of the sea-level changes and crustal movements, published in 1988 by P. Pirazzoli as he includes archaeological and historical data and references of many coastal sites.

Of interest are references to harbourworks found on surveys and studies of broader geographical areas. Many other books whose listing is not necessary at this part of my thesis, were of great interest and assistance.

All the aforementioned sources I have studied and tried to summarize in the present thesis aiming to show what Minoan, Greek and Roman harbours of Crete looked like. Most of the sites I refer to, I was able to research and photograph. However, working mostly on my own I did not have enough time to carry my own surveys which are definitely worthy. I hope that in the near future, I will be able to survey all the sites and search for more, either on land or underwater.

The story of a number of sites in Crete is indeed disheartening. During the construction of massive hotel installations, modern harbourworks and roads, ancient harbour remains have been destroyed or built over without study or recording. More such structures are threatened in the near future by development of coastlines for tourism and the construction of monstrous tourist installations that are mushrooming every season on the coasts of Crete.

Finally, I vehemently believe that the discovery and study of ancient Cretan harbours can solve many archaeological problems concerning the maritime legacy of the cultures involved, and the degree of their sophistication.

II Location, Environment and Topography of Crete

"There is a land called Crete in the midst of the wine-dark sea, a fertile land and rich, begirth with water, and therein are many men innumerable, and ninety cities" (Odyssey 19, 172-174).

Crete is located in the south-eastern Mediterranean, situated in between the continents of Europe, Africa and Asia. It is a long and narrow island with a west-east orientation, being the fifth largest island of the Mediterranean and the largest of the Aegean archipelago.

Crete is a very mountainous island, with three rugged mountain ranges running almost along its whole length from east to west, all above 2,000 m. high, "allowing no room even for a road along much of the nearly harbourless south coast." (J. Graham, 1962, 3). The mountains are snow clad nearly all year round while their slopes in many places are hostile and inaccessible. However, where they are gently inclined, they were once covered with great forests of oak, cypress and fir, of which there is no trace nowadays. (S. Marinatos, 1960, 12). Especially the cypress forests, in Minoan times supplied timber for shipbuilding, and the construction of buildings. The mountains also produce good quality limestone while the high fertile plateaux are good for cultivation and grazing. Thus, on the Lassithi plateau of Dikte, on the east, about 900m. above sea-level, agrarian towns flourished throughout antiquity.

Graham tells us that "across the low isthmus of Hierapetra, the mountains stage one grand upheaval before they slip down steeply into the sea, in the east end of the island". (J. Graham, 1962, 4). However, the wealth of a palace complex found in the 1960's in the harbourage of Kato Zakros is indicative of a flourishing city in Minoan times.

In the centre of Crete, where the island is considerably wider, two large and fertile plains, one in the north - where the modern capital Herakleion lies- and the other in the south -called Messara- hosted the most important cities

of the Bronze Age, Knossos and Phaestos. On another plain to the north - east, lies one more important Minoan city and palace, Malia. Further to the west, the highest mountain range of Crete, Leuka Oroi -over 2,500m. is penetrated by spectacular gorges with a north- south direction and leave little space for habitation with the exception of a few coastal plains. Pendlebury informs us that the whole of Crete westward from Leuka Oroi was an impenetrable virgin forest. (D. Pendlebury, 1939, 6).

Crete does not have large rivers any more and all but a few dry out in the hot summer months, due to the severe deforestation. But even in antiquity the island lacked large rivers available for navigation and inland penetration. This fact makes the Cretan coastline advantageous for the creation and maintenance of harbours, for unlike Israel, (A. Raban, 1985, 11) Cretan rivers being small, do not empty great quantities of silt and sand onto the coast.

Because of intense seismicity, Crete is honeycombed by hundreds of caves many of which present great archaeological, historic and religious interest.

The coastline of Crete is 1,046km. long, with many barren islands off its coast, creating thus many natural harbours. The construction and maintenance of harbours do not present great obstacles. As A. Raban informs us, in relation to the coasts of Israel, the water in the coastline is relatively deep, there is no shifting sand on the nearshore sea bottom, and marshy coastal plains are extremely rare. (A. Raban, 1985, 11). The northern shores are characterised by sandy beaches and bays protected by promontories and are of a completely different nature to the southern. The latter are protected by mountains which in most cases descend steeply to the sea, while the beaches are pebbly near river mouths. Thus the most important bays and natural harbours all lie on the northern coasts. Accordingly, the numerous inlets and harbours of the northern Cretan coastline and its proximity to the Cyclades and the mainland of Greece facilitated and fostered commerce. "The greatest ports of

ancient Crete were as they are now situated on the northern coast. From the Libyo - Egyptian point of view, Crete simply faces the wrong way". (S. Spyridakis, 1970, 2). However, the Aegean pelagos separating the northern Cretan coast from the Cyclades and the Pelopennese, has been "proverbially tempestuous and perilous" to mariners both ancient and modern. Before the discovery of the compass and other navigation instruments (they were discovered in the Middle Ages), navigation was based upon the observation of the constellations at night and scanning of the horizon during daytime. Experience and handbooks from classical times onwards, pointed out the dominant landmarks. (Y. Karmon, 1985, 1). In this respect Crete is very favourable an island. Being long and narrow, its three prominent mountain ranges are distinguishable from tens of miles on a clear day. They offer indispensable assistance to seamen, leading them fairly easily to the islands' ports. While in a proximity to the coasts, the innumerable islets, promontories and bays especially of the northern coast further assisted the ancient navigators to find the Cretan ports easily. As Mrs McGeehan Liritzis informs us, there are differences between winter and summer sea currents. As shown in Fig.2, during the summer, a boat approaching Crete from the Aegean, faces difficulties to enter the north Cretan harbours. Instead, it is preferable to approach the southern coastline. Access of the northern coast is easier via the islands of the Cyclades. During the winter, (Fig. 3) maritime traffic was limited. For the mariners though, wishing to sail to Crete from the mainland, there is a downward wash to the northern Cretan coast, directly from the Attic and Argolid peninsulas. (McGeehan Liritzis, 1988, 240-241). Landing on the northern coastline during the winter was safer due to the lack of conflicting currents. (Mc Geehan Liritzis, 1988, 241).

The Cretan climate is typical of the Mediterranean region, generally marine, temperate and dry. In the mountain regions it is colder but it becomes almost sub-tropical on the south side of the island. The north-western

coastal winds that blow stronger in the summer months (meltemia), are a relief from the blazing sun.

Meltemia are the most important winds on the Cretan coasts. They can be extremely fierce however, reaching high speeds. This factor conditioned accordingly the construction of harbours.

Rainfall in Crete has decreased considerably and takes place mainly in the autumn and winter while the summers are very hot and dry. Precipitation is greater in the west but decreases progressively while proceeding eastwards. Areas cultivatable at different altitudes permit harvesting at different times as well as a variety of products. "It is easy to understand how incredibly varied must be the products of an island in which a journey of only a few hours takes one from cold to heat". (S. Marinatos, 1960, 12).

The soil of Crete is generally speaking fertile and much of its produce is well known for its quality and flavour. S. Spanakis says that Crete gives two crops per year. The main products of Crete are oil, cereals, almonds, walnuts, raisins, dairy products, wines, honey, wax and a great variety of fruits. The excellent Cretan honey was the main source of sweetening food in antiquity. Many of these products -in addition to timber-, we know existed in antiquity through remains excavated and preserved in carbonized form, written sources, inscriptions and representations in works of art. The sources also tell us that the island had great herds of oxen, sheep and swine as well as of the still existing (uniquely in Crete) mountain goat, "Agrimi". S. Marinatos, believes that in very early times, the island must have had deer, wild boars and lions. The sea provided the Cretans with tuna, mullet, bass, bream, sole, mackerel, octopus and cattle fish as well as shellfish. (R. Willets, 1977, 28). Also, sea purple was a very important source of wealth for many coastal cities. Sea purple, -Haliporphiros for Homer-, also called "royal purple" was the most expensive tint in antiquity. The liquid dye was extracted from a gland of the mollusk Murex.

R. Stieglitz - an expert of ancient production of Murex - informs us that it was previously believed that the practice originated in the Levant. However, the earliest sea-purple installations have been found and studied in various coastal sites of Crete, going back to MM II times. Murex manufacture was thence diffused to the Mycenaean world in the mainland, to Troy and possibly to the Levant. (R. Stieglitz, 1986, 183-184).

Crete is, and always was poor in minerals and metals. Excavations, however, have revealed an abundance of metal objects suggesting that they must have been imported in exchange for agricultural products, aromatic substances medicinal herbs and other manufactured goods. In particular, timber was in great demand in treeless Egypt. Also, native Cretan medicinal herbs were highly valued by Egyptians as was resin, used in the embalming of the dead.

III. Sea-level changes and earth movements in Crete

The Mediterranean sea and in particular the Aegean is a very tectonically active area. Probably, one of the most active areas in the world. (N. Flemming, 1971, 185; J. Kraft et. al., 1971, 93). Recent earth movements have been so rapid that a synthesis of the effects of these factors on sedimentary history in the Aegean, can hardly be attempted. (E. Hadjidaki, 1984, 2). Scholars support that in this area, relative sea-level studies are extremely difficult owing to high tectonic activity. (J. Kraft et. al., 1971,93).

N. Flemming informs us that McKenzie maintains that in the Mediterranean region, in terms of plate tectonic theory, the boundary of the Eurasian and African plates, extends from the Azores, passes just south of Gibraltar, and the north-western coasts of Africa, to enter Sicily and Italy. From there, it makes an abrupt curve on the north Adriatic coasts and descends to Peloponnese and through the islands of Kythera and Antikythera it reaches and encircles the south coasts of Crete, to ascend again, and penetrate Anatolia, in the Aegean. (N. Flemming, N. Czartoryska, P. Hunter, 1973, 47). (Fig.3a) Moreover, the plate tectonic theory indicates that the African plate is underthrusting the Aegean one. Under this action this plate is moving northwards, in relation to the Eurasian at a rate of 1.9 cm. per annum in Gibraltar, 2.4 cm. per annum in Sicily, and 2.6 cm. per annum in Crete. Due to this phenomenon, the Mediterranean basin is compressed in a north-south direction. The results of this action are frequent earthquakes and volcanic eruptions that cause land submergence of thousands of metres in length or even uplift, over thousands of years. Therefore, the Peloponnese is doming upwards in the centre, while the Argolis and Messenian peninsulas of Peloponnese are subsiding rapidly with a rate more than 2m. per millenium. Also the Mani peninsula is distorted without a distinct pattern and a ridge of uplift enters Crete after passing Kythera and

Antikythera. South-west Turkey is rather stable with a depression of 0.5m. per millenium. However, the Cesme peninsula and the Fethiye-Gelidonya region are both subsiding more than 2m. per millenium. (supra)

The vertical displacement, instead of being of a downward course, can also be upward. This pattern of subsidence and uplift appears uniquely for the Mediterranean in the island of Crete. (E. Hadjidaki, 1988, 18). It has been shown after extensive field study that subsidence is much more widespread in the Mediterranean, with a rate of 1 to 2m. in 2,000 years. In contrary, uplifted regions are much more restricted, with a more rapid rate of 10m. per 2,000 years. (N. Flemming, 1971, 185) Western Crete is being uplifted up to 4.5m. per millenium while central Crete is partly uplifted and partly submerged. Eastern Crete is depressed in the north-east and uplifted in the south-east. (N. Flemming, N. Czartoryska, P. Hunter, 1973, 47).

Apart from the major faults (lines on which one body of rock moves past another, a plane of movement running down into the earth with a steep angle), there are many smaller ones which cause tilting, subsidence and uplift, in response to great adjustments within the earth. Because of the network of all these faults it is very difficult to know what the position of a certain place is going to be in the future. This suggests that even adjacent places may exhibit completely different histories of subsidence and uplift. (R. Berger, 1978, 51; N. Flemming, 1971, 186). Therefore, each site must be dealt with separately. This can be done in a variety of ways. Firstly, by surveys of coastal archaeological sites and structures, noting their position, in relation to the modern sea-level and comparing it with their primarily intended position; this enabling an estimate of the relative sea-level change, since the occupation of the site or the construction of the structure. Secondly, by scientific methods, such as radiocarbon dating and the application of geophysics and neotectonics (P. Pirazzoli, 1988).

A. Major studies and references of sea-level changes
and earth movements.

Subsidence and uplift of coastal, either natural or manmade structures have been identified and observed by a great number of people over thousands of years. Marks of relative movements between the land and the sea have been noticed on cliffs when the sea-level has dropped, leaving apparent erosion marks. Until a few years ago, those marks on cliffs and evidence of subsidence or uplift on man-made structures was the only way to estimate and date crustal movements. As a matter of fact, the study of ancient sites close to the coasts is a very sensitive method to estimate the relative sea-level changes.

The first people who studied and noticed these indications in various localities of Crete, were Lieutenant Mansel in 1852 and Captain Spratt in 1865, of the British Navy. The latter also took measurements between marks on sea-cliffs in west Crete. Spratt was also the first to realize that the uplift in the area took place in historical times. He concluded that this occurred in a series of upward movements (T. Spratt, 1865, 123, 135, 195, 218, 226, 230, 232). In 1869 Raulin influenced by Spratt's interpretation affirmed that Crete was uplifted on the western part and subsided on the eastern half (V. Raulin, 1865). This view was met with criticism by the followers of the dominant stability theory but were favoured by the supporters of the mobilistic theory towards the end of the 19th and beginning of the 20th century. Thus, Suess in 1888 and Cayeux in 1907 both supported the theory that western Crete has not been affected by crustal changes in historical times. Pirazzoli states that their attitudes are "a remarkable example of scientific blindfolding, justifying the defence of pre-established theories. (P. Pirazzoli, 1988, 160). Negris in 1907 accepts the 'stability' theory but recognizes the submergence of eastern Crete, as a gradual sea-level rise. The supporters of the stability theory influenced later generations having

a "sterilizing effect on research in the field". (P. Pirazzoli, 1988, 160). Half a century was to elapse until the first radiocarbon date results published by Hafeman in 1965, confirming that the uplift of eastern Crete had occurred in historical times. Since then, a lot of new radiocarbon dating measurements have been conducted and published by Kerandren and Angelier in 1979, Flemming in 1973 and Kelletat in 1979. In particular, N. Flemming gave the final blow to the stability theory by developing a geodynamic model of the north-east Mediterranean, based on the assumption that surface plate movements moved in one direction during historical times. The data gathered by his team, of submerged and uplifted sites, harbours of Crete and other parts of mainland Greece and Asia Minor have been plotted to a tectonic map of the major parts of the central and eastern Mediterranean. This map, as is stressed by Raban and Linder helps us understand historical and geomorphological events, as well as the rise and fall of maritime nations and their harbours. (A. Raban, E. Linder, 1975, 16)

The close proximity of ancient sites in the Aegean and their study by Flemming and his team, enabled them to make a statistical treatment and to separate the eustatic and tectonic factors of the last 3,000 years, which resulted in the sites' submergence or uplift. Therefore, Flemming suggested that the eustatic sea-level change has not exceeded 30cm in the last 3,000 years with an error margin of 20cm plus/minus 200 years. (N. Flemming, N. Czartoryska, P. Hunter, 1973, 48). This means that subsidence more than 30cm on a coastal site more recent than 3,000 years old, is more likely to be due to local earth movements and thus of a tectonic character than to a worldwide eustatic sea-level change. Thus because of the intense seismicity in the Mediterranean basin, totally independent estimations of sea-level changes must be made.

Systematic field research and study of a multi-disciplinary approach, conducted almost simultaneously to that of Flemming by Laborel, Pirazzoli, Thommeret and

others led to the idea that the upward crustal movement of western Crete and Antikythera was not due to a series of moves (as believed until then), but rather to a single sudden uplift. This event was dated c. 1530 years B.P. which followed a number of small subsidence movements that took place during the previous two-three millennia. (P. Pirazzoli, 1988, 157). All these results were drawn up with the rapid progress of the neotectonic and geophysical research in the Aegean, which made possible the understanding of sea-level changes in this area. However, the seismic activity in Crete and Antikythera must have been more dramatic with an uplift of up to 10 metres in extreme western Crete. This seismic event created an uplift and tilting of a lithosphere block about 200 Km. long. This event has been unparalleled for at least 10,000 years in this area and was termed 'Early Byzantine Tectonic Paroxysm' (E.B.T.P.). (P. Pirazzoli, 1988). E. Hadjidaki though, informs us that there is only one historical record about such an earthquake written by the Byzantine chronographer Ioannis Malalas, who wrote during the 6th century A.D. According to him, this earthquake (modern seismologists range it at least 8 on the Richter scale,) took place during Theodosius reign (400-450 A.D.) and caused great catastrophe. Crete has always been rich in seismic activity and according to ancient texts, great earthquakes occurred in 66 or 52 A.D. and in 365 A.D. (E. Hadjidaki, 1988, 21)

IV. Cretan ships

It is certain now that during the heyday of the Minoan civilization, from c. 2,000 to 1,500 B.C., the mariners of the island traded and even established trade lines to various locations of the Mediterranean "that were destined to last for millenia". (L. Casson, 1959, 23). In conjunction with the fact that Cretan cities were unfortified, we can only assume that Minoans were protected by a fleet, as so many scholars have argued in the past. (Fig.5)

A. Raban stresses that 3 major types of vessels existed in the Bronze Age. These were:

a) a heavily built ship of deep draft, with large cargo capacity, sailing both day and night.

b) The coaster; a faster and easily manoeuvrable ship, smaller than that of the first type, and narrower, suitable for shorter journeys that required night anchorages and daily resupplying.

c) A third type of ship developed "in cultures of subsistence economies and local military operations were usually directed at simple coastal settlements which could be taken by force." (A. Raban, 1980, 752). Fast and manoeuvrable ships were thus required for such operations, manned by oarsmen. All three types as we shall see existed in Bronze Age Crete. A brief summary of the evolution of Cretan vessels, I believe is important.

During the 3rd millenium, international trade had been already established and sea traffic was intense, mainly due to the search and barter of metals and other precious materials. (G. Bass, 1972, 16). Representations of boats of this period we can find in the Cyclades, incised on terra-cotta objects called "frying pans". The impression that one immediately gets of those ships is that they were long, slender, and fast galleys. Linear in shape, their prow raised abruptly almost perpendicular, topped by ensigns of fish. A number of linear projections indicate oars. No sail or rigging is shown.

Almost the same impression is given by a number of Cycladic lead models from Naxos and a clay model found in Palaikastro, in Crete, dating from E.M. times. (P. Johnston, 1985, 7). Characteristic of these early examples of ships or boats is a fixed appendage visible at the stern. As far as E.M. Cretan vessels are concerned, N. Flemming suggests that they were designed for speed and had one man per oar. These boats must have been about 16m long and 4m. wide and must have weighted 9 tons". (N. Flemming, 1971, 37). Unlike Egypt, Crete did not have navigable rivers and accordingly there can never have been a period when slow river vessels were constructed. On the contrary, given the fact that Crete is an island, seagoing ships coping with the rough seas must have been the main concern of Minoan shipwrights. "Two idiosyncracies which distinguish M.M. ships from their contemporaries in Egypt are the very high prow, rising at an angle of about 60°, and the low stern with keel projecting, a form persisting from the old long boat type of the earliest Bronze Age both in Crete and in the Cyclades". (R. Hutchinson , 1962, 95). These ships which appeared on prismatic gems of semi-precious stones between 2,000 and 1,600 B.C., are shown to carry a single mast, rigged with 2 or 3 stays fore and aft. Sails are not depicted but a number of 4 to 5 lines below the hull seem to indicate oars.

However, starting from M.M. times, Minoan vessels appear with rounded hulls. This hull shape would become characteristic of Minoan ships, although the coaster type of ship undoubtedly would have existed. The Minoan rounded-hulled vessels could be distinguished from Egyptian ships by having a more markedly raised stem and stern. This fact gives the impression that they were bi-directional. They also portray a number of oars and carried a square sail. During the M.M. period, another man must have been added per oar, and Cretan ships must have been up to 30m. long. (N. Flemming, 1971, 37). A group of sealstones of L.M. times portray ships in full sail. Prow and stern are

identical and oars are either omitted or appear as a row of diagonal lines at the same angle below the hull.

Evolution in shipbuilding went on in L.M. times as is shown on another group of talismanic seals. On this group only one end of the ship is shown, profusely ornamented by a three-pronged ornament. This arrangement as informed by J. Betts was called *aphlaston* (Herodotus VI, 114, Iliad XV, 717). A very interesting feature however, of these ships is the portrayal of 2 or 3 pole masts which are linked by cross-hatching instead of the one mast square sail. (J. Betts, 1973, 334). Some examples of those gems indicate 15 oars on one side. Hatsephshut's ships also had the same number of oars on the expedition to Punt. (R. Hutchinson, 1962, 99). Depending on the number of oars, S. Marinatos has estimated that these ships must have been 21m. long and 4 to 4.5m. broad. Yet, the largest sail shown on a Minoan ship is indicative of a ship 30m. long, steering oars also existed. Stone anchors were in use until the 9th c. B.C. N. Platon believes that the ships of Minoan Crete had the two-fold function of carrying cargoes of goods but also becoming warships if need arose. (N. Platon, 1969, 246).

We can get a lot of information about the maritime legacy of the Minoans from the miniature fresco of the "West House" of Akrotiri in Thera. The fresco dates from the 2nd half of the 16th c. B.C. and as Meijer stresses "seeing that other features of the Akrotiri settlement give clear evidence of a significant Minoan presence on the island during the 16th c. B.C., it may be assumed that the ships are Cretan". (F.Meijer, 1986, 5). The fresco depicts a waterborn procession of 20 large and small boats. I tend to agree with the view that a religious festival commemorating a triumphant sea-victory is taking place. (N. Marinatos, 1984, 53). Six large boats are involved in the procession, depicted in the fresco, rigged but not under sail, another ship proceeds under sail, and a number of smaller boats are all heading in the same direction. At yet another portion of the frieze, a naval attack against a coastal city is portayed. All vessels show the essential Cretan design

characteristic, namely the spoon-shaped hull. The larger ships are lightly decorated and are identical in design. L. Casson informs us that one vessel is rowed by 5 oarsmen on each side and is also equipped for sailing with a retractable mast as were the galleys of Homer's "Iliad" and "Odyssey".

From this point onwards it is hard to talk with certainty about Cretan ships. The *Hemiolia* type may have been used by Cretan pirates but although we know that it was a swift vessel propelled by oars and sail, we don't know exactly what it looked like. (F. Meijor, 1986, 142). During Hellenistic and Roman times, various types of ships may have been used. The *Lembos* type of vessel was one of these. It was used by pirates before their expulsion by the Romans. This boat was characterised by its speed and manoeuvrability, varying from 16 to 30 oars and propelled by one or two decks. (Supra, 167). From the existence of harbours on the southern coast of Crete, serving the trade from Rome to the Eastern Empire and visa-versa we may assume that large merchant galleys sought refuge in these havens. On such a merchant vessel, St. Paul passed a winter in Phoenix. However war galleys with troops were operating in and around Crete.

V. The Minoans

Crete's first inhabitants appeared on the island in the mid 6th millenium B.C. (Neolithic Period), and must have arrived from Asia Minor, Anatolia and probably Syria and Palestine. (R. Willets, 1977, 43). In later Neolithic times, Evans believed that Libyan settlers also came to Crete as is indicated by common burial customs and characteristics of the two areas. (S. Alexiou, 1969, 15).

The Neolithic Cretans lived a plain agricultural life, raising the animals they brought with them. They were fishermen and hunters venturing also to the neighbouring islands of Dia, Gavdos and the Cyclades. (S. Alexiou, 1969, 17). The introduction of copper and its use during the middle of the 3rd millenium B.C. brought a new era to Crete. This period was characterized by development and cultivation of foreign relations with Egypt and Asia Minor and through it Mesopotamia. (S. Alexiou 1969, 15). These relations were in a sense responsible for the greatness of Crete during the Bronze Age. These oriental influences in arts and crafts were processed and studied and carefully adopted to the needs of the inhabitants of Crete, to the island's environment. The results of the blending of all these cultural characteristics, was the development of an original and indigenouos civilization which is regarded as the first European civilization. (M. Finley, 1981, 30; R. Willets, 1977, 55; S. Alexiou, 1969, 15). As Burn asserts, it was in Crete that the greatest culture of the Bronze Age in the Aegean reached its greatest height. (A. Burn, 1965, 27).

The Bronze Age civilization of Crete which we call Minoan (from its mythological king, Minos) was "discovered" at the beginning of our century when Sir Arthur Evans started excavations, slowly and expertly piecing the puzzle of Bronze Age Crete together.

Sir Arthur Evans worked mainly in Knossos until his death in 1941 and as Finley stressed "not surprisingly tended to impose a Cnossian stamp on the whole island". (M. Finley,

1981, 30) Basing himself upon the different pottery styles, Evans divided the Minoan Age chronologically. The resulting chronological divisions:

Early Minoan (E.M.) 3,000 - 2,000 B.C.

Middle Minoan (M.M.) 2,000 - 1,600 B.C.

Late Minoan (L.M.) 1,600 - 1,200 B.C.

roughly correspond to the Old, Middle and New Kingdom. The three major divisions are further divided into several subdivisions.

Cultural development in the long-lasting Neolithic times was steady but gradual. From the beginning of the Bronze Age through, many differences appear in Prehistoric Crete. Bronze was used for the first time in the 3rd millennium B.C., as a result of Near-Eastern trade and the arrival of new settlers on Cretan soil. Increase in population seen by a widespread distribution of villages and towns throughout the eastern part of the island is apparent through excavations. (S. Marinatos, 1960, 16; J. Graham, 1962, 6; R. Willets, 1977, 47). Sudden progress in various art and technology fields and introduction of others is evident.

The first instances of genuine Minoan overseas interest during this period is attested by a Cretan settlement on Kythera, indicating an expanding and prosperous population. The appearance in Crete of Egyptian silver, tin, ivory, ostrich eggs, stone vases and scarabs are also other indications of trade and prosperity; whilst harbour towns at Mochlos, Palaikastro and Zakro emerged. (M. Weiner, 1984, 17). Also, during this period, we have the first evidence of a richer upper class seen through the construction of mansions. Whilst the mainland of Greece passed through a somewhat troubled and unrewarding Early Bronze Age and the Cycladic islands never fulfilled their early promise of cultural excellence, Crete moved forward at an increasing tempo "towards the brilliant civilization of the palatial age". (R. Willets, 1977, 64). The following first Palace period constituted the Golden Age of Crete. In the M.M. period "Tremendous advance in other spheres, in political power, in wealth and in artistry" is

attested. (M. Finley, 1981, 33). During this time authority became more centralized, evidence being the erection of the palaces. The first palaces were built about 2,000 B.C. but they were short-lived. They were all struck by a devastating catastrophe, within 2 to 3 centuries from their erection, about 1,700 B.C. S. Alexiou stresses that destruction by earthquakes is the most plausible explanation since many places in western Asia, from Troy to central Palestine were also affected at the same time. (S. Alexiou, 1969, 30). Nevertheless, the "New" Palaces were constructed upon the ruins of the "Old" ones about 1,600 B.C. or little later. (S. Marinatos, 1960, 18)

Four palaces have been discovered so far, in central and eastern Crete; Knossos, (predominant of all) covering an area of 24,000 sq. m. Phaestos, Malia and Zakro but others must have existed. They were religious artistic and administrative complexes as well as focal points of social life, just like the temples of Mesopotamia. They were built amidst urban centres exercising a vital influence on the surrounding area. Art reached its zenith with a style naturalistic and stylized, characterised by lightness, and a delicate sense of movement which can be recognized as nothing else but Minoan. The period has rightly been called the "New Era." (S. Marinatos, 1960, 18).

The invention and development of a writing system began in the Pre-Palace period. During the first palace period, a hieroglyphic form took its place, due to Egyptian influences. However, the symbols in their form were totally unique. In the second Palace period - in particular L.M. - it evolved into a more efficient syllabic writing form known as Linear A. but even this gave way later to a more complex script, Linear B, known to be a Greek writing form. M. Finley informs us that Linear A "was widely dispersed on the island" and that the need of its invention was administrative rather than intellectual and spiritual. (M. Finley, 1981, 36).

The splendour and greatness of the Minoan civilization in its last phase "Late Minoan" was dramatically interrupted.

A fresh catastrophe ruined all the low-lying palaces and major cities of northern Crete, around 1,500-1,450 B.C., and a little later, inland settlements and towns. The dominant theory of their destruction - the major advocate of which is the late archaeologist Spyridon Marinatos - is attributed to the consequences of the eruption of the volcano on Thera and the cataclysmic waves it caused. Almost all the settlements of the northern coast were devastated. At some point, Mycenaean Greeks must have grasped the opportunity of establishing themselves on Crete following the destruction, and proceeding inland, ruining more settlements. They focussed their attention on the capital, Knossos and through it they managed to acquire control of central Crete. (M. Finley, 1981, 43). Indeed, some scholars hold that even before the eruption of the Theran volcano, Mycenaean Greeks had already migrated to Crete, due to the fact that Linear B script had been used in Knossos prior to the destruction. Cultural and psychological innovations appear. Art, consequently, loses its dynamic characteristics and becomes more conventional and grandiose. Decadence, is the right word to describe the situation in the arts. The renowned Cretan artisans however, continued to excel, not in Crete but on mainland Greece. (J. Coldstream, G. Huxley, 1984, 110). Their rich artistic Minoan heritage, strongly affected the development of Greek civilization, into early classical days. (J. Graham, 1962, 16).

Society during the last phase of the Late Minoan period becomes more aggressive, weapons and inventories of them make their appearance, as well as of real "warrior graves" (M. Finley, 1981, 43; J. Graham, 1962, 13-14; A. Evans, 1923, 880).

The participation of Cretan cities in the war of Troy around 1,200 B.C. and their contribution of 80 black ships (Iliad, II, 645-652) is a further proof of the existence in Crete of kings, perhaps vassals of Agamemnon. (S. Alexiou, 1969, 59).

A. Minoan harbourworks, overseas trade, contacts
and colonization.

The Minoans were known for their relation to the sea. The testimonies of a number of writers vividly present the "Thalassocracy" or naval supremacy of king Minos in the heyday of Minoan civilization. (Thucydides, I, 3-8; Diodorus, E.79, 3; 84. 1). Thucydides relates that king Minos according to oral tradition built the earliest navy that ruled over what is today called the Hellenic sea and the islands of the Cyclades on most of which he founded colonies. The Minoan Cretans were also credited with the expulsion of Carian and Phoenician pirates from the Aegean islands. "Both their obvious feeling of being secure on their island and their interest in safe routes can hardly be understood without naval supremacy". (S. Hiller, 1984, 28). Homer talks about an island called Crete in the middle of the wine-dark sea, rich and powerful. (Odyssey, 19, 172-174). Aristotle described the location of Crete which enabled Minos to acquire this Aegean empire. (Politics, II, ch. 10). McGeehan Liritzis believes that for most of the 3rd millenium, contact between Crete and the Greek mainland remained indirect, conducted through the Cycladic islands.

Egyptian stone bowls and vases found on Crete, are evidence of contact between Crete and Egypt as early as the end of the Neolithic period. (A. Evans, 1921, II, 16). In the succeeding E.M.I period, ivory (used in Crete for the construction for seals and amulets) is imported from Egypt and the Levant. Towards the turn of the E.M. period, ivory increases and Egyptian scarabs appear. (McGeehan Liritzis, 1988, 252).

It is certain now that by 2,000 B.C., Cretans were trading with the Aegean, Syria, Asia Minor, Egypt and Italy. (Minoan Thalassocracy, 1984 N Platon, 1984, 4). It is interesting to note that classical literary tradition does concur in many instances with archaeological finds. However, a symposium of the archaeological Swedish Institute of Athens, suggested that a more neutral term rather than

'thalassocracy' should be used. Whatever the terms however, the fact remains that great seafaring activity was taking place in Bronze Age Crete, carried out mainly on Cretan ships. (J. Graham, 1962, 8; M. Wiener, 1984, 17).

Evidence of widespread Minoan trade as well as maritime activity comes from the discovery of Cretan pottery and other objects as well as Cretan religious and every day habits in Cyclades, Mainland Greece, Asia Minor and Egypt. In particular, Minoan influences are apparent in M.M. times in the Helladic sites of Ayios Stephanos, Asine, Lerna, Kollona, Pefkakia and Magoula. (M. Wiener, 1984, 17; G. Korres, 1984, 144). Cretan presence is attested to the Aegean islands of Thera, Melos, Aegina, Kea, Kythera, the Cyclades, Kos, Rhodes, Kasos, Karpathos and Seria, as well as on the Anatolian coast such as Miletos, Iasos and probably Knidos. (Minoan Thalassocracy, 1984). One of the greatest incentives for Minoan colonization, as two metallurgy experts stress, was to acquire natural resources, unavailable on Crete, especially metals, so important for the maintenance of Minoan civilization. (Z. Gale, N. Gale, 1984, 59-64).

In the M.M. and the L.M. periods the ties between Egypt and Crete seem to strengthen. Many Egyptian artifacts are found in Crete and there is evidence of widespread Minoan pottery as far up the Nile as Aswan. The most important evidence, however, comes from written and pictorial Egyptian sources (E. Sakellarakis and Y. Sakellarakis 1984, 197-203) "of the Minoans, the *Keftiu*, as they referred to, in the literature of Egypt". (S. Hood, 1971, 91; E. Vermeule, 1964, 91; M. Wiener, 1984, 17). It is noteworthy that in Egyptian tomb paintings, the Minoans appear, carrying Near Eastern as well as Cretan products, denoting that on their way to Egypt they first passed from Asia Minor and the Syropalestinian coasts (E. Sakellarakis and Y. Sakellarakis 1984, 201). N. Flemming believes that despite the preference for coastwise navigation, the first voyages from Crete to Egypt seem to have followed a direct line. However, as soon as the route via Cyprus and the

Syropalestinian coast was established, the direct sea line was abandoned although it was only a third the length. (N. Flemming, 1971, 38). It is also suggested though that the eastern coastwise route was used from earliest times (S. Spyridakis, 1970, 3).

G. Bass has stressed that by the 14th c. B.C. a vast trade network was well established among various racial groups around the Mediterranean.

Following the eruption of the volcano on Thera, both the Minoan fleet (I. Strom, 1962, 191) and the settlements of northern Crete involved in trade, were destroyed. (J. Graham, 1962, 11). Thus, commercial activity wilted. However, the Mycenaeans built a great maritime empire and continued the trade routes and connections of the Minoans. From now on, we cannot distinguish Minoan from Mycenaean influence, since both their cultural characteristics mingled. In general, Creto-Mycenaean maritime expansion resulted in at least 54 settlements in the Middle East, reaching as far as Babylon and Egypt in the South and Sicily and Italy to the west. (E. Hadjidaki, 1988, 122). This Creto-Helladic supremacy came into an end at about 1150 B.C. when the Dorian invasion (the return of the Herakleides) took place. Commercial activities and maritime traffic was once more interrupted for 300 years.

The ports that protected the ships employed in this widespread trade, and how they came into being, can be surmised by tracing the alterations of Mediterranean geomorphology. Thus, by the beginning of the Bronze Age, about 3,000 B.C. the Mediterranean coasts abounded in natural anchorages created by climatic changes that occurred during the previous 15,000 years. What happened actually was that during the last glaciation, the sea-level was about 100 m. lower than it is today. (N. Flemming, 1979, 162; A. Raban, 1980, 752). This last glaciation was followed by a period of relative warming lasting for about 10,000 years. This, accordingly resulted in a rise of the sea-level. Thus, almost at every coast, perfect natural harbours were produced. Conditions became

even better, where rivers had cut deep valleys at what is today the continental shelf. The process was felt greatly, at low-lying coasts, flooding large areas, rather than places where the continental slope was narrow and steep. Unfortunately for Bronze Age mariners, this situation changed, when the level of the sea, stabilized about 5,000 years ago, at approximately its former height. Rivers flowing on the coasts filled up valleys and various inlets. Bronze Age sailors were gradually excluded from haven after haven. The timing of the creation of the first harbours, coincided with a gradual rise in trade in the 3rd millenium and consequently enlargement of ships. These two reasons i.e. change of the coasts' morphology and the rise of commerce, must have been the main ones that influenced Bronze Age mariners to build the first artificial harbours.

The Minoan civilization in the 3rd and 2nd millenia was the cradle chiefly of a maritime civilization that spread up to Crete's neighbouring islands. It evolved in an insular environment but also received influences from the surrounding cultures.

Having said all that, it only seems natural that these forefathers of modern Cretans acquired the skills and the technical knowhow to build their harbours. This is actually the case. As we shall see, from the knowledge we possess from Minoan harbours presently, most of these were dependent greatly upon natural features, most of the times comprising of simple breakwaters and moles. These ports have depended upon a local hinterland. Accordingly, these small ports were visited only by boats and small ships with a shallow draft, having a limited cargo capacity. it can be easily understood then, that those vessels engaged in a local trade.

However, Bronze Age Cretans were engaged in long voyages (Y. Karmon, 1985, 1-6) around the Mediterranean, and larger vessels carrying large cargoes needed appropriate harbour installations. Indeed, one such harbour may have been Kommos in south Crete. Unfortunately, excavations there, have not progressed to such a degree to make us certain of

the statement. But if indeed it was a large harbour as is suspected, then it could regularly be visited by large boats (comparative to the period), depending thus, upon a regional hinterland (a more widespread hinterland reaching up to the northern Cretan shores) (supra). Also, large ports are preferred by more ships thanks to the variety of bartering goods. "The ports of Crete are the oldest in the world for which the sites are known. There, more than 4,000 years ago, the merchants of fine painted pottery precious metals, and textiles loaded their tough little boats in the summer to row or sail to islands of the Aegean and to Egypt". (N. Flemming, 1971, 41).

As has been referred to elsewhere, the discovery of Minoan ports is hindered due to a variety of reasons. On many occasions, harbourworks of subsequent generations built upon Minoan structures make the latter's discovery impossible.

At the present state of my study, I can discuss mainly the topography of Minoan ports and partially methods of construction, rather than their internal organization, since excavations are more than necessary at most of them. Minoan port builders were mainly concerned with the need to protect their ships from the north and north-western winds that blow mainly during the summer months.

Typical physical conditions, favourable for the being of a Minoan port are: 1) the existence of a small offshore island at which ships were beached in the lee. In some cases, the islets were connected to the mainland by an isthmus of rubble boulders. Thus, protection was afforded both sides of the isthmus, according to the wind direction. 2) The existence of a headland at the leeway of which protection for shipping was achieved. Sometimes these could be further reinforced artificially. Plato remarked that Bronze Age Cretans often situated their ports on promontories, thus affording protection on either side, according to the winds' direction. (R. Hutchinson, 1962, 100). 3) A deep bay. A combination of features could also exist. It is interesting to note that the Minoans shared

the preference of their Levantine contemporaries in building harbours on small uninhabited islands. The explanation even to our days remains a mystery. R. Hutchinson quoted H. Rose who supports that these islets or ports on an open shore were placed under a perpetual truce. Or else, exchange could operate without the appearance of the parties involved. He concluded that trade on these islands long preceded trade on the mainland. (R. Hutchinson, 1962, 100). Indeed, N. Platon commented that transit trade was established on the small islands of Pseira and Mochlos. (N. Platon, 1969, 346).

Between 1910 and 1915 Gaston Jondet surveyed a huge harbour on the island of Pharos in Egypt, where modern Alexandria is situated. This was built about 2,000 B.C. (N. Flemming, 1971, 40). It seems that the port of Pharos is the later 'edition' to a smaller one, built just before 3,000 B.C. that literary evidence refers to it as 'The Great Door' or 'Port'. This is near the Canopic mouth of the Niles' Delta, from where the early commerce of Crete and the Nile valley must have passed. Judging by the fact that "havens on the open sea were foreign to its Egyptian tradition", (A. Evans, II, 1928, 292), Raymond Weil has suggested that this huge project could have been executed by the combined might of both Egyptian and Minoan civilizations. "It could have profited both" -R. Weil continued- and the Egyptians could have provided the labour and material while the Minoans would have put their valuable knowhow as well as part of the cost. (N. Flemming, 1971, 41). Since its discovery, as A. Evans pointed out, a number of features of its construction, further point to the Minoan commitment. N. Platon is convinced that the harbour of Pharos was made by Cretans. He even goes further suggesting that rock-cut features, found today partly or wholly under the sand and sea, may be the predecessors of the Phoenician Kothons of western Mediterranean. (N. Platon, 1969, 313, 317). Also, at Mersa Matruh, a small offshore island, the only natural harbour between Alexandria and Tobruk, excavations indicate that there were

close links between the Aegean and the eastern Mediterranean in L.M. times. Judging by the fact that sherds of Minoan pottery abound here, the director of the excavations has concluded that the islet served as a port of call for mariners, sailing from Crete towards the Nile's Delta and the coast of Palestine. (J. Shaw, 1986, 268).

Of prime importance for the maritime legacy of the Minoans is the fact that during the Bronze Age, a vast road network existed, uniting the major palatial centres and chief harbours of the island. In 1924, A. Evans discovered one part of this network, uniting the north with the south Cretan coast. This started from the palace of Knossos and ran across the fertile plain of Messara to terminate at the southern coast, at Kommos. This "Great South Road" also had branch routes east and west, guard buildings and protective stations along the way. Under these conditions, the greatest Minoan centre of Knossos had an outlet to the south, bringing it into contact with the shores of the Libyan sea. (A. Evans, 1928, II, 91). Furthermore, Knossos was connected by the northern extension of the same road to its harbour-town at Katsamba. A. Evans again informs us that apart from the road connecting Knossos with Amnisos, the great Minoan palace was also linked both by sea and land with other Minoan centres by a transit trade route. This passed through Nirou Khani, the palace of Malia, then the ports of the eastern region. The route was then extended either by the coastal route of Siteia or by land through Vassiliki, across the isthmus of Hierapetra, to terminate finally at the extreme eastern ports of Palaikastro and Zakro. (A. Evans, II, 1928, 253).

Three km. west of Malia, near some fishermen's cottages, H. Frost in the '50s came across some peculiar structures which may be a clue to Minoan harbour installations in places where no convenient beaching possibilities were available. There, the rocks were cut vertically and from dead trees' branches securely implanted in the rocks, boats were hang 2-3m. above water level. (H. Frost, 1963, 106). As H. Frost does, I also believe that this practice could

have taken place in Minoan times. Structures similar to this were spotted by E. Hadjidaki in western Crete years ago. (E. Hadjidaki, 1984, 13). I was also able to find and study a similar feature exactly below the Minoan *megaron* of Nirou Khani. The terrain here is extremely irregular and a boat cannot be pulled ashore. Instead of dead trees' branches implanted in cliffs, a metal frame was built close to the sea-side. A boat could be lifted by the use of a crank and was suspended from wires in mid-air 2m. above the water. This immediately struck me as a continuation of what H. Frost had described. Was the structure's actual location, 100m. from a Minoan *megaron*, accidental? Traditions and customs on the island of Crete don't die out easily. Parts of the island have remained unaltered for thousands of years. Thus, I also believe that the aforementioned practice has persisted to our days since Minoan times. (Fig.7)

Another possibility for mooring and beaching in Bronze Age Crete may have been the use of wooden jetties and quays. Although not many such structures exist today in Crete due to lack of timber, we nevertheless know that wood was easily available in Minoan times. (N. Platon, 1962, 243; J Pendlebury, 1939, 6). Furthermore, it was cheap, efficient and would have left no physical remains after their abandonment and deterioration.

B. Minoan Harbours

1. The Harbour of Knossos

Time and time again, archaeologists prehistorians and travellers have asked themselves about the harbour or harbours of the Minoan cultural centre, the palace complex of Knossos. The reason is that there are certain problems and restrictions towards its/their identification. First of all, there is the fact that the Minoan centre lies 6km. inland from the northern coast of Crete, south-east from Candia, modern Herakleion. An appropriate site readily identifiable where one might expect Knossos's port, does

not exist -that is directly north of the city.

Could the remains of the principal port of Knossos be under the Venetian harbour of the capital of Crete? The possibility is tempting. More tempting however seems the probability for the existence of Knossos's harbour directly north of the palace, in the harbour-town of Knossos, at the mouth of the river Kairatos. However, the lack of basic features make its recognition problematic. Was there a port at Amnisos -some 10km. away from Knossos? Evans also points out Ayia Pelagia about 16km. west of Herakleion. However, he supports the view that the island of Dia 6 miles off the coast north-east from Candia could also serve the purpose well, under certain circumstances. Even the installations of Nirou Khani -14km. east of Herakleion have been proposed. As Arthur Evans stressed, the importance attained by the port of Minoan Knossos, resulted mainly from an augmenting need for an access to the sea, a "maritime outlet" for a great centre of population, that had been living in one of the most fertile plains of Crete, from time immemorial. (E. Evans, 1928, II, 253).

a. Candia: A Minoan port?

It seems quite probable that one of the ports of Knossos lies beneath the massive blocks of the Venetian harbour of Candia. This is also the view of Admiral Spratt. (T. Spratt. 1865, I, 67) A. Evans supports the possibility, adding that "The Venetian wharves are themselves superimposed on earlier moles and whether actually in position or replaced, many Minoan blocks are visible in the harbour itself." (A. Evans, 1923, I, 298). This pioneer of Minoan archaeology, also believes it possible that the Minoans enlarged the ancient harbour by building a breakwater, thus extending a natural reef running to the east, and starting from the point where the Venetian castle was erected.

b. The harbour-town of Knossos: A Minoan port at the mouth

of the River Kairatos at Katsamba.

Along the coast, to the east, Minoan remains prove the extension of the site at Candia towards the harbour-town of Knossos, up to the mouth of river Kairatos. Here, at modern Katsamba existed the harbour-town of Knossos. This seems an attractive spot for an ancient harbour, thanks to the existence of Juktas, a mountain, situated immediately behind Knossos, a conspicuous landmark seen by seamen from many miles offshore. A. Evans favours the harbour-town of Knossos as a port, saying that it was a flourishing centre of manufacture, industry and arts as well as a port. "It must have stood to the city in much the same relation as the Piraeus stands to modern Athens". (A. Evans, 1928, II, 238). Under these circumstances he also believes that the harbour-town of Knossos stood in a prominent position, a "seagate" for the central trade route, with special relations to the Cyclades and other further Aegean shores. Arthur Evans, being our major source of information for this site in the Minoan period, informs us that the harbour-town was linked both by sea and land with other eastern Minoan centres by the eastern transit trade route. (A. Evans, 1928, II, 253). This is how -he believes- various remarkable finds discovered in the harbour-town have arrived. One of them is the alabaster amphora bearing the *cartouche* of Tuthmose III. (N. Platon, 1984, 66).

Today, the proposed site of the port is protected only from the east by a promontory. It has been stressed elsewhere that protection in northern Crete is basically needed from the west. This fact in conjunction to the smallness of the sandy bay which must have existed then, (A. Evans, 1928, II, 238) led E. Hadjidaki to believe that although the port lay on an important trade route, it could never have been particularly successful. (E. Hadjidaki, 1984, 11). Indeed, A. Evans stressed that the natural conveniences of the place as a sea-port were not such as would have led us to expect such a flourishing community. (A. Evans, 1928, II, 238). An underwater survey conducted by the author at the site, revealed nothing of importance.

The same results had been attained by the team of J. Leatham and S. Hood in the summer of 1955. (J. Leathan, S. Hood, 1958-59, 264). In which manner then, were Minoan seamen using the port? Could the river Kairatos help at all? Indeed N. Platon suggests that small craft could sail up the river as far as the Minoan palace of Knossos. (N. Platon, 1963, 317). This could be a solution. However, although we do know that the river has not changed its course much since Minoan times, geological research is needed in order to have a clear view of its navigability.

c. The Island of Dia

The island of Dia is situated 6 miles offshore, north of the harbour-town of Knossos. Today it is deserted. Its southern side is separated by 4 deep coves protected by headlands. What could not be obtained from Katsamba - namely protection from the north-western wind- could very well be obtained from the southern coves of Dia. In fact, A. Evans stressed that the coves of the island have in all ages offered secure refuge for shipping from the northern gales. Furthermore, the two major coves show signs of Minoan habitation. (A. Evans, 1928, II, 239). Of importance are the remains of a wall close to the sea-level at the cove of Ayios Georgios. Evans suggests that the island had served the same purpose as the island of Pharos to its opposite mainland.

d. Ayia Pelagia

Another interesting site about 16Km. west of Herakleion is that of Ayia Pelagia. Here, is a headland site, flanked by two sandy bays. A natural arrangement so typical for the existence of a Minoan harbour, since effective protection for shipping could be achieved. Could the site be used by Cnossians? Arthur Evans believed that here exist the best remains of a Minoan harbour. (A. Evans. 1928, II, 299). Indeed the site abounds with Minoan potsherds. Houses have been discovered on the low hill of the promontory the remains of which still exist. Occupation of the site went

on in classical times. Here a funeral stela with a Cretan warrior in relief was found.

e. Amnisos

Amnisos was the ancient name of the river Karteros as well as of the whole beach, 7,5Km. east of Heraklion. S. Spanakis informs us that the place was an ideal harbour for dragging boats to the beach, from Bronze age to Venetian times. (S. Spanakis, 1982, I, 123-126). Strabo mentioned "It is said that Minos used Amnisos as his harbour-town, where the sanctuary of Eilithia lies". (Strabo, X, 4, 76) On the left of the main road from Heraklion to Lasithi, towards the sea, there is a rocky hill called Palaeochora, where the ancient city of Amnisos was built. Parts of a Minoan town which flourished from M.M.III to L.M.I periods, was excavated in the '30s by the ephor of Crete. S. Marinatos. Among the excavated buildings there was a sanctuary of Zeus Thenatas, to which continuity of its cult is attested from Minoan to Roman times. (S. Marinatos, 1938, 130-139). The Minoan town was deserted at L.M.I period perhaps by the same reason that other Minoan towns were destroyed i.e. Tylissos, Nirou Khani, Sklavokambos. The hill of Palaeochora overlooks two bays and an islet, lying a short distance from the beach offshore. (Fig.7a) The results of research conducted by Dr. V. Sturmer, made him believe that the major harbour of Knossos was indeed Amnisos. He estimated that the little island opposite Palaeochora hill would have been connected to the mainland, and accordingly, further protection from the winds would have been achieved. The mooring and landing conditions in Minoan times would have been ideal in the eastern part of the western bay, since the ships sailing before the wind would automatically be blown into the harbour. At the eastern part of the western bay, at the north foot of Palaeochora, a building called the 'Spring House' probably supplied the ships with water since the water of a spring sprung up from the interior of the building.

From the present state of research we are lead to suppose

that here the ships were probably pulled on land except if excavations close to the water-front prove that quays and moles are hidden below the silt accumulated by Karteros river and the sand. Subsidence here has been estimated at about 1,5m since Minoan times. (N. Flemming, P. Pirazzoli, 1981, 66-87; N. Flemming, 1978, 405-458)

The imported goods could have been carried by mules or men to the palace of Knossos. Indeed, a Minoan road existed in Evan's times leading from the palace to the harbour at Amnisos.

Veit Sturmer supports the view that loading and unloading the ships could have been facilitated by the existence of wooden quays and paths.

However, from the organization point of view, it would have been more sensible and convenient to store either the exported or imported goods in storerooms at the harbour. The remains of a building discovered on the west foot of Palaeochora hill -V. Sturmer stresses- could have belonged to a storehouse. This and the spring house could have been the major structures of the harbour known so far. I personally believe that excavations here are essential for the discovery of more structure connected to the harbour and its function. Also many oriental artifacts discovered at the sanctuary -mainly from Egypt- dating from Hellenistic and Roman times may well be indicative of the port's usage during these periods too. (S. Marinatos, 1935, 408-409)

f. Ayioi Theodoroi

Fourteen Km. east of Herakleion, on the main road to Mirambello are the remains of the Minoan harbour of Ayioi Theodoroi. The topography of the coast here consists of two sandy bays separated by a rocky promontory. The reef-promontory extends for about 100m. towards the north-east. It rises a few metres above modern sea-level and even today breaks the force of the north and north-westerly winds. The headland was built over during Minoan times and traces of extensive quarrying can be seen all over the length of the

reef.

Ayioi Theodoroi is the only place on the northern coast of central Crete from Ayia Pelagia (18Km west of Herakleion) to Hersonissos (26km. east of Herakleion), where shelter from the north-westerly winds can be provided, due to the aforementioned breakwater.

The degree of subsidence here is a matter of disagreement. A. Evans estimated 3 to 4m. of subsidence, judging from quarries found underwater, since quarrying cannot have taken place underwater. (H. Frost, 1963, 107) On the other hand, Pirazzoli believes that Nirou Khani (an alternative name of the area) has not subsided more than 1.8m. (P. Pirazzoli, 1988, 173).

The ruins of the houses of a settlement south-east of the promontory, have been excavated by Xanthoudides (1918) and Marinatos (1926). About 600m. south-east of the site, a L.M.I Megaron was excavated by Xanthoudides in 1918 and described by Sir Arthur Evans as a "Propagandist Depot". (A. Evans, 1928, II, 279). The reason was that the villa consisted of storerooms containing ceremonial objects such as double-axes, and about 50 portable clay altars. This statement is of great interest if we accept the views of many a prominent scholar -Sir A. Evans and Dr. S. Marinatos among them- holding the view that the Minoan religious "message" was diffused to various foreign parts from here. (H. Frost, 1963, 107). Some scholars suggest that this may have been a secondary port of Knossos, since it was lying on the Minoan road, connecting the great Minoan centre and the palace of Malia. (A. Evans, II, 1928, 280; E. Hadjidaki, 1984, 11).

The main features of the coast as it appears today are the ruins of a rectangular building of large oblong roughly cut stones, whose north-east corner is washed by the sea. About 10m. east of this corner, a line of rubble stones extend into the sea for about 20m. (Fig.8) On the south-eastern side of the reef, appear the ruins of a wall of rectangular porous stones, running into the sea. These are very well dressed and matched together in place. Parts of

this wall can be seen dispersed in the sea. The place has changed drastically lately, though, due mainly to the construction of a massive hotel, built on the western bay, and the courtyard of the chapel of Ayioi Theodoroi. Both structures have covered the Minoan harbour installations and the settlement's well. (S. Marinatos, 1926, 142). In Evans's times a small stream terminated about 1km. east of the reef and the massive blocks of a mole could also be seen on the right bank of the river mouth. "These remains, if rightly interpreted are of the highest importance, since here we seem to have traces of a harbour, divided by a mole and perhaps, we may infer, protected by a breakwater besides". (A. Evans, 1928, II, 280). Marinatos also informs us that a day after a storm, traces of a well built wall of large porous slabs, close to the modern water level as well as the remains of a kind of a shed with a pavement of the same materials, was exposed, not far from the reef. The bases of columns surrounded by a wall, can also be seen in the sea.

The most important feature of the whole area, however, is a rock-cut recess hewn out of the soft porous rock, at the junction of the promontory and the eastern bay. It measures about 40m.x12m. and is divided into 2 unequal compartments by a wall. The depth of the recess varies, as the bottom of its landward end is under 30 to 40cm. of water whilst its seaward end is a few metres under water. (Fig.9,10) The function of the construction can only be clarified when we are certain as to the degree of land subsidence. It is accepted though that if the subsidence is more than 2m., the recess may have served as a Minoan shipyard or a mooring place for small vessels. (H. Frost, 1963, 109; E. Hadjidaki, 1984, 12).

Initially, the ruins on the beach were taken to be traces of a fishing community. However, after the exposure of the large carved porous stones with columns and slate paving, equal to the finest Minoan buildings, it became evident that they could be nothing else but parts of harbour installations. (S. Marinatos, 1926, 147).

2. The Minoan harbours at Malia.

Malia lies on the north coast of eastern Crete, 40Km. east of Herakleion. Here, there is another Minoan palace. It is rather provincial though in comparison to that of Knossos and Phaestos.

The palace was discovered in the first quarter of our century by the ephor of antiquities I. Hadjidakis and was excavated by the French School of Archeology. It comprised of about 8,000sq.m. The palace was built in a fertile coastal plain but its Minoan inhabitants must have explored the sea as well.

Malia was not isolated in Minoan times. A. Evans argued that the palace was connected with Knossos by road and its port was brought into contact with the easternmost region by the Siteia coastal route to Palaikastro and Zakro.

The palace is situated half a Km. away from the sea. Immediately north from it, the coast is bordered with outcrops and there is not a convenient place for the siting of a harbour. My choice for a harbour site, obvious from the geomorphological point of view, was on the east, where a small bay is guarded by a small island. The place at first glance reminded me of a typical Minoan port. Indeed, a path starting from the palace takes an eastern course to end-up at the bay. However, it is far from easy to walk and Minoans if their port was indeed here, would have had a hard time in transferring goods from the port to the palace. I visited the place twice but the Meltemia were so strong that I could not conduct underwater research and locate the causeway found by H. Frost. (H. Frost, 1963, 105). When this expert of ancient harbours accompanied by Frederic Dumas, visited the site, she decided that no more than a small anchorage could have existed here. One of the main reasons was that the bottom of the sea was extremely irregular, thus, making a ship unable to turn, without hitting an outcrop plus the fact that a ship's anchor would have definitely get stuck. (H. Frost, 1963, 105).

The western sandy beach proved to be much more rewarding.

Here terminates a Minoan road paved with flagstones starting at the north-western corner of the palace. (E. Hadjidaki, 1984, 13). The beautiful beach is guarded at its western end by a long reef which may have served as a protective promontory. Even today this offers some protection from the north-western wind. So it could have been much more effective when the sea-level must have been 2m. lower in Minoan times. (A. Guest Papamanoli, R. Treuil, 1979, 668-669). Honor Frost says that here undoubtedly lies the Minoan harbour.

At the eastern part of the beach, an interesting building was found in 1978 buried under the sand and sea. It was exposed due to movement of the sand, owing to heavy wind. (A. Guest Papamanoli, 1980, 99). This proved to be a large oblong rectangular building with an orientation east-west along the beach. The outer walls of the building surround 3 long compartments, the walls of which have a distance from one another 1 to 3m. (Fig.11). It is hard to date the construction. The building seems to be Minoan but Roman remains are also apparent at this part of Malia. Nothing can be said about its function. However, it is striking its similarity with the one discovered at Ayioi Theodoroi, by S. Marinatos. This has been interpreted as part of harbour installations; not only the design and dimensions of both buildings resemble each other but also their position in relation to the morphology of the beach, indicates a common function. (A. Guest Papamanoli, 1980, 101). This building has been attributed by V. Sturmer as a storeroom. Other interesting artificial features of the bay are: a boundary wall of oblong Minoan blocks separating some buildings from the beach. Other remains of Minoan installations indicate a rock-cut trench parallel to the reef, running towards the sea for about 30m. Another wall was found to protrude from the sand below the landward end of this cutting. H. Frost had seen a Turkish "hump-backed" bridge, covered almost entirely by the sand. (H. Frost, 1963, 105). If a bridge of such a late date was covered by sand, then I think we are able to suppose that a great deal of the harbour

installations are buried under the sand and silt.

It was interesting that I found a ditch of concrete, sherds and stones, past the south-eastern end of the beach, ending completely in front of the sea. (Fig.12,13) It was emptying in front of an oval-shaped basin, made of concrete, placed on a constructed terrace. (Fig.14,15). The basin was rather small, about 1.10m. long, 62cm. wide and 1.20m. deep. This construction today is just washed by the surf of the waves. I followed the channel in the opposite direction, landwards, for about 60m. Up to here it was very carefully built, taking advantage as much as possible of the natural rocky formations. Although it took some turns, its general drift was south-west. Approaching the eastern side of the beach, the ditch was buried under the sand. I followed its hypothetical course, entering the fields, exactly behind the beach. Astonished, I found out that about 80m. behind the beach there was a spring. Curious from this discovery I asked an old man whether he knew anything about it. He ascertained that no more than 20 to 30 years ago, a much greater part of the ditch could be seen, leading towards the spring. Only then I allowed myself to suppose that the spring must have supplied the ditch with fresh water, emptying in the small artificial basin. From there, ships could be supplied directly with water, or with the help of a wooden jetty, penetrating further into the sea. The date of construction however is a mystery.

Another indication for the existence of a harbour at Malia is the discovery of three limestone anchors. Two of them have been found near a stone cutter's workshop. The third one was found in House 'Ea', about 650m. from the sea.

I personally believe that right here, another important Minoan harbour existed. Some scholars judging by the fact that no imported finds have been found in the palace, attribute the installations to a small fishing port. E. Van Effenterre being one of them. However, as V. Sturmer believes, the great prosperity of the palace can hardly be

conceived without export and import trade. The latter scholar also supports the view, that given the proximity of the harbour to the palace, the harbour of Malia was a city-harbour.

3. The harbour-town of Kommos.

At Kommos, a short sail to the north of Matala, in southern-central Crete, Sir Arthur Evans suggested the existence of a Minoan port. (Fig.16). Indeed the results of excavations conducted at the site by Professor J. Shaw, from the mid '80, supported Evans' hypothesis. (Fig.17). Remains of the largest and probably most important Minoan harbour in Crete and a thriving town have been revealed, lying for thousands of years under the prominent sand dunes, in close proximity to the shore.

The sandy bay at the harbour of Kommos faces west and is guarded by the small islands of Paximadia on the west, and protected by a promontory to the south. The relative sea-level of Kommos in Minoan times was at least 2m. lower than present. Thus, the whole shoreline should be further out. Accordingly, the now irrelevant spur of rock rising for 1m. above water level, and lying 300m. offshore, would have been much closer to the land and rising more than 4m. high, above water level. It would considerably protect the harbour from the westerly gales. (J. Shaw, 1982, 193). To the north, the bay is sheltered from the westerly winds by a partly submerged reef, acting as a natural breakwater. The town was supplied by a fresh water spring. H. Frost informs us that today, the river to the west of the reef serves as a refuge for ships in bad weather. (H. Frost, 1963, 111).

The harbour-town of Kommos lies on the southern part of one of the most fertile plains of Crete, Messara. The town had an immediate hinterland of small plots and hills. It had close relations with the Palace centre of Phaestos which actually exercised an effective control over the plain, until L.M.I., -situated at the western end of it-, and Ayia Triadha; another very important Minoan centre -

situated on the last hill between Phaestos and the Libyan sea. (Fig.18) (J. Shaw, 1986, 269; 1984, 286; P. Betancourt, 1984, 31-32). Arthur Evans goes even further however, suggesting that Kommos served both those great Minoan centres of the south. (A. Evans, 1928, II, 90).

Of greatest importance is the fact that the harbour can hardly be considered as isolated in Minoan times since it was connected to the Palace of Knossos by the "Great South Road". (A. Evans 1928, II, 91).

The excavations in Kommos revealed that the Minoan town was inhabited from c. 2,000 B.C. (M.M.I.) right through 1,250 B.C. (L.M.IIIB.) (J. Shaw, 1977, 238 ; 1982, 192 ; J. Shaw, H. Blitzer, 1983, 91). It reached a peak mainly towards L.M. period and was consistent with the general prosperity of both Early and Late Minoan periods. However, stratified finds suggest habitation also from the Protoegeometric through Early Roman period.

Indicative of the maritime activities of the site is the discovery of 6 stone anchors of probably Minoan origin. The archaeological context of 5 of them place them as late as L.M.III. Unlike other anchors found in Crete -5 of which have been ascribed to the Bronze Age so far- the 5 Kommos anchors were found in unambiguously every day contexts. The 6th one was found in the sea. (J., Shaw, H. Blitzer, 1983, 91; J. Shaw, 1984, 286).

Many aspects of Kommos town are either directly or indirectly connected to the sea or to its harbour. In particular a broad roadway was unearthed, bordered with large ashlar buildings. This separates the residential quarter from the ashlar buildings. Its width -an average of 2.85m.- makes it wider than all known Minoan roads and most carefully built. The road entered the town and finally led directly to the sea, to a place where ships could be loaded or unloaded. Since it entered the harbour-town from the direction of Phaestos it is not unreasonable to believe that it connected it with the harbour-town.

Other aspects of the town related to the sea activity must be, Minoan building 'J'/'T' which seems to have been

storerooms, starting about 40m. from the modern water level. A series of adjacent rooms must have also been storerooms, entered by a long and wide corridor. 'Q', is another interesting building, belonging however to the 7th c. B.C. (J., Shaw, 1986, 55, 229). Its connection to the sea is unambiguous since one room of it was proved to have been a purple-dye workshop. It revealed a great number of crushed *Murex Trunculus* shells. Other rooms of 'Q' point to their function as store rooms, safeguarding the storage of foreign or local goods. Most interesting of all however, is that of L.M.III building 'P'. Its unnatural shape for storerooms, -it composed of long roofed galleries- (32m.x5.60m.), the fact that it was doorless at least at the western (seaward) side in conjunction to the fact that no impediment has been found from its western side, have led scholars to suggest that it belonged to ship-sheds. (Fig.19) "Not perhaps a coincidence is the fact that the dimensions correspond closely to those of a number of ship-sheds". (M., Shaw, 1985, 22). (Fig.20). Of course, comparison can be made only with classical ship-sheds, since earlier -if any- are hard to identify and date, due to relative sea-level changes. At least, the dimensions of the galleries do not conflict with those of large Bronze Age ships.

By the end of L.M.IIIB, Phaestos was almost deserted, at Ayia Triadha the population had decreased dramatically and Kommos was abandoned. Nevertheless, archaeological finds in the site suggest that the once thriving harbour regained its prosperity again, between 450 and 150 B.C. The large number of sherds belonged to great oil jars, found scattered on the site, prove once again that oil was one of the major commodities of Crete that must have been exported to Egypt. In Evans' times a building found full of pithoi still in position was attributed to a "Custom's House". (A. Evans, II, 1928, 88).

Various fragments of pottery found in the site prove commercial connections of the busy harbour-town with various other Cretan cities, the Greek mainland, Italy,

Cyprus, the Cyclades, the Levant and Egypt. Thus, these finds are consistent with the views of many a prominent scholar that various ethnic groups of the Bronze Age were in close commercial contact with each other. Watrous informs us that if we take together the fragments of pottery found in Kommos, a pattern of trade route emerges with goods moving from Syria to Cyprus and then to Crete. (V. Watrous, 1985, 9). Also J. Shaw and G. Bass inform us that Canaanite and Cypriot pottery found in the harbour of the small offshore island of Egypt, Mersha Matruh, indicate that the two ports lay on a counterclockwise trade route. (J. Shaw, 1986, 268).

4. Trypeti

One branch of the "Great South Road" terminated at a sandy bay which is guarded by two rocky promontories. The right one offers good shelter against the western winds. This headland is tunneled through by a cave. An artificial ledge runs along the face of the cliff to the right. Here, Arthur Evans discovered foundations protruding over from the beach, while towards the base of the slope he identified "Minoan terrace walling" overbuilt by Greek and Roman works. Yet, potsherds scattered about on the slope, indicate almost exclusive Minoan presence. Black glazed M.M.II as well as remains of great oil jars of L.M.I were identified. (A. Evans, 1928, II, 83). As Evans stressed "this was only a side outlet of the interior road system". (A. Evans, 1928, II, 83). What was at its end though at Minoan times? Could the remains belong to a sort of harbourworks of a small Minoan fishing and agricultural community? If we suppose that it was, why should it be connected to Knossos since probably the largest Minoan harbour, that of Kommos lies a short distance away? Unfortunately, answers to these questions are not satisfactory at the present state of my research.

5. The Palatial harbour of Zakros

The harbourage of Kato Zakro is situated at the easternmost point of Crete. It is a remarkably barren stretch of land surrounded by treeless white limestone hills which are intersected in two places by deep gorges. (Fig.21). In these run two streams, one of them emptying its content into a natural harbour, a deep and protected bay. The river's delta has created favourable conditions for the cultivation of a small coastal plain.

Today, the city is a little fishing and agricultural hamlet, inhabited by few people. Here, in 1961 the then ephor of antiquities of Crete, N. Platon discovered the fourth Minoan palace-complex.

Captain Spratt who visited the place saw traces of ruins and rightly remarked that "the combination of a rivulet, plain, bay and high bounding ridge that Zakro presents are features highly favourable for the situation of a coast city of the Cretans in early days". (T. Spratt, 1865, 234). However, he was mistaken in believing that here was the site of the ancient city of Itanos.

At the dawn of this century, the British archaeologist D. Hogarth excavated parts of the site. (D. Hogarth, 1900-01, 121-149). Among others, he discovered a deposit containing groups of bronze implements, 500 clay sealings and other artifacts, the remnants probably of a commercial correspondence. (N. Papadakis, 1983, 139).

The palace centre of Zakros flourished during the Late M.M. and L.M. periods and is the only one that was discovered unpillaged. So far, it covers an area of over 9,000 sq.m. It consists of the palace rooms and various workshops. It is estimated that with upper floors of the palace included, 250 to 300 rooms existed for various purposes. Characteristic of its wealth is that more than 10,000 movable objects have been recovered. (N. Papadakis, 1983, 141). These discoveries, many of which were imported from Asia Minor, Anatolia and Egypt, point to the site being an important commercial port. A great number of the artifacts are of exceptionally superior quality made of raw materials brought from the east - elephant tusks, ostrich

eggs, to mention just a few. These could be sent to Crete in exchange of lumber, so valuable in treeless Egypt, aromatic substances, wine, oil, resin etc.

N. Papadakis, ephor of eastern Crete stresses that the importance of the discovery of the palace complex here, is indeed great. Due to its existence, we are able to clarify the picture regarding the relations of eastern Crete in Minoan times with Egypt and the Near East. Also, it is certain now that the palace centre of Zakros must have been one of the biggest intermediary trading stations on the whole island, exporting works of art, agricultural products and timber. (N. Papadakis, 1983, 141). "The establishment of a palace at Zakros and the transformation of the rather unimportant settlement into a palace centre, must have been motivated not so much by the need to utilize vital local resources as by a desire to create a well organized harbour from which to control maritime trade and strengthen commercial relations with the east and Egypt". (N. Platon, 1969, 240). Apart from this, it also seems possible that the initiative for the creation of the harbour belongs to Knossos, if we take into consideration similarities between the two palaces in architecture, various crafts and Linear A script. (D. Hogarth, 1900-01, 147; N. Platon, 1969, 240). If this assumption holds true, then contact from central Cretan cities could be easily established with Near-Eastern and Egyptian ports without the latter's ships being forced to circumnavigate the eastern end of Crete, the risky cape Samonion. Professor Platon goes even further supporting the view that the harbour-town of Zakros was at such a favourable position that it could be hard not to conceive of it as a maritime base exercising effective control over the passages between eastern Crete and the islands of Rhodes, Karpathos and Kassos. (N. Platon, 1969, 246; 1984, 66). The deep bay of Zakros is protected from all sides but the east, and is an ideal site for the existence of an anchorage. It is the safest in eastern Crete and even today fishing and sailing vessels find protection in adverse conditions.

Of the Minoan harbour that once stood on the southern side of the bay, almost nothing can be seen today. The major reasons being the subsidence of the site since antiquity, which is estimated at 1m. (P. Pirazzoli, 1988, 174) and the accumulation of alluvial silt from the river. (N. Flemming, P. Pirazzoli, 1981, 77-78). "The whole district is exposed to terrific denudations, owing to the heavy precipitation on the abrupt eastern face of the Siteia mountains". (D. Hogarth, 1900-01, 123).

N. Platon informs us that after a fierce storm, part of a loading quay was exposed. The ruins of rectangular structures seen today on this part of the coast have been attributed to storerooms for temporary storage and preparation of logs before their loading into vessels and thence transportation. (N. Platon, 1969, 244) It is significant that the harbour was connected with the palace by "The Harbour Road". Parts of it have been exposed starting from the northern boundary of the palace, ending presumably to the harbour.

Destruction of this bustling palace and its harbour was sudden, caused by violent catastrophe. Not a few scholars - including the director of the excavations here, N. Platon - attribute it to the devastating results of the eruption of the Thera volcano, around 1450 B.C. Habitation in the harbour-town and palace that was in climax for about 100 to 150 years ceased, following the destruction and the site was abandoned and forgotten. Nothing else has been built over the site of the palace until its discovery and the hamlet of Zakros was reinhabited early in our century.

6. Palaikastro.

The Minoan town of Palaikastro flourished mainly during the L.M. period. It is situated on the eastern coast of Crete. The prehistoric site overlooked a small bay, and the offshore island *Grandes* offered good protection from the wind. Palaikastro "played an important role in eastern trade as it offered convenient harbourage at a place important for navigation." (K. Davaras, 1976, 241).

The town was excavated in the dawn of our century -from 1902 to 1906- by the British School of Archaeology, directed by D. Bosanquet and R. Dawkins. The whole town excavated, perhaps covered an area larger than 50,000sq.m. without fortifications. Nearby, the remains of a settlement showing continuity from Mycenaean to Hellenistic times, has also been discovered. Some people believe that this is the site of ancient Dragmos, but, this is far from certain. (S. Spanakis. 1982, II, 305). Here, the ruins of the temple of Dictaean Zeus were found. This was part of a prosperous sanctuary that belonged to the Dorian city-state of Itanos. Excavations conducted here in 1982 and 1983 discovered that worship of the sanctuary's cult continued from Geometric down to Hellenistic and Roman times. (K. Davaras, 1976, 241). Excavations by the British School were resumed in 1986. (J. Mac Gillivray et.al., 1987, 135-154). Spratt, who visited Palaikastro, suggested that this must have been a Phoenician settlement since the place was in an ideal position on their trade route from east to west. (T. Spratt, 1865, I, 210).

The siting of the town favoured the existence of a harbour. The *Grandes* islet offered considerable protection from the winds and it was connected to the mainland by a wall right where it was needed. Thus, protection would have been enhanced. Research though at this part of Chiona beach did not reveal much of importance either on the shore or underwater. If something existed thus in Minoan times it may be covered by silt and sand. Pirazzoli has estimated subsidence here roughly at 50cm. (P. Pirazzoli, 1980, 101-11) This estimation however may not be correct, judging by

artificial remains found underwater at the northern side of the bay. Here, in particular, a number of scattered walls are found today about 5m. away from the coast, covered roughly by 1.60-1.80m. of water. One such a wall is preserved for a length of 2m. and height of 1m. It is built with irregular stones stuck together by heavy fusion. The most interesting underwater feature though, is of a circular construction. Characteristic is that its base is lined very carefully with rectangular tiles. This, I believe to be a well. Its modern position indicates that the relative water level at the time of its construction - which I believe to be Hellenistic or Roman- must have been at least 1.50m. lower than today. These features have also been described by N. Flemming and P. Pirazzoli. (N. Flemming, P. Pirazzoli, 1981, 77).

A number of lines of walls running parallel to the coastline can also be seen at this part of the beach. One in particular is built of well-dressed rectangular porous stones, put together very carefully in an isodomic style.

7. Mochlos

Mochlos is the name of both a fishing village and a small island, located at the eastern end of the Mirabello gulf. During E.M. and M.M. times it was a very important settlement. On the island, a very rich cemetery has been excavated (as well as houses) by Seager in 1908. (Fig.22). Very important jewels and ceramics retrieved from the site, today, adorn the chambers of local museums.

The settlement was destroyed during the M.M. period by the same force that destroyed many other settlements in northern Crete, namely earthquakes. From that period onwards the site remained uninhabited until the Roman times. (D. Pendlebury, 1939, 146, 237, 365). The settlement during the later period also encapsulated the mainland opposite.

Today, the little limestone mass of land lies roughly 150m. away from the mainland but during the Bronze Age it was connected to it by a causeway, thus, forming an

isthmus, affording safe anchorages on either side, according to the wind's direction. (R. Seager, 1909, 274; Leathan, S. Hood, 1958-59, 273). Protected therefor from both prevailing winds (northwestern and northeastern), Mochlos, according to Seager must have possessed the best harbour on the northeastern coast of Crete (R. Seager, 1909, 274), and due to this fact and its geographical position, Mochlos became an important Minoan centre. (N. Papadakis, 1983, 69)

The causeway today is under 1 or 2m. of water but easily distinguishable on a calm day, in the form of rubble boulders running from the island towards the mainland.

A couple of fish-tanks of Roman period, hewn out of the porous cliffs of the mainland opposite the island, are safe indicators of the subsidence of the place, estimated between 1m. more or less, since Roman times. (J. Leathan, S. Hood, 1958-59, 266) and 60-70cm. (P.A. Pirazzoli, 1988, 174; N. Flemming, P. Pirazzoli, 1981, 76). (Fig.23).

8. Pseira

Two miles west of Mochlos and 1,5 miles off the coast of Crete lies the island of Pseira, situated at the eastern part of the gulf of Mirabello. Here, a Minoan settlement flourished during E.M. times and it was also destroyed in M.M. times by earthquakes too as was the case with nearby Mochlos. (Fig.24).

The eastern side of the island is indented by three deep sandy bays, flanked by headlands. The central headland protrudes into the sea for about 180m. On its top and sides as well as on the adjoining hillside, once flourished a Minoan settlement which owed much of its existence to the excellent small harbourage offered by the southern cove of the promontory. (J. Leathan, S. Hood, 1958-59, 277).

The port is covered from all directions of the compass but the east. An easterly gale is a rare phenomenon for northern Crete. (R. Seager, 1910, 6).

Ruins of the little town today are found submerged into

the water in various degrees of subsidence indicative of great tectonic activity. A spring and a well in the sand of a cove north of the site, discovered by Seager in 1900, used to supply the water to the settlement in Minoan times. (Fig.24a,24b).

The site was reoccupied once again in Roman times as is shown by the discovery of Roman remains on the highest ridge of the island, belonging to a military camp and probably a beacon station. Roman remains have also been found in the vicinity of the above mentioned cove. Seager, after the examinations of the island in 1900 assures us that the cove was occupied in the same way and at the same period as the settlement. (J.Leatham, S.Hood, 1958-59, 277).

Pieces of concrete masonry belonging to a Roman waterfront are found today 1,5 to 2m. under water. The wave action has altered drastically their configurations but it is estimated that the mole stretched right across the cove, having a front of 15m. long to the sea. (J. Leatham, S. Hood, 1958-59 278).

VI. Crete from the sub-Minoan period to the Roman conquest
c. 1020 B.C. - 67 B.C.

Following the Dorian invasion, the Cretans and Mycenaeans continued to populate Crete, sharing many common cultural characteristics. The Dorian tribes moved within the geographical confines of the Mycenaean spread, reinforcing the Greek population. The fate of Crete from now on is common to that of mainland Greece. The Dorians, introduced the use of iron for the manufacture of tools and weapons. Thus, this lengthy time-span following the invasion until classical times, is termed the 'Iron Age'. The Greek invaders, unlike their predecessors were aggressive and warlike, lacking the Minoans' colourful spirit.

The Dorian influence upon the inhabitants of Crete, was strong enough to alter their characteristics. However, in some places, due to Crete's rugged geomorphology, Minoan elements could be traced down to Hellenistic times, in religion, in the Eteocretan (true Cretan) dialect and in place names. This unevenness of Cretan landscape is mainly responsible for the settlement of Cretan inhabitants into numerous small, independent city states. (A. Lembessi, 1987, 135).

Settlements were built mainly in eastern and central Crete, chiefly upon earlier Minoan sites. The prevalent sites of the 1st millennium are to be found in mountainous regions and at strategical points from where military control of a valley, or an important passage could be guarded (A. Lembessi, 1987, 135).

International trade was minimal and no coastal cities have yet been found. Inland settlements were preferred out of fear of piratic acts and accordingly traffic in the harbours affected by the disasters of previous generations was also extremely limited. The sub-Minoan period (1020 - 710), was one of decadence in both architecture and art; while a simplification of Minoan prototypes was also evident, especially in pottery, where geometric patterns begin to appear. (970-850 B.C.). Knossos took the lead again and during the 8th century reestablished

international relations with the Orient and Greek cities. Precise geometric designs appeared in pottery, characteristic of the geometric period (850-710), where quality improved again.

The Phoenician expansion westward in the 8th c. B.C. must undoubtedly have left traces on the Cretan coastline, especially on the south-eastern part. (J. Shaw, 1986, 224). Although we do not possess any proof, since no excavations have been conducted at harbour-towns of this period, nevertheless by knowing maritime activities of the Phoenicians on the coasts of the island, we may assume that harbour-towns and accordingly harbours were operating. Can we suppose that Phoenicians took the initiative establishing their own colonies in Crete? It is quite possible. These may be Itanos, (N. Papadakis, 1983, 38), Phoenix (E. Hadjidaki, 1988, 127), Phalasarna (E. Hadjidaki, 1988,) and perhaps others.

Once the Dorians had settled, a new wave of oriental connections started bringing with them a renaissance of oriental themes. (R. Willets, 1965, 4). During this "Orientalizing" period of the 7th c. B.C. the eastern and western coastal cities of the island must have profited by the trade, conducted between the Greek homeland cities and their colonies of the northern African coast. (G. Schaus, 1980, 23). (Fig.24c) The summit of mount Ida of Crete can be distinguished for over 160km. out to sea on a clear day and the Libyan coast rises abruptly from the coastal plain. These facts must have encouraged mariners to undertake the direct crossing from Greece to Libya via Crete. (Strabo, 10. 475). This trade route must have undoubtedly affected harbours on the eastern and western coastlines of Crete but the degree and the character can only be guessed. Aristotle remarked that the principal regions of contact with the neighbouring mainland were the eastern and western extremities of Crete. Through the southern Sporades in the east, the Doric coasts of Anatolia could be easily reached and by way of Antikythera and Kythera in the west, the Laconian city states were accessible. (S.Spyridakis,1970,2)

The result of colonial expansion and the growth of maritime trade from Greek cities of the mainland in the 8th and the 7th c. B.C. was the first large scale attempts by the Greeks to improve their natural harbours. The introduction of coinage certainly helped the finance of major public works, including harbour constructions. Also, the rise of strong men from a number of Greek cities, the tyrants helped considerably the financing of great public works. (D. Blackman, 1982, part 1, 93).

During the "Orientalizing" or "Daedalic" period, art products appear from various individual Cretan workshops. Art reaches once again a peak, while this style originating in Crete, spreads right through Greece. (J. Boardman, 1980, 76; 1978, 13; A. Lembessi, 1987, 163). A. Lembessi also informs us that these connections with the Near East, Crete, owes to its excellent geographical position and to the extensive Phoenician maritime trade, from the south-eastern Mediterranean to the western markets. (A. Lembessi, 1987, 166). Excavations of the cemetery of Knossos of this period yield a degree of prosperity and show connections with the rest of Greece.

The artistic reawakening lasted to the end of the 6th c. B.C. From the middle of the Archaic period to the Hellenistic times, Crete goes through economic, commercial and artistic stagnation. (R. Willets, 1965, 4).

The rugged geomorphology of the island did not permit major cities to control large cultivatable lands. This fact plus the diversity of ethnic groups resulted in the emergence of many autonomous city-states. Usually, treaties were drawn up between them, that however were often broken for the control or annexation of land. "Periods of peace in Crete were of short duration". (R. Willets, 1969, 178). Only when foreign danger threatened was there a coalition of Cretan cities known as *synkritismos*. (R. Willets, 1976, 180; A. Lembessi, 1987, 143-144).

The government of the Cretan cities (that was an aristocratic institution), remained conservative up till Roman times. The main reason for this particular

conservatism was that Crete did not participate in the economic revolution that occurred in the rest of Greece, mainly due to its inability to follow the Greek and Phoenician example of colonization. As a consequence, Crete developed many small industries upon which internal trade was based. The Cretan economy remained mainly agrarian.

In the classical period, Crete retained many practices in government, law, society and economy, of the preceding periods. This resulted in a considerable isolation and a differentiation of Crete from the rest of the Hellenic world. (A. Haniotis, 1987, 178). Due to this isolation we have scarcity of written sources, and we can only depend upon archaeological data, mainly in the form of coins, inscriptions, architectural features and works of art.

During the classical period therefore, Cretan cities with their "ancient" form of government and social elements were totally separated and isolated both politically and commercially from the rest of Greece. Thus, excluded from historical developments of this period, namely the Persian and Peloponnesian wars and the Athenian hegemony (S. Spyridakis, 1970, 13). This resulted in a stagnation of trade and manufacture and the displacement of Crete from the forefront, shifting the commercial and artistic interest to mainland Greece. (A. Haniotis, 1987, 179).

From evidence that we have so far it seems that all these aforementioned factors resulted in the weakening and thus, the inability of Cretan city-states to finance the construction of harbour installations, unless future excavations prove the statement wrong.

The fate of Crete during the Hellenistic period was to change once again radically. Alexander the Great with his military campaigns created a new situation, uniting the ancient world within a political and geographical entity. Crete, therefore was suddenly found, due to its geographical position, in the centre of the Hellenistic world, divided internally and weak due to political and social strife, unable to play a major role as a great power. (A. Haniotis, 1987, 182; S. Spyridakis, 1970, 14).

Crete, in the middle of the new world was of paramount importance for the control of strategic points in the south-eastern Mediterranean; by now the centre of political developments. Due to this fact, the island became indispensable among the warring descendants of Alexander. Another major reason for the importance of Crete to foreign powers was the recruitment of Cretan mercenaries for their armies. (H. Ormerod, 1924, 145; S. Spyridakis, 1970, 15). Except mercenary service, one of the major sources of wealth for Hellenistic Crete was piracy as well as the slave market. (A. Haniotis, 1987, 185, 219, 220, 269, 279; H. Ormerod, 1924, 145, 166; Polibius, 4. 8; Strabo, 10. 4. 10; E. Hadjidaki, 1988, 122-135). "There is no doubt that geomorphological conditions were largely responsible for making the Cretan what he was a mercenary or pirate, or both, as occasion offered... The mountain character of the island bred a hardy race of warriors, adept in all kinds of guerilla fights". (H. Ormerod, 1924, 143).

The period is also characterised by internal strife and coalitions of cities, under the hegemony of the strongest. Under these circumstances various foreign regents through diplomatic relations and interference in Cretan affairs tried to take advantage and strengthen their position. (Livy, 42. 51, 7; E. Hadjidaki, 198, 97, 98).

Despite the various efforts for unification, Crete remained ununified till the intervention of the Macedonians. Polibius stressed that the advantage of having all Cretan cities on ones' side was great. Philip partially succeeded. He established strong Macedonian influence in Crete and for the first time in Cretan history all cities united in a confederacy under the presidency of Philip. (Polibius, VII, 11. 14). Even this was not destined to strengthen the position of Crete as a whole. The confederacy of cities *Koinon ton Kriton* was often on the point of dissolving. Cretan cities proved very narrow minded, determining their external policy, strictly according to their own local interests. Thus, Crete, never played a political part in international developments as

Rhodes and the Aetolian and Achaean alliances did.

In the sphere of political organization and culture, Crete, thanks to the cosmopolitan atmosphere of the period, received many influences and ideas. As a result, the form of government of some cities changed, not without foreign pressure in some cases.

Maritime activity and trade were greatly reinforced, and the phenomenon of *sympoliteia* occurred; that is the unification of a strong inland city with a coastal one that possessed a harbour. Lyttos with Hersonissos, Polyrrhenia with Phalasarna, Elyros with Lissos, Gortyna with Matala. The phenomenon was common enough throughout the Greek world that the technical term *epineion* was invented by the Greeks, referring to the coastal city. This phenomenon "resulted in part from the early settlement pattern, for as Thucydides noted, in early times the Greeks built their cities inland, for security from attack by sea" (D. Blackman, 1982, part-2, 193). Although the inland city was responsible for the administration of both (at least in the beginning), later on, the harbour-town developed into an autonomous centre at the expense of the inland mother city. Other strong inland cities possessed harbours or emporia; small coastal settlements, lacking autonomous administration. (A.Haniotis, 1987, 235, 255, 262). In other cases self supporting settlements emerged on the coast such as Syia and Tarrha. (A. Lembessi, 1987, 133).

Alliances of Cretan cities under the leadership of the strongest (Gortyn, Knossos, Kydonia, Hierapytna) continued to warfare, thus becoming weaker and weaker. Characteristic of the period is that the 100 Homeric cities of sub-Minoan Crete, "Ekatompolis Kriti" became 35 to 40 at the end of the Hellenistic period and were further reduced after the Roman conquest. (D. Tsougarakis, 1987, 301).

As far as harbour building developments are concerned, the first time that harbour construction did not rely heavily upon nature, took place during the Classical and Hellenistic periods. Thus, harbours could be created by excavating a basin behind the coast, sometimes taking

advantage of preexisting lagoons, joined by one or more artificial channels to the sea. This method can be seen in Crete at least in the harbour of Phalasarna. The preference in construction of the double port, and the development of the *Loimen Kleistos* type, are easily defined. The first, usually comprised of two different basins connected together by a channel. The one serving as the commercial and the other as the naval port. The *Loimen Kleistos* comprised of an anchorage closed by breakwaters that were extending the city's fortifications. The narrow entrance could be closed off to foreign ships by means of chains or booms. Thus, completed a well protected port that fitted efficiently into the general system of fortifications. Out of the 14 closed harbours of the ancient world, 2 were built in Crete, at Kydonia and Phalasarna. (Scylax, 53, 37). Also, a new type of breakwater was developed which was a sea-wall and jetty at the same time. This was a massive structure of enormous boulders weighing up to 50 and even 100 tons, strewn on the sea-bed, as deep as 15m. (N. Flemming, 1978, 168) and rising above the surface level. On its upper level a quay was built.

Among other features of this period, we can list shipyards, slipways, mooring installations as well as sluice canals for the prevention of silting. As R. Yorke and D. Davidson stress, all these innovations and especially the elegant use by ancient Greek engineers of ashlar masonry walls at considerable depths, must have involved great technical experience and a high degree of technological sophistication. (R. Yorke and D. Davidson, 1985, 157). H. Frost stresses that Greek harbours fall between the extremes of Bronze Age and Roman design. (H. Frost, 1963, 113). Generally speaking, it is very difficult to distinguish classical from Hellenistic harbourworks because they share many common features.

During this long period a great number of Minoan harbours that had not been destroyed by natural catastrophes or had not been silted up, were reinforced, although in most cases it is very hard to talk with certainty, due to the

extensive overbuilding.

The Greeks in many instances followed the example of the Minoans for the siting of their harbours. These people now built a number of harbours on the southern coasts as a result of the rise of new coastal sites. These ports have a particular importance throughout Crete's maritime history being the natural outlet (as early as in the Bronze Age) for Minoan trade with Egypt and Libya, in Greek times with the trade of mainland Greek cities and for Roman dealings with North Africa.

Towards the end of the 3rd c. B.C., Rhodes allied with Rome becoming the "watchdog" (E. Hadjidaki, 1988, 128-129) of Roman interests in the eastern Mediterranean. F. Meijer informs us that King Philip of Macedon opposing Roman expansion in the Aegean, incited Cretan pirates to plunder Rhodian merchantmen, while Rhodes was trying to build a Mediterranean hegemony. Finally, a Creto-Rhodian war broke out (205 - 201 B.C.) (F. Meijer, 1986, 174). Having won, Rhodes signed treaties with individual Cretan cities, such as Knossos in 220 B.C. (Polibius, 4. 53; Diodorus, 20. 88) and Hierapytna in 200 B.C. (Guarducci II, 1939, 438).

During the 1st c. B.C. the Romans who had already conquered Greece in 146 B.C. were at war with the King of Pontus, Mithridate VI. Cretan cities openly supported him with mercenary forces, piratic acts and supplies for his fleet. This resulted in the arrival of a Roman force, to suppress Cretan piracy, in 74 B.C. The Romans underestimated the Cretan forces and were finally beaten. (F. Meijer, 1986, 192; E.Hadjidaki, 1988, 134). In 67 B.C. general Metellus was sent to Crete. (I. Sanders, 1982,3; D. Haniotis, 1981, 241). "Metellus destroyed Kydonia, as well as other Cretan pirate strongholds with the utmost brutality and proceeded to subdue the whole island". (E.Hadjidaki, 1988, 135).

VII. Greek Harbours.

A. Phalasarna.

Phalasarna was an ancient harbour-town lying at the extreme western coast of Crete. According to Scylax it possessed a "closed harbour". The town and harbour were situated at the neck of the exterior side of cape Korykos, -modern Grambusa-, at Livadi bay, facing the western Mediterranean sea. Three small islands lying a short distance offshore, offer little protection from the prevailing winds that blow strongly almost throughout the year. The city was built on the eastern slopes of the rocky promontory -called Koutri- projecting into the sea on a south-west orientation, and on the slopes of a fertile plain. Nothing has been built over the ancient city since the 1st c. B.C. and a lot of its features are fairly well preserved.

The area must have been inhabited as early as the M.M. period judging by archeological remains of two settlements. (E. Hadjidaki, 1988, 10, 136). Excavations at the cemeteries of the town conducted in 1966 (G. Tzedakis, 1969, 433-434) as well as 1981 and 1985 (E. Hadjidaki, 1988, 120) suggest habitation of the site from the 6th c. B.C. to the 4th c. B.C. References to the city in the 5th and 4th c. B.C. we also possess through inscriptions. (M. Guarducci, 1939, 221, I, 223). Scylax in his *Periplus* says that it is a day's sail from Lacedaemonia to the cape of Crete, on which the city of Phalasarna is situated, possessing a closed harbour. Coins of Phalasarna -18 of which have been identified so far- suggest that the city was independent (J. Svoronos, 1890, 268, 271), although the most powerful city of far western Crete at the time was Polyrrhenia. E. Hadjidaki stresses that by the end of the 4th c. B.C. Phalasarna was a powerful independent maritime power. (E. Hadjidaki, 1988, 94). The city, however, must have been in constant warfare with Polyrrhenia. (E. Mikroyianakis, 1967, 63). Phalasarna sometime in the 3rd c.

B.C. had developed close ties with king Ptolemy III, Euergetis, of Egypt. (M. Guarducci, 1939, II, 19). In 172 B.C. Phalasarna with Knossos sent 3000 men against the Romans. (Livy, 42. 51. 7). From then on although we lack ancient sources, the harbour-town must have existed as a town 4 Km. south of its ancient location as is indicated by a map of Ptolemy and Roman remains identified by E. Hadjidaki. (E. Hadjidaki, 1988, 101-102).

Descriptions of the city and its harbour we also have by various early travellers and modern scholars. Among them, F. Basilicata, (S. Spanakis, 1952, V, 52-53), C. Buondelmonnti. (C. Buondelmonti, 1897, 112-113).

The name of the city (lost through the centuries) was rediscovered in the early 19th c. by R. Pashley. The city was difficult to approach due to its natural protection from mountains and the growth of wild vegetation. It had been thus missed by previous travellers and geographers. (R. Pashley, 1837, 62-74). Spratt who visited Phalasarna was not only the first to notice the marks of the uplift on the cliffs of Koutri but he also identified and drew the plan of the lost ancient port of the city. (T. Spratt, 1865, 227-235). Other scholars who visited Phalasarna and described or commented about its ruins were L. Savignioni and V. De Sanctis, Lehman Hartleben, H. Van Effentere, D. Blackman, N. Flemming, P. Pirazzoli, F. Frost, J. Shaw among others.

Excavations in the harbour of Phalasarna was started in 1986 by the Department of Classical Antiquities of Western Crete, directed by Mrs. E. Hadjidaki.

Atop the promontory, an acropolis overlooking the town and the sea is built. Other buildings are also found on the top of the promontory and around it. All over its slopes, remains of public buildings have been attributed to military outposts, comprising a line of fortifications. As the director of the excavations stresses, the whole cape seems to have been a strong fort surrounded by towers and bastions. (E. Hadjidaki, 1988, 3). A number of cisterns can also be seen on the eastern slopes of the promontory. In

the coastal plain, a great deal of ruins are seen today scattered around the place or half buried under the soil and vegetation. South of the cape, a 2m. high rock-cut structure standing on a flat plain resembles a throne. It has been attributed as a throne dedicated to the sea god Poseidon. (R. Pashley, 1837, 64-69; L. Savignioni V. De Sanctis, 1901, 352; N. Flemming, P. Pirazzoli, 1981, 72-73). Opposite the promontory to the east, the two cemeteries discovered, date from Archaic to the Late Classical period. (G. Tzedakis, 1969, 433-434).

The harbour today is found on dry land, approximately 100m. away from the present shoreline, for the uplift here has been estimated at 6.6m. since its use in antiquity. (N. Flemming, P. Pirazzoli, 1988, 168). (Fig.25a) The basin of the harbour seems to be quadrangular, measuring roughly 100x75m. and with the fortification walls "form a landlocked enclosure well protected from all winds". (E. Hadjidaki, 1985, 15). Another flat space situated just behind the harbour, seems to have been a small secondary port, since estimations of the ancient sea-level, prove that it was covered by water. A line of stones located equally every 4m. over a length of 30m. has been found along the secondary port's perimeter on a higher elevation. These may either belong to bollards or door-posts of shipsheds or even the remains of a stoa. (E. Hadjidaki, 1988, 16). In the excavations of 1988 -of which I was also a member- an artificial wall was found within the secondary basin. (Fig.25b) It is strongly believed that it belonged to an internal channel connecting both basins. The basins were connected with the sea by two long rock-cut canals -resembling thus a Phoenician Cothon- which today are dry, covered by toppled stones and wild vegetation. In antiquity, however, one of the two was at least 5m. deep and 10m. wide. (E. Hadjidaki, 1988, 137). The port's basin was also bordered by stone quays and at least 4 towers.

The excavations also revealed that the south-east mound was covering a circular tower preserved in places up to 4.5m. high. It was 9m. wide, built of ashlar sandstone

blocks, in an isodomic style, with the outside faces of the rocks polished smoothly. (Fig.26). Five of its upper courses were fallen "as if the wall had simply been pushed over its side" indicating destruction by earthquake. (E. Hadjidaki, 1988, 30). Further excavation unearthed two long parallel walls on the exterior western part of the tower. The northern one is bonded and starts from the tower itself. Four recesses from 20-30cm. wide and 50cm. deep run along the width of the wall at the top. These may have been sluices. It seems that the tower up to 1m., as well as the walls, were exposed to wave action since they appear to be badly eroded. A number of finds discovered within the tower dated to the 4th c. B.C. E. Hadjidaki suggests that this may also be the date of the round tower. However, the harbour's design may be earlier. The director of the excavation has called the space between the exterior wall and the southern one which joins the tower, a moat, since its excavation showed that it was filled up to a certain extent with water. (E. Hadjidaki, 1988, 38). Generally, the walls are believed to encircle the towers and surround the harbour. Another feature revealed, was a water tank, joined to the exterior part of the tower facing the port. This was lined by blue hydraulic concrete. (Fig.27).

A trench dug within the harbour basin indicated that the sea was indeed filling the port, since a layer was found rich in marine fauna. In the middle of the primary channel approximately at the ancient water level, a considerable number of boulders and ashlar blocks were found. This led the excavators to believe that the harbour mouth was deliberately blocked. This hypothesis was strengthened when a trench was cut through the channel that revealed enormous blocks, suggesting "a deliberate act of war". (E. Hadjidaki, 1988, 53-54). The trench also contained pottery mainly of Hellenistic times but also Roman of the republican period from Vesuvius in Italy, Carthage and the Syropalestinian coast. The excavation in the harbour basin along with the study of geomorphology and the geophysical survey do not leave any doubts that "this area

was a military port and many of its adjoining structures belong to harbour installations. (E., Hadjidaki, 1988, 57).

It is likely that the ancient harbour was built in a preexisting lagoon. (E. Hadjidaki, 1988, 136). Its connection to the sea by canals makes it resemble a Phoenician Cothon. (D. Isserlin, 1971, 178-186; N. Flemming, 1980, 170-171). The harbour was of greatest strategic importance since it controlled the western gateway to the Aegean, being the only harbour in far western Crete and the first one, a ship could rely on, on the way from the Peloponnese to Crete. The port is hidden from the sea side and it wouldn't be easy for ancient sailors to imagine that a port lies behind the rocky promontory.

Personally, I believe that further excavations will shed light on the suggestion that the harbour was a pirates' hideout or it belonged to Phoenicians. It seems certain though that abandonment of the ancient harbour-town occurred, following the Roman invasion of the island to destroy Cretan piracy. Hence, the buildings must have been further destroyed by earthquakes. (Fig.28,29).

B. The Loimen Kleistos of ancient Kydonia.

Kydonia was one of the most important Cretan cities in antiquity. The founding of the ancient city is lost among legends and traditions. References to its name by ancient writers and travellers abound; among them Homer, (*Odyssey*, III, 292), Pausanias (*Pausanias*, VIII, 53, 4), Herodotus (*Herodotus*, III, 59). Its location in antiquity was until recently a matter of dispute. (*Strabo*, 10, 13; R. Pococke, 1745, II, 247; E. Vardinoyiannis, 1968, 6-9; K. Fotiou, 1975, 41, 53). However, today, the view that the location of ancient Kydonia is at the modern capital of the region Chania prevails. (E. Falkener, 1854, 27; T. Spratt, 1865, II, 138-39). Historical Kydonia was a strong state dominating the north western coast of Crete from headland Psakon (modern Spatha) to the headland Kyanon (modern Meleha). From this period 96 coins have been discovered,

another proof of its independence as a state. (J. Svoronos, 1980, 96). The Spartan king Archidamos tried to conquer Kydonia in 344 B.C. but his army was defeated and himself killed. (Diodorus Siculus XVI, 63; Pausanias X, 2, 7). The city was almost always at war with her neighbour cities Phalasarina, Polyrrhenia, Elyros and Aptera. (S. Spanakis, 1982, II, 234). In 189 B.C. the city was fighting against Knossos and Gortyna.

In 74 B.C. the Roman praetor Mark Antony arrived in Kydonia with a strong naval force, aiming to conquer the whole island. The campaign ended in disaster though, and the praetor signed a treaty in favour of the Cretans. (S. Spanakis, 1982, II, 235). In 69 B.C. however, 3 Roman legions who came to Kydonia again, forced the city to capitulate. During the civil war (30 B.C.), Kydonia took the part of triumphant Octavian who in return granted liberties to the city. (Dio Cassius, II, 2). J. Svoronos has identified 62 coins of the Roman period. (J. Svoronos, 1890, 96). Among other buildings of the period, what predominates is the aqueduct built by Hadrian. (S. Spanakis, I, 1982, 235).

If we do accept the existence of the city where modern Chania stands today, then the ancient harbour is under the remains of the Venetian harbour of the city. Today, the two basins are well protected from the prevailing winds and are surrounded by the Venetian fortifications. Scylax has referred to the harbour of Kydonia as Loimen Kleistos, (closed harbour). (Scylax, 53, 57). Anyone walking around the harbour can understand what Scylax meant by Loimen Kleistos and what such a harbour must have looked like in antiquity, since the Venetian fortifications surround it. Spratt wrote that the harbour was formed by long transverse pier, running east and west. This encloses a double bay, at the end of which stands a grand lighthouse. "The foundations of the sea pier are partly natural rock and partly the old mole of the ancient harbour of Kydonia, upon the site of which city Khania undoubtedly stands". (T. Spratt, 1865, II, 138). The curator of the museum of

Khania, E. Hadjidaki stresses that the Venetians in order to build their harbour used ancient sandstone blocks and that the present mole definitely dates to the Venetian period and probably the latter follows the contours of the ancient mole. (E. Hadjidaki, 1988, 89). A natural reef is overbuilt by large ashlar blocks creating a long jetty which ends in a lighthouse. This is built upon large boulders, piled atop the reef. Now, a major section of the mole is silted up.

C. The harbour of Phoenix.

Phoenix is the ancient name of a coastal town of the western coast of South Crete which today is called Loutro. The town is situated on the eastern end of an anvil shaped headland, called Mouri. On the other side of the headland there is the gulf of Phoenix. The ancient name of the city is thus retained up to our days. Captain Spratt who visited the place confirmed that the gulf which the ancient city was built, is the safest of all on the south coast of the island and he asserted that security can be achieved by a ship all year round. (T. Spratt, 1865, II, 249). Indicative of this assertion is the fact that the captain of a grain ship that was carrying St. Paul to Rome from Alexandria, preferred to spend a winter on Phoenix rather than Kaloi Loimenes. (T. Spratt, 1865, II, 249).

Judging from the fact that the village is full of ruins of all periods, it seems that there is a continuity of habitation on the site from at least Minoan times, (E. Hadjidaki, 1988, 127), down to our days. Heavier concentration though of remains and sherds of the Roman and Byzantine periods are clear indications that the city flourished mainly during these times. Ptolemy refers to the harbour-town as Phoinikus Loimen. (Ptolemy, III, 16, 3).

The anvil-shaped headland one of the best formations for the existence of harbours in antiquity, thus, provided shelter to ships according to the direction of the wind. The eastern bay has deep waters and on its bottom a number of ancient as well as relatively modern wrecks have been

identified. (E. Hadjidaki, 1988, 127). The same person also informs us that at the next little bay she has discovered a great number of amphorae pieces lying on the sandy bottom. Many have been identified to have come from Kos and Rhodes. E. Hadjidaki says that close to the shore she saw megalithic constructions that she attributes to the Minoan times. (E. Hadjidaki, 1988, 127).

How did Phoenix reach a climax during Roman times ? Are we allowed to suppose that Phoenix was another coastal city of southern Crete that flourished through the Roman trade from the north coasts of Africa to Rome ? At least the assertion of a surveying team of Sfakia that "the range of non Cretan pottery in Sfakia does suggests that the area was linked to the broader Mediterranean economy, (L. Nixon, et.al., 1989, 208) fully supports the hypothesis as is also shown by the case of St. Paul's ship.

D. Kaloi Loimenes - the mole of Lassaia.

By the ancient name of "Kaloi Loimenes" -Fair Havens- is denoted a large bay, lying 6 miles east of cape Lithinon, in south central Crete. The headland offers good protection to the sudden northern winds but although the bay is one of the best anchorages of the south coast it is far from completely safe, since it is exposed to the east and south-eastern winds. The bay is protected in places by three little islands and has two sandy beaches. It is protected from the winds only during the summer months.

The place is known in antiquity only from the case of the grain ship of St. Paul. However, its captain left Kaloi Loimenes for "the harbour was unsuitable for wintering". (Acts, 27 : 12). The same source also informs us that here lies the ancient city of Lassaia. This city of south Crete has been firmly identified by Spratt to have been built close to the shore on the east side of the bay, on the promontory opposite the islet of Traphos. (T. Spratt, 1965, II, ; A. Evans, 1928, II, 85). The slope of this promontory is full of the remains of buildings and a great number of sherds strewn around the place suggest habitation of

Hellenistic/Roman times. A number of buildings' remains built on the shore are washed today by the sea; the seaward side of which have in fact been completely washed away. In some of these buildings parts of their walls are preserved up to 3-4m. in height. (Fig.30). These have been attributed as warehouses. (D. Blackman, K. Branigan, 1975, 30). Also, ruins of a massive wall preserved to a short height, running parallel to the shore, is supposed to belong to a defensive wall. (T. Spratt, 1865, II, 7).

Lassaia was a harbour-town probably belonging to Gortyna in the Hellenistic and Roman times. (S. Spanakis, 1982 ,II, 343). The most important remains of the harbour is that of a mole built with loosely piled large blocks of stone. This starts at the end of the headland and runs towards Traphos island for 90m., 15m. away from it, it turns westwards for another 25m. The 10-15m. channel therefore left between the mole and the island must have facilitated the passage of craft from one bay to another when the wind changed. (Fig.31a) How old the construction of the mole is, is hard to deduce. However, there are good reasons to believe that it belongs at least to Roman times. First of all the city seems to have flourished not later than Roman times. Thence abandonment has followed due probably to sea raids and piracy. (P. Faure, 1965, 38). Secondly, Lassaia has remained uninhabited ever since. Third comes the fact that at this part of Crete relative sea-level has altered the coast very slightly since Graeco/Roman times, thus enough to erode the seaward end of the buildings of the coast, but not so much as to submerge the breakwater. (D. Blackman, K. Branigan, 1975, 30). It is believed that the sea-level has remained constant since antiquity. (J. Blanc, 1958, 158; N. Flemming, P. Pirazzoli, 1981, 74).

Today, at the westward side of the bay as well as on one of the little islands, a bunkering station has been built as a refueling point for ships passing from the western Mediterranean to the Suez Canal.

E. The *Neosoikos* at Trypeti Siteias

Three Km. east from Siteia, on the northern Cretan coastline, (Fig.31b) The remains of a *Neosoikos* -slipway- was discovered and studied by K. Davaras. This rare structure for Crete, is situated at the south point of the eastern side of the small peninsula Trypeti, being thus protected by the prevailing north-eastern winds.

The *Neosoikos* is a simple rock-cut feature, curved out of the soft porous stone. It is rectangular, 30m. long by 5.50m. and 5m. high. Its floor slopes to the sea, with a gradient of $15^{\circ}30'$ -resembling thus the shipsheds found at Sounion with a gradient of $15^{\circ}50'$. (Fig.32,33). The *Neosoikos* was used for storing and repairing ships during the winter or heavy weather. Under these circumstances ships were also protected from sea worms. The dimension of the present *Neosoikos* indicate that it was for storing a ship of relatively small dimensions. (K. Davaras, 1967, 86). K. Davaras believes that the slipway was topped with a pointed roof. Usually, the various moving parts of the ships such as rigging, oars, masts, sails etc. were stored at a separate building, the *skevothiki*. (K. Lehman-Hartleben, 1923, 118, 228).

The seaward end of the slip is roughly at modern sea-level. However, some cuttings found some 40cm. underwater, indicate that subsidence in the area has not exceeded half a metre. (K. Davaras, 1967, 88; 1974, 87-93). Another *Neosoikos* has been found in Matala. (D. Blackman, 1971, 14-21). There are suggestions for the existence of three more at Kommos, M. Shaw, 1985, 19-24), Amnisos, and Ayioi Theodoroi. (A. Evans, II, 1928, 233, 279; S. Marinatos, 1925-26, 141-147). These date to Minoan times and their actual function has not been clarified yet. The *Neosoikos* of Siteia cannot be accurately dated. However, it is believed that it belonged to the Hellenistic period. The slipway of Sounion, with which it shares many common features, have been dated to this period. This dating also fits to the need of the Cretan coastal cities for further

protection from the scourge of piracy.

It was believed that the slipway belonged to the city of Siteia, situated, where modern Siteia lies. (K. Davaras, 1967, 90). However, excavations conducted at the top the the peninsula of the slipway that started 3 years ago, unearthed a Hellenistic settlement. This fact may be another indication that the Neosoikos belonged to this period.

F. The Hellenic/Roman Harbour of Matala

Matalon or Matallon was an ancient Cretan city situated at the central part of the southern coastline of Crete, on the south side of Messara plain. Here, exists a landlocked natural harbour surrounded by cliffs -a typical- landscape of the south Cretan coastline. (Fig.33a). A. Evans stressed that Matala was used as a natural harbour during all years. (A. Evans, 1928, II, 87). S. Spanakis and E. Hadjidaki stress that the harbour was used in Minoan times as the port-town of Phaestos. (S. Spanakis, 1982, I, 393; E. Hadjidaki, 1984, 13). However the total lack of Minoan remains or even potsherds makes this hypothesis problematic. (H. Frost, 1963, 112).

In the Hellenistic times according to Polybius (Polybius, IV, 35), Matala served as the harbour of Phaestos. In Roman times the harbour became the military port of the Roman capital Gortyna. (Strabo, X, 4, 11; D. Evans, 1928, II, 87).

The remains of a probably collonaded jetty have been found in the middle of the bay. On the south-eastern part of the bay, the soft rock is carved forming a Neosoikos - slipway -various flights of steps (leading into the sea), storerooms etc. On the hill at the south eastern point of the bay, great quantity of sherds as well as long parts of walls seem to be an indication of the existence of a settlement during Hellenistic and Roman times. On the other side of the bay, the soft cliffs have been honeycombed by caves. Today some of them are found 2m. under water. (Fig.34) This is a clear indication that subsidence here

must have been greater than 2m. since the time of the caves' construction. The time of their construction though is in dispute. The change of relative sea-level here, still remains a mystery. Although subsidence of the aforementioned caves is somewhat greater than 2m. Faure reported that he saw walls partly buried by sand, and great quantities of sherds of jars, about 7m. under the water in the middle of the bay. (P. Faure, 1973, 44). The sequence of subsidence in Matala is still unclarified. However, Matala is situated on a different crustal block than that of western Crete. (P. Pirazzoli, 1988, 172).

G. The Neosoikos at Matala

On the south-eastern corner of the Matala bay, a recess hewn out of the soft sandstone-limestone rock exists, protected from the prevailing south-westerly wind. The recess has a north-south direction. The south side runs into the steeply sloping hillside. As D. Blackman informs us, the cutting undoubtedly was a Neosoikos first identified in 1970 by J. Shaw. (D. Blackman, 1971, 14).

The west wall of the cutting is preserved to a length of 38m., its width is a regular 5.58m. at ground level and the floor slopes towards the sea with a gradient of just under 12°. The dimension of the Neosoikos -translated in English as *shipshed* or *slipway*- clearly indicate that it was constructed to protect a warship, probably a guard ship, against pirates. (D. Blackman, 1971, 18). D. Blackman informs us that this ship must have been round about 35m. long, since there must have been a clear space at the top of the slipway and a wooden device for hauling the ship. The sides of the slipway rise 12m. on the west side and 10m. on the east side. No recesses suggesting the existence of supporting timbers of a roof are apparent. These constructions however, were always roofed in antiquity, in order to keep the vessel safe, especially in winter.

Among many recesses hewn out of the rock, a side chamber cut in the slip's east wall was apparently used as a storeroom.

The slipway of Matala along with the one from Siteia are the only such features found in Crete. In comparison with the Siteia one, it is slightly longer and wider and has a shallower gradient. The slip of the Siteia is 30m. long, 5.50m. wide and has a gradient of $15^{\circ}30'$. (K. Davaras, 1961, 84-90).

Since it is not possible to date the Matala slip from datable structures found nearby we are compelled to accept any date from the classical period to Roman times.

When D. Blackman surveyed the slip, part of it had been incorporated into a house. Matala has changed dramatically in the last decade and today a restaurant occupies part of the Neosoikos (Fig.35).

H. Itanos

The ancient city of Itanos is situated on the east coastline of Crete, a short distance south of the north-eastern tip of the island, (cape Samonion, modern Sideros).

The date of its founding is unknown although Evans saw here a Minoan settlement of L.M. period. The first historical reference to its existence we find in Herodotus who relates that the Therans after a severe drought of 7 years found Itanian Corovios, a Murex fisher to lead them to Libya and establish a colony there. The Theran colonists under the leadership of Corovios founded the city of Cyrene. (Herodotus, IV, 151). The story seems to have a historical foundation if we consider the close ties of the eastern coastal cities of Crete with the Near East and Egypt. The establishment of Cyrene is dated to about 630 BC. It is interesting to note that the reference to Itanos visited by the Therans in search of a pilot, indicates its important maritime position and the excellence of her citizens as seamen.

The ancient city was first identified by the Italian archeologist F.Halbher and was excavated by French archaeologists at the beginning of this century. (J. Demargne, 1900, 222-246; 1904, 299-428). The second wave of

excavation by the French School were initiated in 1950 and yielded remains and artifacts of Minoan, early geometric and Hellenistic periods. (J. Deshayes, 1951, 201-209).

Historical Itanos was autonomous and was one of the most important and rich cities of eastern Crete. Along with Praissos and Hierapytna, it shared control at the whole region, and for some years dominated the eastern coasts of Crete, from cape Samonion to Erythraion - modern Goudouras. Thanks to its favourable position, it became an important port for foreign trade, having commercial ties with cities in the Near East and Egypt. (N. Papadakis, 1983, 39; S. Spanakis, I, 1982, 283). Spiridakis supporting this fact stresses that "a certain eastern orientation must have been therefor, quite important in its history and manner of life". (S. Spiridakis, 1970, 3). The main exports of the city, were sea-products such as "royal purple" and sponges. But also exported glassware. (N. Papadakis, 1983, 39).

The city's excellent strategic position resulted in the creation of a maritime base by the Ptolemeis of Egypt in the Hellenistic times, in an effort to establish and maintain a hegemony in the Aegean. In the book "Ptolemaic Itanos and Hellenistic Crete" S. Spiridakis informs us that they made the city into their "protectorate", since Crete had become an important source for recruitment of mercenary forces.

The city must have flourished under Roman dominion, considering its position on the route between Alexandria and Rome, as well as its good anchorages, which were protected from the prevailing north-westerly winds. This view is also supported by Spratt. (T. Spratt, 1865, 196). Itanos definitely reached a peak in the Christian era, judging by the 2 Basilicas built here.

The ancient city was built on a hill's slopes overlooking two small bays. On the southern slope, the ruins are literally falling into the sea. Thus, a portion of the city is found today underwater.

Itanos shows signs of continuous habitation until the middle ages, when final destruction and abandonment of the

city came about, due to a combination of Arab raids in the 9th c AD and earlier earthquakes, which may be the reason for the subsidence of the place.

The harbour of the once rich trading centre and military base must undoubtedly be under water (S. Spiridakis 1970, 10), given the subsidence of the area which is estimated in 2,2 m. (T. Spratt, 1865, 193 - 94; P. Pirazzoli, 1988, 174). Although the northern bay seems convenient for an anchorage, a field survey of the coast as well as under water investigation by the author revealed nothing. However, another third bay about 300m. northwards, (Fig.36, 37) revealed traces of walls and quarries in close proximity to the sandy coast. Particularly, traces of neatly cut and fit walls of porous stones are seen to protrude from the bushy terrain of the overlooking slope, with a direction towards the bay. About 27m. away from the water's edge, the wall is covered again under sand. Also, in a natural outcrop close by, signs of stone quarrying are apparent. An underwater investigation in this bay, revealed also nothing. Could these remains of walls belong to works of the harbour installations of Itanos? An excavation at the spot might shed some light on the question.

IIX. Roman Crete (67 B.C. - 100 A.D.)

After the subjugation of Crete by the Romans, the island became a senatorial province, united with Cyrene. During the Roman period, peace finally returned, bringing with it prosperity. Such was the tranquility of the Cretan cities that the Roman governor usually played only a judicial role. (I. Sanders, 1982, 7). "Crete entered a period of prosperity such as it had not known since the palmy days of L.M.I". (J. Pendlebury, 1939, 365).

The settlement pattern in Roman times changed. During periods of warfare, it was much safer to live in an urban centre. In the Roman period where peace prevailed, farmsteads were created outside the city frontiers. As was natural, many sites especially coastal ones were resettled again for the first time since the Bronze Age. The danger from piracy was over. Some coastal sites though, either declined like Ayia Pelagia, (I. Sanders, 1982, 31) or were destroyed by the Romans perhaps like Phalasarna (E. Hadjidaki, 1984), probably indicating their end as pirate bases.

The capital of the new joint province of Cyrene and Crete was Gortyna, situated on the eastern part of Messara plain in south-central Crete. It was the cultural centre of the island and developed into the most populous city, ornamented with many fine public buildings. (D. Tsougarakis, 1981, 302; J. Younger, 1971, 3). The Roman capital had an immediate outlet to the Lybian Sea, having Matala as its main port-town, but could also use Lassaia and Leben for the same purpose.

A wealth of foreign artifacts excavated at various sites of this period, are proof that extensive trade took place with the Greek mainland, Asia Minor, Egypt, Cyprus, Italy and also with the Aegean islands. These imports consisted either of luxury goods, raw materials or specialized items. Agricultural products were the only Cretan exports, while imports surpassed exports. (D. Tsougarakis, 1987, 320). Manufactured products were almost entirely for local demand. (I. Sanders, 1982, 33).

Following the subjugation of Crete and the clearance of piracy from the Mediterranean, maritime activity became safer than it had ever been before. *Pax Romana* "united" the whole sea, and trade flourished. (F. Meijer, 1986, 187). (Fig.38).

As has been stressed earlier, Crete was in a crucial position, linking East with West and North with South. Thus, the most important trade route, necessarily had to pass by the south coast of Crete. This route originated in Egypt or the Syropalestinian coast, ran via the southern Cretan coastline and terminated in Rome (D. Tsougarakis, 1987, 322; I. Sanders, 1982, 35). Under these circumstances, this trade route became a great source of wealth, fostering the development of rich coastal cities such as Lissos, Suia, Tarrha, Lassaia, Phoenix, Hierapytna and the city on the island Leuke. These cities became exceptionally rich and it has been suggested that the only reason for their wealth, if not their existence, was their favourable location. (D. Tsougarakis, 1987, 322). This statement is of special importance if we take under consideration the fact that most of those cities lack any cultivable lands or that these are at best very limited. Such was the economic importance of cities such as Gortyna and Hierapytna of the southern Cretan coast during the most flourishing period of the Roman occupation, that they replaced Knossos and Kydonia of northern Crete. This route, by being the fastest to the west, was used by all kinds of ships seeking a safe haven and supplies. As a result of this trade route, the southern coastline unfavourable for the construction of harbours, became the coast where the principal harbours for the Roman period existed. The Romans due to their technical advances were able to impose a harbour on any coast that was convenient for commercial, administrative or naval purposes. Natural protection for the creation of a harbour, was not essential any longer and indeed the unfriendly south coast of the island is poor in natural anchorages.

N. Flemming informs us that the Romans, between 100 B.C.

and 100 A.D. were active, refurbishing and expanding almost all harbours constructed in earlier periods and built numerous new ones on previously inaccessible coasts. "This architectural achievement was so complete that almost every old harbour that divers try to survey, is dominated by Roman construction". (N. Flemming, 1978, 172). Greek but especially Roman harbours are relatively easy to follow and understand because their parts are similar to modern structures.

Among the many technical innovations in harbour building brought by the Romans, we can point out the use of hydraulic concrete (appropriate for building under water), arched breakwaters and moles (a feature which controlled water circulation and thus prevented silting), stones bonded by iron keys and the creation of huge rubble breakwaters, to name a few. All these innovations involved a high level of sophistication. Extensive building of lighthouses also took place. (N. Flemming, 1978, 172). On the peak of Leuke island -modern Kouphonisi- as well as on Palaikastro, large seated statues were found, that were believed to have belonged to the Ptolemies. Sanders informs us that if they are compared to the statue of Porto Raphti, they then seem to be lighthouses as the latter indeed is, or beacons "based on a statue of the *oikoumene*, and that there was a chain of these guiding lights down this coast, for the benefit of the trade route from the East". (I. Sanders, 1982, 17).

The possibility of the employment of wood for the construction of specific harbour features in Crete - where timber was abundant - is indeed tempting. Evidence for the use of wood we have from the excavations of Caesarea Maritima on the coasts of Israel, where wood elsewhere was extensively used in harbourworks, (J. Oleson, 1988, 147-157), from the fresco of Puteoli, depicting wooden jetties, and the excavation of the Londinium waterfront. (R. Yorke and D. Davidson, 1985, 157-164).

Nevertheless, as G. Rickman stresses, Roman harbours should not be studied just as structures but related to the

purposes they served. They must be approached consequently, as units of a network of ports, fulfilling a commercial, administrative or naval function in the Roman world.

Acta Apostolorum description of St. Paul's voyage from Ceasarea to Puteoli at the beginning of the 2nd. c. A.D. is one of the best accounts of a sea journey available to us. It refers to the seafaring conditions on the south-east coast of Crete. Due to the strong opposing wind to the ship's north north-westerly direction, the captain was forced into the fine harbour of Phoenix, instead of passing the winter in Kaloi Loimenes. (F. Meijer, 1986, 229; D. Tsougarakis, 1987, 322; I. Sanders, 1982, 35).

Dr. G. Rickman informs us that a common size for a seagoing merchantman was round about 300 to 400 tons. Especially for the vital grain route from Alexandria to Rome, some freighters may have had a capacity of over 1,000 tons each. (G. Rickman, 1985, 108). Accordingly, the consensus of modern scholars emphasize the need for massive port constructions during the Roman period. Given these facts, I personally believe that under the sand and soil of the south Cretan coast, large harbour installations with safe anchorages are hidden. Facilities and machinery for loading and unloading, resuppling, storage, repair as well as entertainment and boarding of the crews, must all have been available. However, the facts that in all periods small vessels coexisted along with large ones and the discovery in Crete of medium size Roman harbours, lead us to the conclusion of Dr. Rickman concerning trade in Roman times, namely that "short haul, middle range and long distance trade all existed side by side, ebbing and flowing in response to unpredictable demands, but -and this is the important point- they interlocked and led into each other so as to promote an interdependent vigour". (G. Rickman, 1988,260).

IX. Roman Harbours.

A. Kissamos.

Kissamos is the name of the ancient city, built where modern Kissamos now exists. It is situated 42Km. west from Chania. The city is built in the gulf of Kissamos, protected by two peninsular headlands, those of Spatha on the east and Grambousa on the west.

It is interesting that the modern city bears the ancient name. Pliny refers to the city as "*Cisamon*" (Pliny, 4, 12, 30) and Ptolemy as "*Kisamos polis*". (Ptolemy, 3, 17, 8). Spratt stressed that the city was a naval and commercial centre of western Crete and during Classical and Hellenistic times acted as one of the ports of Polyrrhenia. (T. Spratt, 1865, II, 30-31).

Judging by the fact that the city had the right to mint her own coins, (J. Svoronos, 1890, 55) we suppose that it was an independent state. If we consider the fact that there is an abundance of Roman public buildings, we are forced to suppose that the city flourished during the Roman period. Interesting to note is the fact that even today, water is supplied to the city by the Roman aqueduct. (S. Spanakis, 1982, II, 209). Many ancient remains of Kissamos have been described by Buondelmonti (C. Buondelmonti, 1897, II, 21), Pendlebury (D. Pendlebury, 1939, 350, 39), Savignioni and De Sanctis. (L. Savignioni, V. De Sanctis, 1901, 304).

The harbour of ancient Kissamos lies west of the city, in the area *Mavros Molos* -Black Mole. The English traveller Pococke who visited Crete in 1745, saw along the coast to the west of the harbour, remains of buildings which he attributed as warehouses. (R. Pococke, 1745, II, 245). The site consists of a sandy bay protected from the east by a natural reef, about 200m. long and a breakwater to the west, constructed of large irregular blocks. Today, the whole length of the mole is exposed, and stands high and dry. (Fig.39,40) The uplift of the area has been estimated at 6.5m. (T. Spratt, 1865, II, 30-31; N. Flemming, P. Pirazzoli, 1981, 70; P. Pirazzoli, 1988, 171). In antiquity

this mole must have broken the swell of the westerly blasts, quite effectively. When the level of the water was higher though, the reef at the east end of the bay must have been covered by the sea, thus providing no shelter towards this direction. Nonetheless, the ruins of a rubble jetty and probably a breakwater, is today washed by the sea, about 150 m. far from the mole to the east. This feature in conjunction with the mole must have created ideal conditions for the existence of a safe port in antiquity.

It is important to note that research by the author among the lowest blocks of the mole, revealed substantial pieces of Roman pottery. (Fig.41) Also necks of probably Roman amphorae were found encrusted to the reef (to the east) in a research, below water level. All these in my opinion, are signs of commercial traffic in the ancient harbour.

B. The Harbour wall of ancient Minoa.

Minoa was an ancient town of north-western Crete, which according to Ptolemy, possessed a harbour. (Ptolemy, III, 317). The site of the ancient town was first identified by Pasley on the southern part of cape Akrotiri at the entrance of Souda bay -the best natural harbour of the island -opposite the islet of Marathi. Pasley taking into consideration the writings of Ptolomy, Strabo and Stadiasmus, deduced Minoa's location and supported the view that it acted as the harbour-town to Aptera (which is located on the opposite side of the gulf). (R. Pasley, I, 1837, 42-53). The site favours the existence of an ancient port. However, the islet of Marathi must not have protected the port considerably in antiquity, since it would have been probably submerged, given that the uplift in the area is 1.5m. (N. Flemming, N. Czartoryska, P. Hunter, 1973, 63).

Excavations conducted here by the ephor of Antiquities of western Crete, the then, B.Theophanides in 1939, revealed the remains of a Roman city built upon a previous one, probably Hellenistic. The most important discovery is that

of a wharf which was found about 2m. inland from the present water's edge (another proof of the uplift of this site in antiquity). (B. Theofanidis, 1950-51, 1-13). This was preserved at a height of about .60m. and in a length of about 60m. The director of the excavation informs us that it was built in the centre by a line of only two large blocks of 1 to 1.50m. and at both its ends by lime and pebbles. B. Theophanides dated the construction at the Roman period. Nothing can be seen today of the Roman wharf, for it has been destroyed for the sake of constructing a modern harbour for fishing.

C. Lissos

Lissos -referred to by Ptolemy- (Ptolemy, III, 17) is situated on the west side of Crete's southern coast. It was a small maritime city built on a coastal valley surrounded by mountains. (Fig.42). A footpath has always passed through a wonderful gorge taking one in an hour from Suia to Lissos. According to Stadiasmus Lissos possessed a harbour. The inhabitants of the coastal city earned their living by fishing and trade. Lissos flourished mainly during the Doric and Roman times. (I. Sanders, 1982, 30). It may be possible that this is another harbour-town of south Crete that flourished through the traffic of Roman ships from Rome to the north coast of Africa and vice versa. A source of considerable wealth was undoubtedly the sanctuary of Asklipeios and its medicinal spring, judging from the wealth of statues discovered there. This was excavated between 1957 and 1960 by N. Platon. (N. Platon, 1957, 336-338 ; 1959 , 376-378).

According to Spanakis, Lissos was one of the port towns of ancient Elyros. (S. Spanakis, 1982, II, 247). Its location was first identified by Pashley, (R. Pashley, 1837, II, 87-97). Ruins of the city -many of which are still identified today- have been described in the past by Pashley, Spratt, (T. Spratt, 1865, 240-242), Savignioni De Sanctis. (L. Savignioni, V. De Sanctis, 1901, 448-460).

Lissos in the Hellenistic times, in order to

counterbalance strife and insecurity prevailing at the time, partook in the formation of the political league of the *Oreioi* -mountainous-. This, apart from Lissos included Tarrha, Poikilasion, Elyros and Hyrtakina. (S. Spanakis, 1982, 247; L. Nixon et.al., 1989, 207).

Today, the city is deserted, and nothing has been built in the site after the Byzantine times.

The cliffs surrounding the cove offer a good shelter from the winds. However, the relative level of the sea in antiquity was much higher than today, creating thus ideal conditions for the existence of a port, since the coast would be further inland, accordingly protected from the western winds. Uplift here seems to be between 6 and 7 metres, judging from the marks on the cliffs of the shore. Features of the city's ancient harbour had very kindly been pointed out to me by E. Hadjidaki, curator of the Chania museum.

In a distance of about 100m, from the shore, inland, a wall parallel to the shore can be traced, built of irregular blocks of limestone, starting from the west-end of the valley. This is about 107m. long. At the very end of it, west and towards its western end, it was exceeding 2m. in height. Interesting to note is the fact that roughly in the middle of the wall's height, the ancient mark of the sea-level exists. Below the line, the long-lasting presence of the sea has fused the architectural blocks. (Fig.43). Some metres further to the east, a rectangular recess has been found, carefully built on the wall, clearly indicating to me the end of a sewer, emptying its contents in the harbour basin. (fig.44). Some metres further to the east, the wall fused here, is bisected probably by the action of an earthquake. Through this gap, the water of a small river passes in winter, to end up in the sea, further down. Another interesting feature of the site presents the remains of another wall built in the same manner with the aforementioned one, running vertically 90m. from its western end. (fig.45). All these features are clear indications to me that they are parts of the ancient

harbour. Today, the small plain is covered by wild growth and carob trees. Also, various architectural members and immense quantities of sherds are found all over the place.

About 40m. away from the shore stand the remains of a rectangular building, the walls of which are preserved in many courses. It was built guarding the entrance to the sea, at an elevation that would have brought it clearly above water level. The building was referred to me by a native worker as "*To Teloneion*". That is a Customs' house. Indeed, the probability is tempting. I strongly believe that an excavation here is necessary, since it will answer questions concerning the nature of the harbour, its date and the general relation of the city to the sea, during the periods of its existence.

D. The Harbour-Town of Ancient Syia.

Souia today is a small tourist town, but in antiquity it was a maritime city. Its ancient name was "Syia". (S. Spanakis, 1982, 356). Strabo refers to it as "Siva". The city is situated in the largest coastal plain and bay of southern Crete. The plain and a gorge at its northern side are crossed by a stream, the "Lakkos tou Zographou" which separated the ancient city into two parts. The major parts of the city's remains have been described in the past by Pashley (R. Pashley, II, 1837, 98-102), Spratt, (T. Spratt, 1865, II, 240-242), Savignoni, De Sanctis (L. Savignoni, V. De Sactis, 1901, 167-172) and others.

Stephanos Byzantios informs us that Syia was the port-town of Elyros. In antiquity it possessed a good harbour, as is revealed by the anonymous writer of Stadiasmus. The city reached its peak during Roman times. (I. Sanders, 1982, 24). The basic source of its prosperity must have been its harbour and the services offered to the ships and their crews, cruising the south coast of Crete, on their way to Rome or to the northern coast of Africa. (S. Markulaki, 1982, 81)

Today, nothing is to be seen of the city's ancient port and there is no real shelter for shipping. Its

"disappearance" can be explained effectively, considering the land's upheaval, estimated here at about 6,6 m. above modern sea-level. (fig.45a). (T. Spratt, II, 240 ; P. Pirazzoli, 1988, 171). Thus, estimates of this uplift bring the harbour installations under the sandy and pebbly coast. A line of remains running parallel to the shore have been attributed by Spratt (T. Spratt, II, 240) to a sort of an embankment or mole. This, unfortunately can not be seen today.

S. Markulaki believes that the harbour-town owes much of its prosperity to the exportation of timber that was abundant in antiquity. (S Markulaki, 1982, 81). Judging from the splendidly adorned Basilicas discovered at the town, one suggests that the city retained its prosperity until the first Christian era. The town was re-enhabited in our century.

E. Tarrha

Tarrha is the ancient name of a small maritime city located at the outlet of the Samaria gorge in the Libyan Sea. The first person to identify its location was Pashley in 1837. (R. Pashley, 1837, 263-4). Today, the fishing village -developing into a tourist place- of Ayia Roumeli is built exactly where the ancient city was erected. That is, mainly on the eastern side of the little river that passes through the gorge and upon a hill. The sight of the village today is of exceptional beauty.

The ancient city although a small one, must have been independent, judging from coins discovered, belonging to the city. (J. Svoronos, 1890, 321). Its ruins have been described mainly by Buondelmonti, (C. Buondelmonti, 1735, 85), Pashley and Spratt. (T. Spratt, 1865, II, 248). Stadiasmus of the 6th c. or later gives its location, being 60 stades from Phoenix. Even today remains of various ancient buildings are seen, preserved to a considerable degree, as well as lines of fortification. Tarrha was famous in antiquity thanks to its oracle and temple of Apollo. M. Guarducci outlines the cult of Apollo and the

history of the city. (M. Guarducci, 1939, 305-6).

G. Weinberg stresses that although Tarrha participated in the league of the Oreoi of c. 250 B.C. (S. Spyridakis, 1970, 26) and later belonged to the coalition of Cretan cities which signed a treaty with Eumenis II of Pergamon in 183 B.C.; it was not a strong city politically and it was always dependent on the sea, since even to our days it is still completely cut off from land communication. (G. Weinberg, 1960, 100). However, the team of L. Nixon which has conducted surveys for the last two summers in the area, stress that Tarrha is the only place of the eparchy of Sphakia that yielded archaic material. (L. Nixon, et.al., 1989, 207).

Today, the gulf of Ayia Rumeli is not one of the safest on this part of the coast. Landing facilities had to be much safer however, when the harbour of the ancient city was in use. Effective protection from the prevailing winds may have been offered. Tarrha, "must have been a regular stopping place on the route from Alexandria to European ports". (G. Weinberg, 1960, 91). The city must have depended upon sea trade heavily, judging by the fact that no cultivatable land is available to the city as well as that the city was not connected with any other by land.

The harbour that Buondelmonti entered in 1415 must be today buried under the pebbly beach, if we consider the uplift of the area, that is estimated at about 4.5m. (P. Pirazzoli, 1989, 170-1).

Another reason for believing that trade was the major source of wealth for the small city, as G. Weinberg proposes, is the fact that its final abandonment does not seem to have been due to conquest, but rather to change in communication routes.

F. The harbour of Hersonisos

The city "*Loimen Hersonisou*" -Hersonisos harbour- lies on the north coast of Crete, situated on the western edge of the Mallia bay, about 25km. east of Herakleion. The rocky promontory jutting into the sea, is between two wide and

sandy beaches being a perfect site for a settlement. Today, the tourist city possesses one of the most important harbours of the whole of Crete, the best between Ayios Nikolaos and Herakleion.

The site has been inhabited since Minoan times judging from the Bronze Age sherds found among the walls of houses. (E. Hadjidakis, 1986, 114). Minoan remains have also been found in Anisara, west of the harbour. (S. Spanakis, 1964, 522-23). In the Classical period, the city was colonized by Dorians of Tyrrhenian origin. (Plutarch, Ethics, Virtus of women, 8). The colonists built the city up and decorated it with public buildings such as temples and theatres, one of the main ones being the temple of Artemis Vritomartis, mentioned by Strabo. Initially Hersonisos was the sea-port of Lyttos, 15km. inland, but later it became an independent state. (Strabo, X, 479, 14). Ruins of this temple have been found nearby. An inscription on a marble stone found there mentions the treaty between Knossians and Gortynians. The city also took part in the treaty of Cretan cities with Eumenis II of Pergamon. Hersonisos, reached its peak during the Roman period, when it became independent, minting its own coins, of which 43 kinds have so far been recorded. (J. Svoronos, 1890, 48; E. Hadjidaki, 1984, 144).

The harbour was constructed on the eastern bay, where today the modern tourist town of Hersonisos lies. L. Mariani in 1896 saw vertical walls along the bay and attributed them to shipsheds and shipyards. (L. Mariani, 1896, VI, 91). Honorio Belli who visited Crete in the 16th c. estimated that the harbour, although partly silted could hold 30 galleys. Today, it is shallow and silted substantially. It has a sandy bottom and much of it lies about 1m. under water, due to the result of a change in sea-level since Roman times. The harbour can be seen in front of the city.

The eastern bay was bonded by massive concrete moles on the east and south, leaving a spacious and safe anchorage almost rectangular in shape, measuring about 270m. long and 150m. wide. (Fig.46) The moles B and C leave an entrance

about 90m. wide and 9m. deep. "The sea moles ABC are tolerably well preserved, and form an impressive monument to Roman harbour engineering". (J. Leatham, S. Hood, 1958-59, 267). From north to south, a sandy beach was adequate for berthing small boats.

The moles were constructed of concrete and rubble. Their width varies between 5.20 to 5.30m. and the length of A and B is about 170m. long and 165m. long respectively. Today, the major part of A and B survive but only small parts of C are still preserved. Moles A and B meet at a sharp angle, which is shattered today. It is believed that at the junction of A and B a lighthouse may have stood in antiquity. (J. Leatham, S. Hood, 1958-9, 267). A set of mooring devices have been noticed along the inward face of the mole A, in the form of stumps of rectangular stone bollards. Two of them are 9m. apart and three others shown in the south section are at intervals of 6.80m. being 1 and 1.50m. in depth, from the surface of the mole, and between 60m and 80m. in width. "Such recesses might have housed wooden steps, or stone bollards or other mooring devices like iron rings; or else they could have held large timbers standing proud of the face of the mole to prevent ships from chafing their sides against it". (J. Leathan, S. Hood, 1958-9, 267).

The moles initially may have stood about a metre or less, above water level. This can be deduced from the level of the bottom of a set of fish-tanks, hewn out of the rock on the north-eastern side of the promontory. These today are found 20cm. below modern sea-level and were initially intended to be more than half a metre underwater.

Lines of scattered rough blocks on the exterior sides of the moles A, B and C appear to be rubble breakwaters of probably an earlier age. Today, they are submerged but a portion of mole A is still seen above water-level.

A quay is traceable for about 60m., running from the south-east to the north-west, in the south-west corner of the harbour. It is constructed of concrete and is about 2.50 to 2.70m. wide. Today, only 30m. of the quay extends

about 65cm. above water level. This means that in Roman times it was half a metre or more higher than the tops of the harbour moles. (J. Leatham, S. Hood, 1958-9, 268). (Fig.47). Remains of mooring arrangements have also been found on the quay.

At the northern end of the harbour, a concrete wall running from the end of the beach into the sea, may have belonged to a Roman pier or jetty.

Harbourworks prior to Roman times can be identified along the shore. They consist of structures built of well dressed square blocks fitted together without cement. Most of these works are found on land on the southern (exterior) part of mole C. The tops of huge blocks measuring over a metre long and half a metre wide, must have belonged to the remains of a sea wall or quay. (J. Leatham, S. Hood, 1958-9, 269). Other constructions of uncertain character can also be seen at various points of the beach. However, since the research of the Leatham and Hood team in 1955, the site has altered considerably. The once small, agricultural and fishing town has evolved into a busy tourist city and architectural parts of the harbourworks have been employed in the construction of various shops and houses. (Fig.48)

G. The harbour of ancient Hierapytna.

Ierapetra is today the most populated town of the Lasithi region with 8,500 inhabitants -in the census of 1981. It is situated on the south east coast, at the narrowest point (from north to south) of Crete.

The origin of the city has been lost through the passage of time and mythology. (Strabo, I, 3, 473). However, a Minoan settlement has been identified in its location. (S. Spanakis, 1982, 274; N. Papadakis, 1986, 13). The geographical location of the city and its name have safely been established through the description of Strabo (Strabo, I, 975), Pliny (Pliny, 4. 12, 59), Ptolemy, (Ptolemy, 3. 15, 3), Stadiasmus (Stadiasmus, 319) and Stephanos Byzantios. (S. Spanakis, 1982, I, 274). The latter informs us that the city was first called "Kyrva" then "Pytna" and

"*Kamiros*" and finally "*Ierapytna*". With this name the city became one of the strongest in Crete throughout antiquity. Although we lack definite information until the 4th c B.C. we do know that its inhabitants were Dorians as opposed to the *Eteocretan* (true, unmixed Cretans), of other eastern Cretan cities, such as *Dragmos*, *Oleros*, *Itanos* and *Praisos*. From the 4th c. onwards *Hierapytna* becomes a leading economic, naval and military power of eastern and later of the whole of Crete. It safeguarded her economic strength and naval and military supremacy with shrewd diplomatic moves, establishing close political and socio-economic relations with Cretan cities and foreign powers. *Hierapytna* reached her climax during the 2nd c. B.C. dominating the eastern coasts from modern *Tsoutsouros*, to the shores of *Siteia*, and through aggressive acts occupied more territory than any other Cretan state. (N. Papadakis, 1986, 13). Testimony of *Hierapytna*'s peak may be the discovery of 44 different coins minted by the city during these centuries. (J. Svoronos, 1890, 183).

Spyridakis stresses that the decline of Cretan piracy in the beginning of the 2nd c. B.C. may be attributed in part "to the antipiratical policy of *Hierapytna* and its collaboration with *Rhodes*". (S. Spyridakis, 1970, 39).

In the war against the Romans (67 - 66 B.C.), *Hierapytna* was the last stronghold of Cretan resistance. Judging from the many public buildings, statues, works of art, inscriptions and coins found in *Hierapytna* from the Roman era, it seems that the city also assumed a major position among Cretan states during this period. It must be stressed though that one of the reasons for *Hierapytna*'s prosperity was its geographical position. The unification of Crete and *Cyrene* into one Roman province, made *Hierapytna* one of the key harbours in the trade route from *Alexandria* to *Rome*. "The city took a cosmopolitan character - being a crossroad almost in the centre of the eastern part of the Roman world, with easy access to *Africa*, the *Near East*, *Greece* and *Italy*". (N. Papadakis, 1986, 18). Under these circumstances, the splendid public building of the

Naumachia and the amphitheatre -features found nowhere else on Cretan soil- but also theatres, temples, public baths, aqueducts, are all testimony to the splendour of Roman Hierapytna.

Of the once busy Hierapytnian harbour nothing remains today. We do know however, through descriptions of travellers, that in antiquity it possessed two basins, thus forming an inner and an outer harbour and another 3rd one, the *Naumachia*.

C. Buondelmonti, a 15th c. traveller who visited Crete in 1415 wrote that he distinguished the harbour basins which however had been silted up and transformed by the peasants into a fertile field. (C. Buondelmonti, 1897, 21).

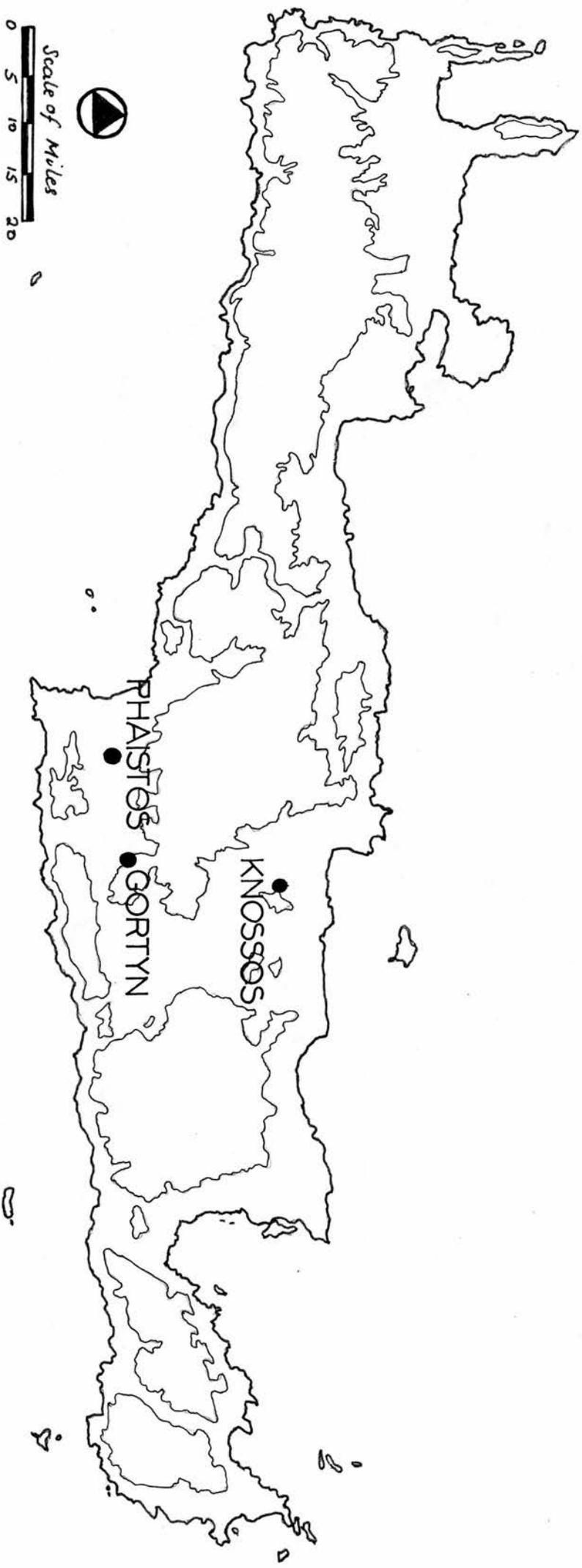
Admiral Spratt who visited Hierapytna in the middle of the 19th c. wrote that the city possessed two harbour basins both of which were silted up, as a result of earthquakes and silting. (T. Spratt, 1865, 255). Spratt relied upon the 16th c. traveller H. Belli. Unfortunately, only a few extracts of the latter's valuable book survive today. He wrote however, that massive foundations of moles or quays could be seen through the town. The western mole was a massive construction. Five or six perforated blocks projecting from its sides are attributed to mooring facilities. He also confirmed that the harbour basins were very solidly built. They provided an arrangement of chains which were opened to friendly ships and closed to enemies. (N. Papadakis, 1986, 40).

N. Papadakis also informs us that the irretrievably lost monument of *Naumachia* was a very rare sight on Greek soil. It was common though in North Africa and Rome. There, mock battles took place for the enjoyment of Roman spectators. The fighting was real and bloody and the galleys' crews were gladiators. A football stadium has been overbuilt upon this curious Roman monument.

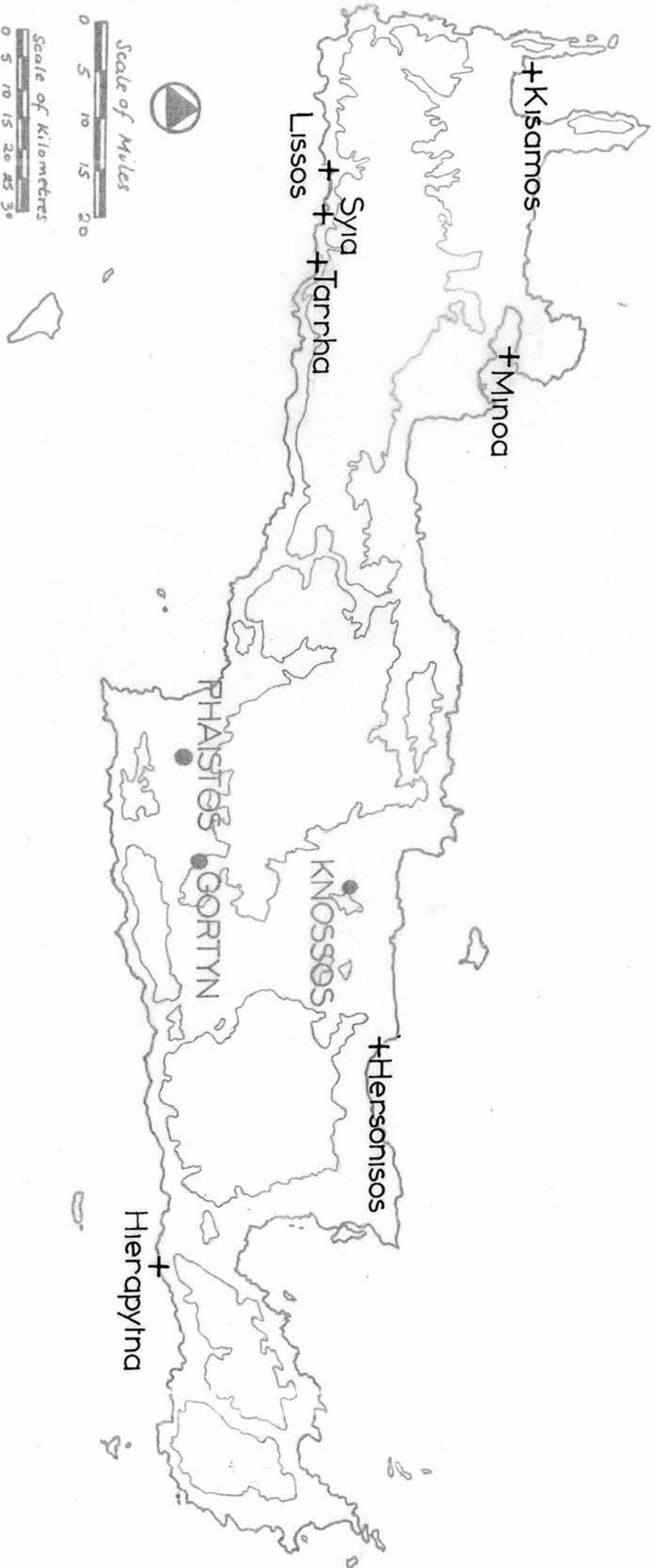


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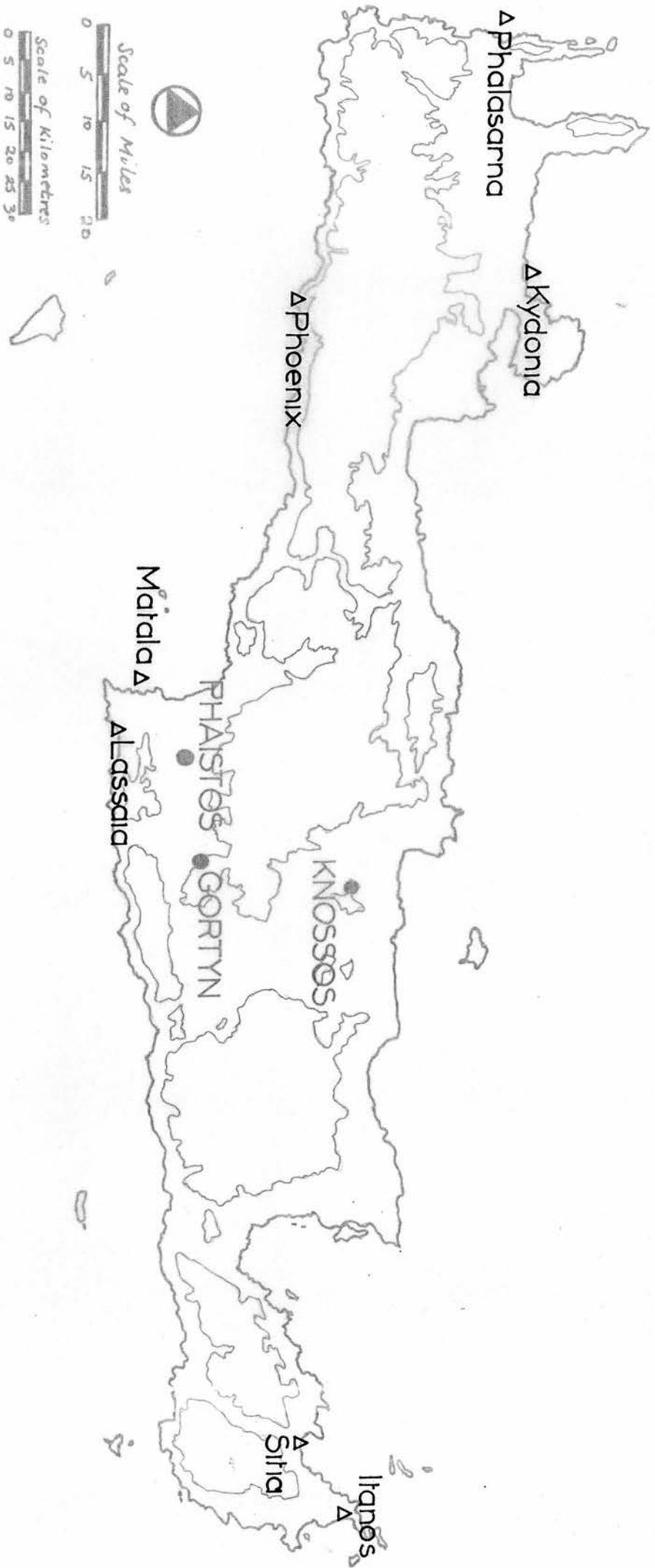
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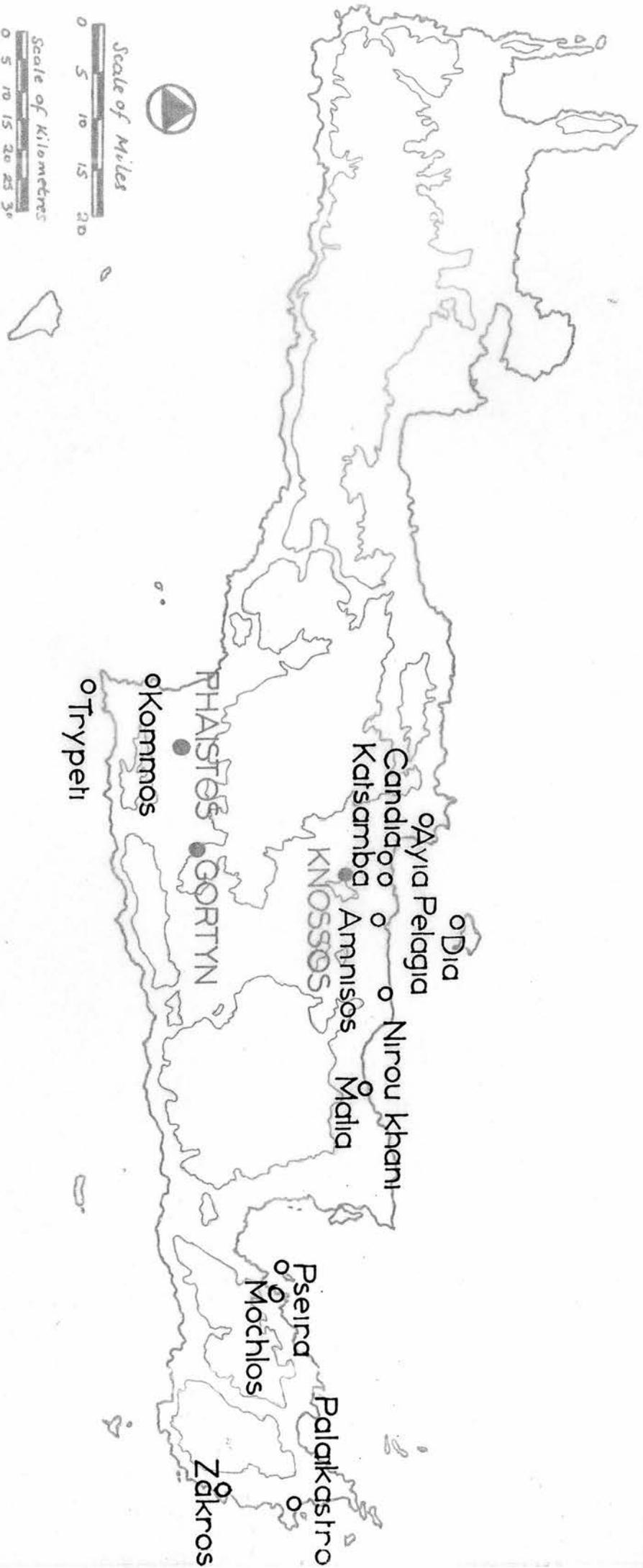
ROMAN HARBOURS



GREEK HARBOURS



BRONZE AGE HARBOURS



X. Conclusions

A combination of the study of ancient sources, epigraphic testimonia, iconographic evidence, the reports of travellers and researchers of previous centuries, the surveys and excavations and finally, research conducted by the author; compose the knowledge we possess of Cretan artificial harbours of antiquity.

Drawing to a conclusion, it is important to note that artificial harbourworks are found on the island of Crete from the first time such constructions were needed - that is in the Bronze Age - right through to our days. Therefore, the first artificial Cretan harbourworks were among the earliest to be found in the whole Mediterranean region. Climatic changes which destroyed all previous natural harbours, and the rise of commerce, must have been the basic reasons that forced the Bronze Age mariners of Crete, to build the first artificial harbours in the 3rd millenium B.C. If the evidence is rightly interpreted, it has been shown that large ships at least up to 30m. long with deep draft did indeed exist in Minoan Crete. These undoubtedly needed adequate harbour installations for their effective protection, loading and unloading, storage facilities, as well as shipyards for the vessels' repairs. Nevertheless, it has been noted, that our knowledge of the ancient Cretan harbours is meagre. This is due to the geological phenomena of subsidence and uplift that have altered considerably the Cretan coastline, thus many ports either under silt and sand, are found underwater, or are buried many metres inland. Another fact that makes our knowledge scant, is the lack of surveys and excavations aimed specifically at harbours. Accordingly, we cannot talk about the internal organization of the harbours but mainly of their geographical and physical setting, that is the configuration of the coast and the prevailing winds in the area, as well as the commercial and strategic importance of the harbour's location.

Cretan harbours of the Bronze Age that we know of so far,

are simple structures taking as much advantage as possible of natural features. These are then in most cases reinforced and extended. Most traces of the Minoan harbourworks that have been discovered are on the northern and eastern coasts of Crete, where coastal settlements and towns were built. This is natural, since the northern and eastern coasts are frequently indented by bays, promontories and dotted by many small islands in close proximity to the coast. Also, Minoan habitation of western Crete was very restricted.

As has been described in the chapter of the Minoan harbours, the main concern of the harbour builders of Bronze Age Crete was the adequate protection of their ships from the prevailing northwesterly winds. These blow throughout Crete between July and September and constitute the major threat to shipping during these months. Minoan harbours were basically built:

1. between an islet and coast, like Amnisos and Kommos. Sometimes a line of strewn boulders united the island with the mainland, affording safe anchorages on either side, according to the direction of the wind. Such constructions so far have been found in Mochlos, Ayia Varvara (Malia).

2. In a bay, usually protected by promontories guarding at least its western side, as appear in the western bay of Mallia, Ayioi Theodoroi, the island of Pseira, Kommos in South Crete and Zakros.

3. On islands at a short distance off the coastline such Dia, Pseira and Leuke. The use of these insular harbours still remains a puzzle. A combination of natural features could also have existed making the port even safer. Anvil-shaped promontories affording ports on each side like the one at Phoenix could have also attracted Minoan settlements.

As far as the distance of Minoan ports to the cities they belonged, are concerned, two distinct types of harbours emerge. Firstly, the ones that are directly connected with a town, like the harbours at Zakros, Malia, Kommos. Secondly, the ones that are indirectly connected to the

town, especially if the coastline close to it is inappropriate for harbour installations. These harbours were connected by a road with the Minoan town. Such a harbour may have been Candia, Amnisos and possibly Ayioi Theodoroi.

Limestone or porous promontories and nearby outcrops provided the stone for the construction or reinforcement of natural features.

Following the eruption of the Thera volcano, along with the destruction of many settlements of the north-eastern Cretan coastline, harbours must also have been destroyed. The Myceneans who continued the trade routes of their Minoan predecessors must have repaired and probably constructed new harbours but as is the case with their vessels, it is impossible to distinguish Minoan from Mycenean works.

From the classical period onwards we have development and extension of Minoan harbours. Technical innovations brought by the Greeks to the island, resulted in the creation of some harbours on the inhospitable southern coastline. However, nothing more can be said about the ports of south Crete since all of them are buried under the soil many metres away from the coast, such as Suia, Tarrha, Lissos, Hierapytna. During these periods appear the design of the double port and the "Loimen Kleistos" type, two of which are also found in Crete, in Phalasarna and Kydonia. These were turbulent periods with pirates ravaging and pillaging coastal cities. This was the major reason for the creation of the "closed" harbours.

The Romans put an end to the piracy, destroying all the pirate's hideouts throughout the Mediterranean. Security and prosperity returned to the island of Crete and coastal cities that had moved inland out of fear of the pirates, returned once again to the coasts.

Within two centuries (1st c. B.C. to 1st c. A.D.) the Romans refurbished and extended almost all pre-existing harbours around the Mediterranean and built hundreds more. Thanks to their tremendous technical innovations and

harbour design, they were able to impose harbours wherever it suited them from a strategic and commercial point of view; regardless of protection from natural features, essential for the creation of a port in preceding civilizations. Therefore, they constructed a number of ports in the harbourless southern Cretan coastline, in order to facilitate their trade route from Rome to the Eastern Empire -on the Syropalestinian coasts and Egypt. They even constructed a Naumachia in the harbour of Hierapytna -a *rara avis* for the Greek world- for their entertainment.

From the evidence we possess so far of Cretan harbours of the aforementioned periods we can infer that they are of varying sizes and fall into two categories:

1. The local; ports dependent upon a local hinterland and accordingly, attracting only small vessels with shallow draft and limited cargo capacity, which in turn visited other local ports.

2. The regional; these were dependent upon a larger hinterland which could be extended almost throughout the whole island. These ports were relatively large and attracted vessels with greater cargo capacities, venturing in the open seas and also sailing at night.

Other mooring and beaching possibilities may have been the construction of wooden quays and jetties as well as the practice of modern Cretans for hanging boats from dead trees branches or metal frames, where the beach was irregular.

I strongly believe that we are just beginning to achieve an understanding of ancient Cretan harbours. Therefore the present study has added rather than answered questions concerning the function, aspects, methods of construction and trade routes of Cretan harbours. I hope that a number of surveys and excavations which are more than necessary, will be conducted in the near future, in order to further elucidate the ports of Crete, before the entire Cretan coastline is built up with massive tourist installations.

XI. Acknowledgements

I am deeply indebted to Dr. Elpida Hadjidaki for her valuable assistance and guidance. She was always available and willing to discuss with me the aspects of my thesis. I must thank Mr. N. Papadakis, ephor of antiquities of eastern Crete for research permission that he eagerly granted me for the sites of eastern Crete. I am grateful to Dr. Veit Sturmer who provided me with yet unpublished material for the sites of Amnisos and Malia. Avner Raban and Kostis Davaras were eager to discuss problems concerning Cretan harbours and share with me their valuable experience. I am also grateful to the Russel Trust Fund, which, by offering me the grant, helped me cover travelling expenses on the island of Crete. I cannot end without thanking Mrs. P. Pyett-Kouzof and my wife L. Black for their valuable help in correcting my English. Last but not least I am grateful to my professors Dr. C. Martin, Dr. R. Prescott and Dr. N. Dixon for their supervision, guidance and patience without which the present thesis would have never come to an end.

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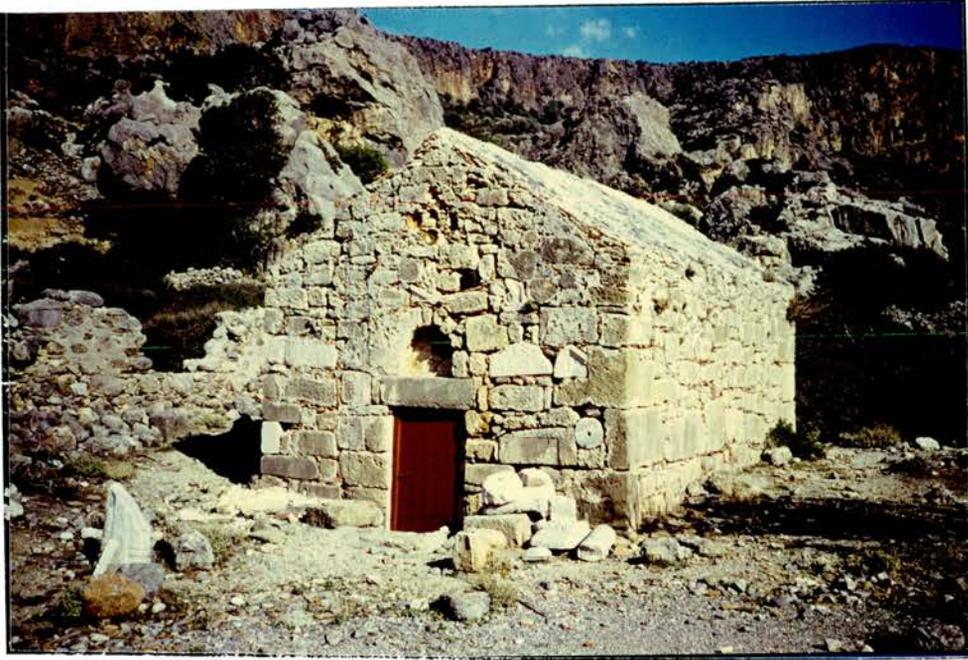
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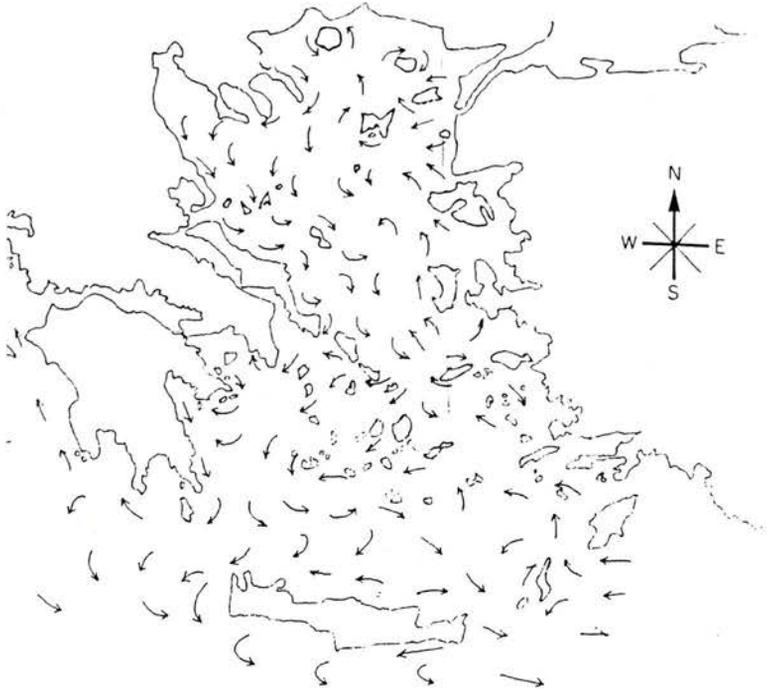
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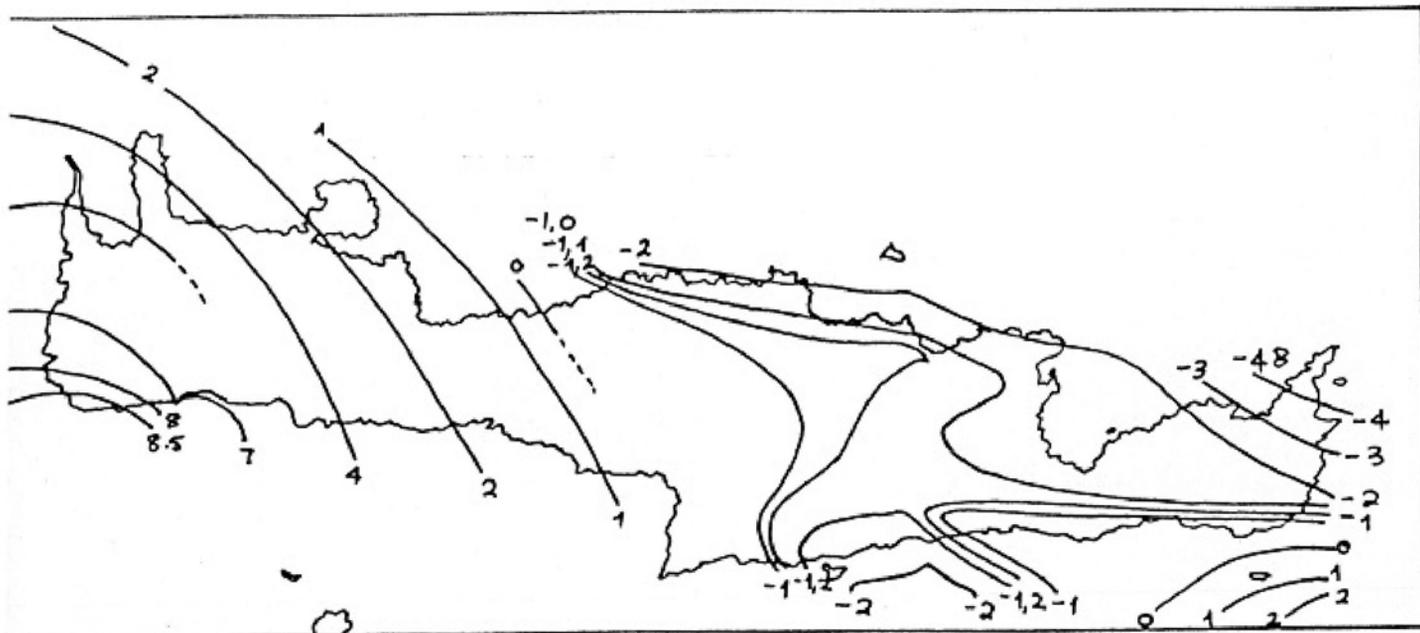
XIII Figures



(Fig.1) A Byzantine chapel at Lissos. It was built with ancient masonry. (photo by author)



(Fig.2) Summer currents in the Aegean. (after McGeehan Liritzis)



(Fig.4) Vertical movements of Crete for the last 2,000 years. (after Flemming)

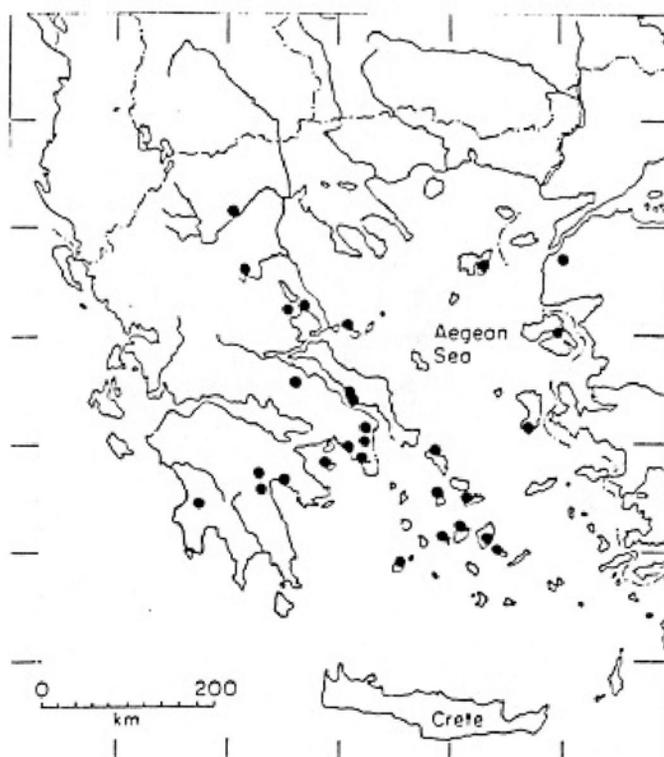
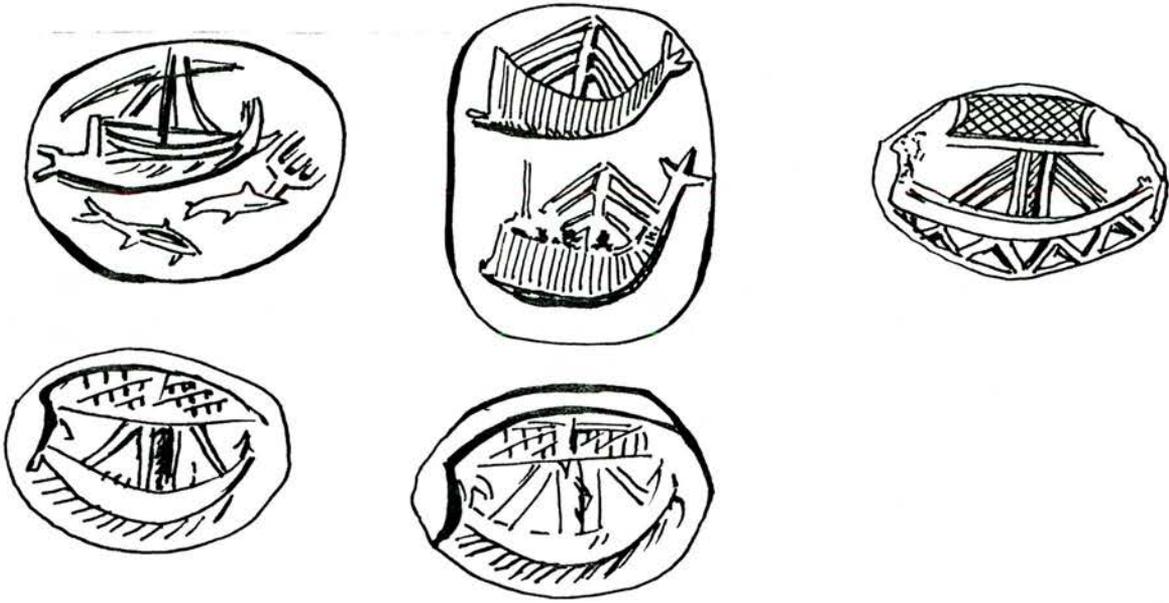


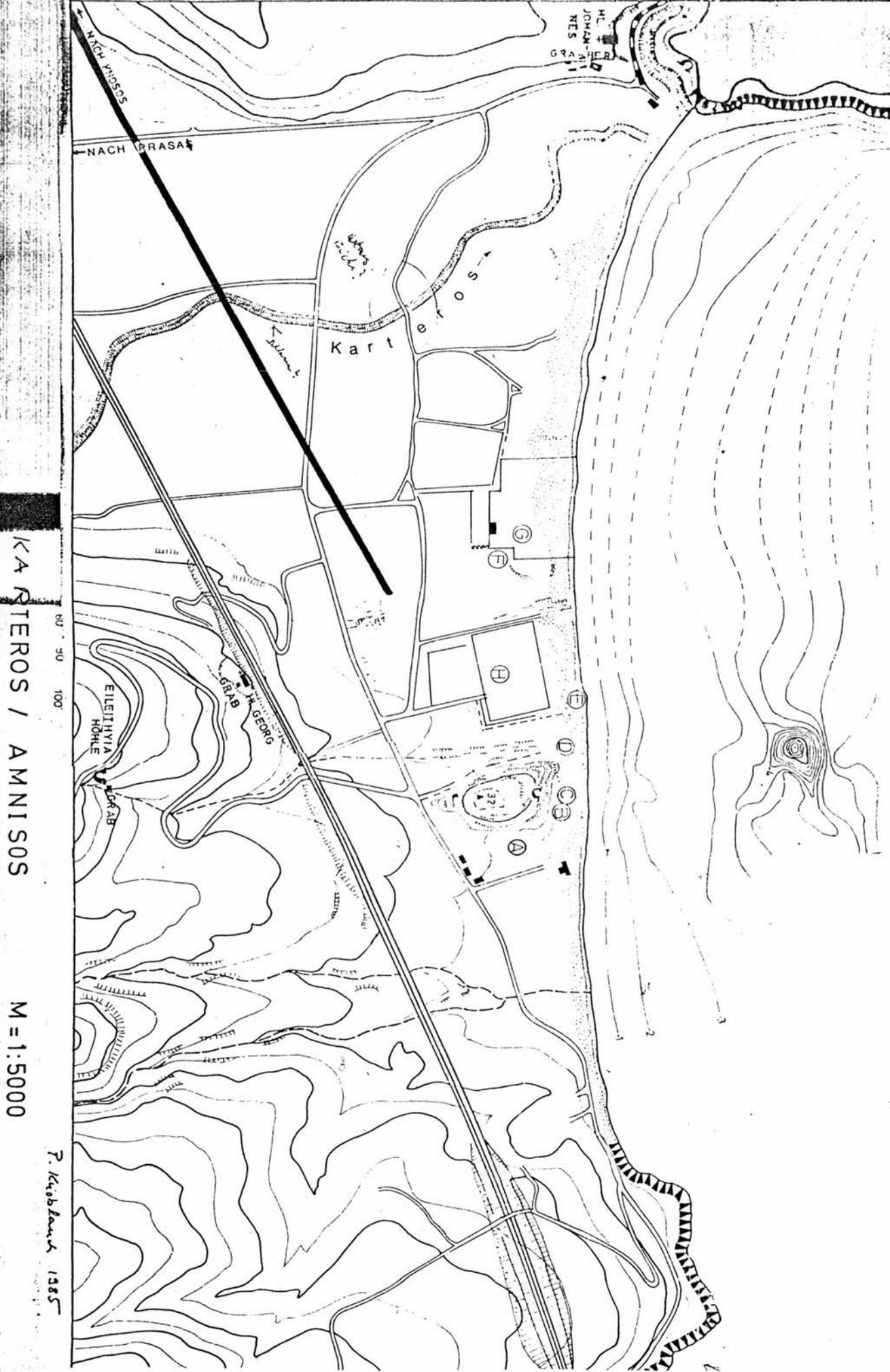
Fig.5) The distribution of fortifications during the third Millenium in the Aegean. (after McGeehan Liritzis)



(Fig.6) Various types of Minoan ships portrayed on gems and seals.



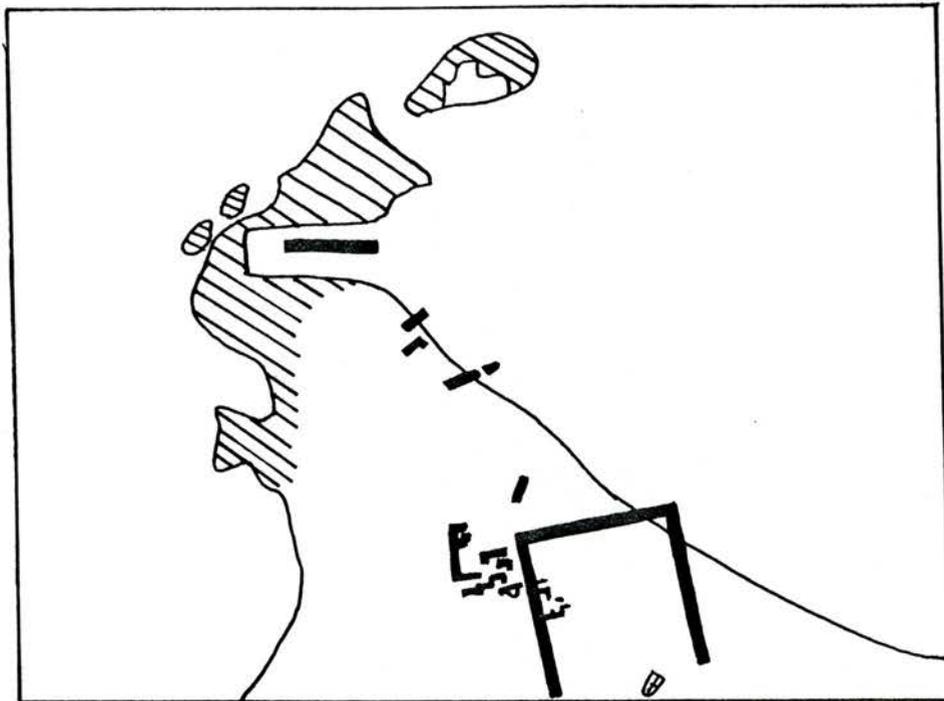
(Fig.7) A boat suspended by a metal frame. (photo by author)



(Fig.7a) A map of Amnisos. (after Sturmer)



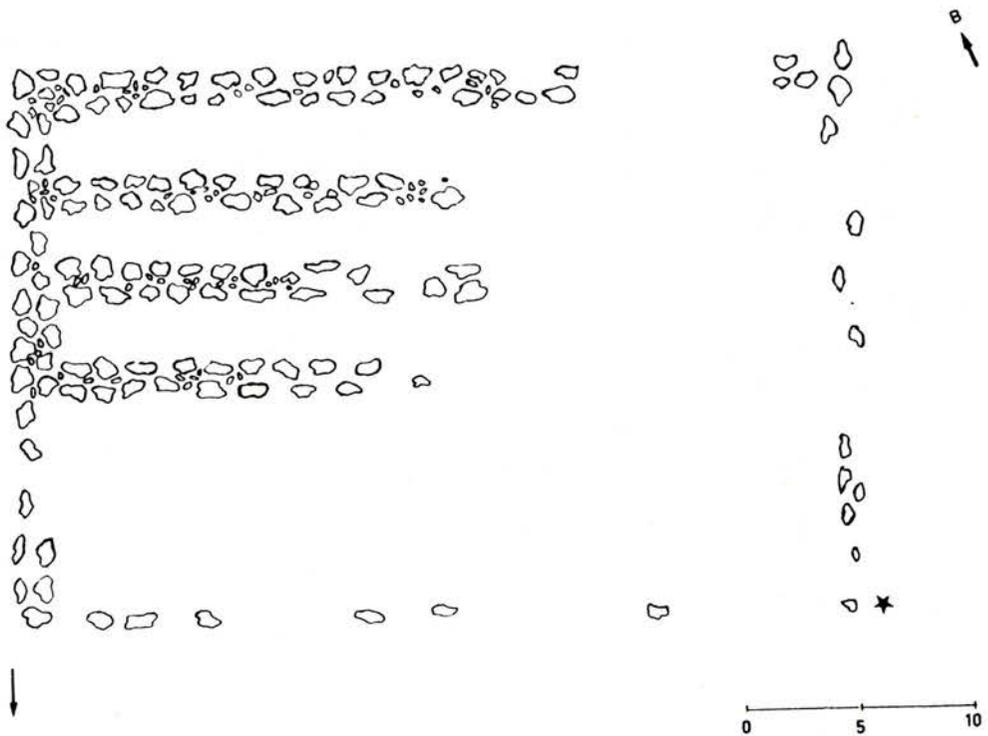
(Fig.8) The north-western corner of the building at Ayioi Theodoroi. (photo by author)



(Fig.9) Features of the coast at Nirou Khani. (after Flemming Pirazzoli)



(Fig.10) The rock-cut recess at Ayioi Theodoroi. (photo by author)



(Fig.11) The building at Malia. (after Guest Papamanoli)



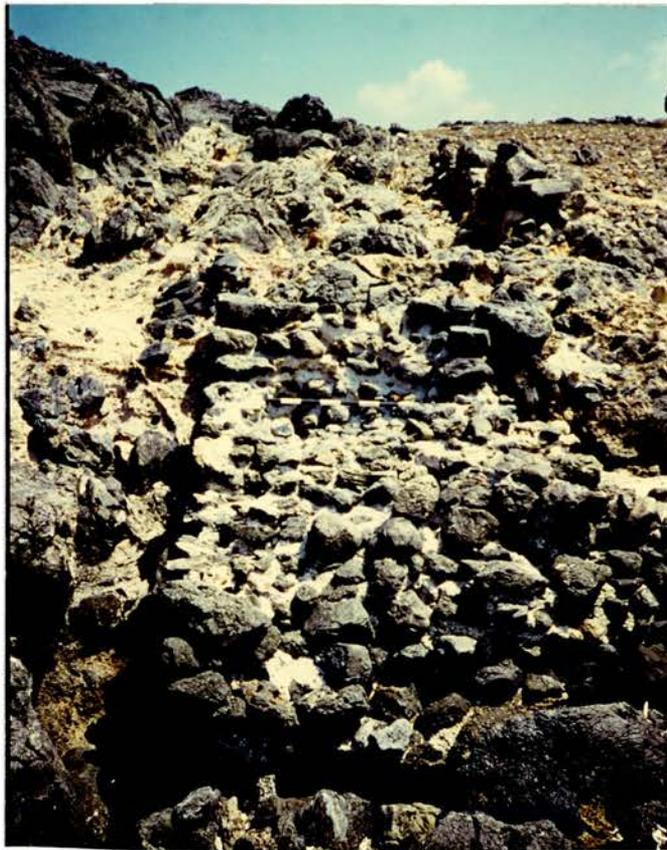
(Fig.12) The final section of the ditch -from the east-
(photo by author)



(Fig.13) The final section of the ditch -from the south-
(photo by author)



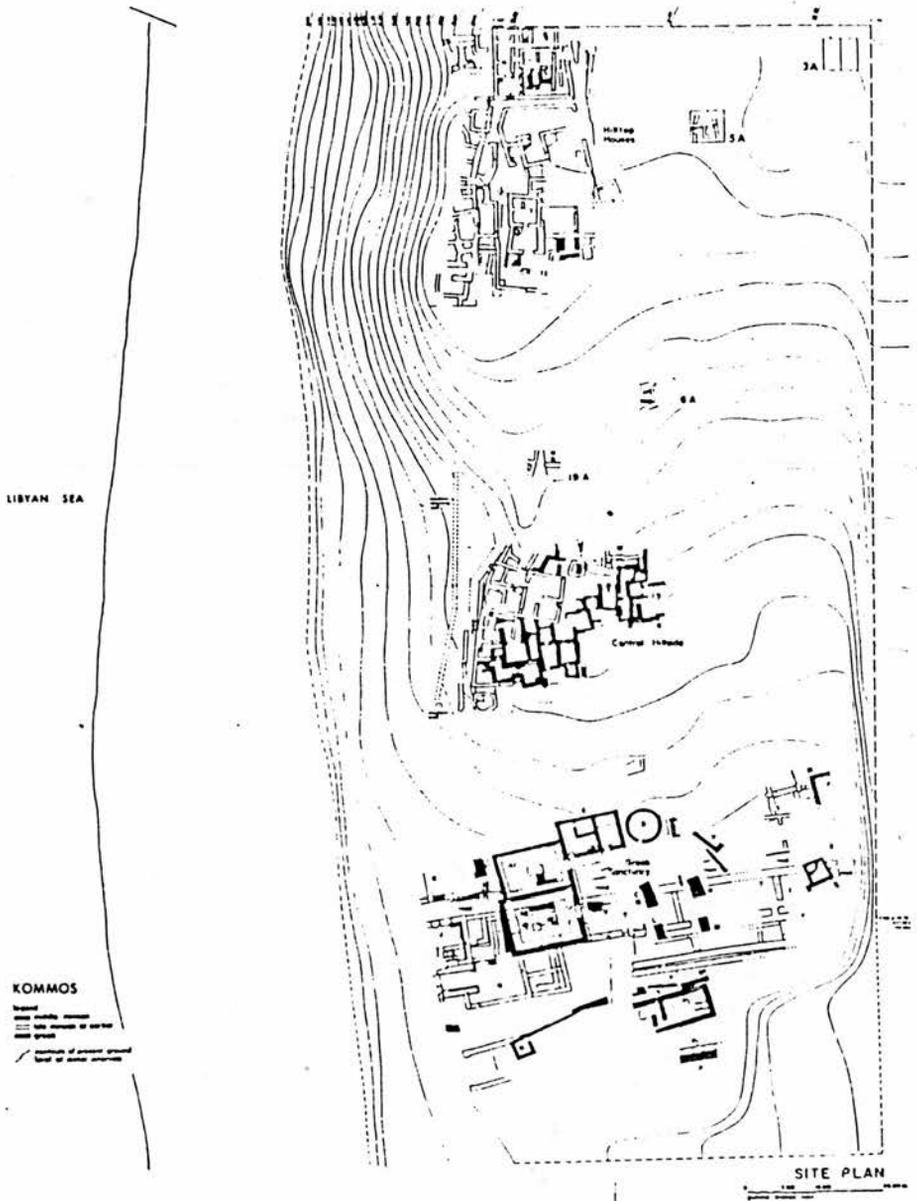
(fig.14) The basin, where the ditch ends, just in front of the sea. (photo by author)



(Fig.15) Constructions in front of the sea. (photo by author)



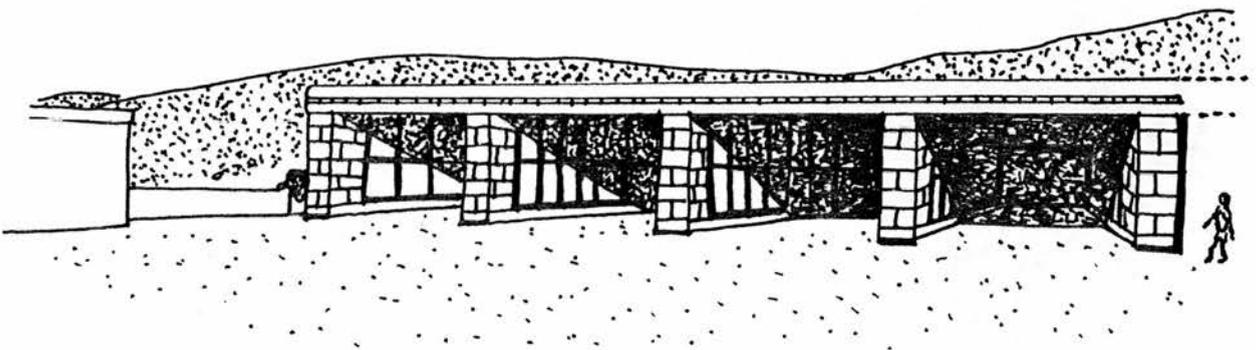
(Fig.16) The bay of Kommos. (photo by author)



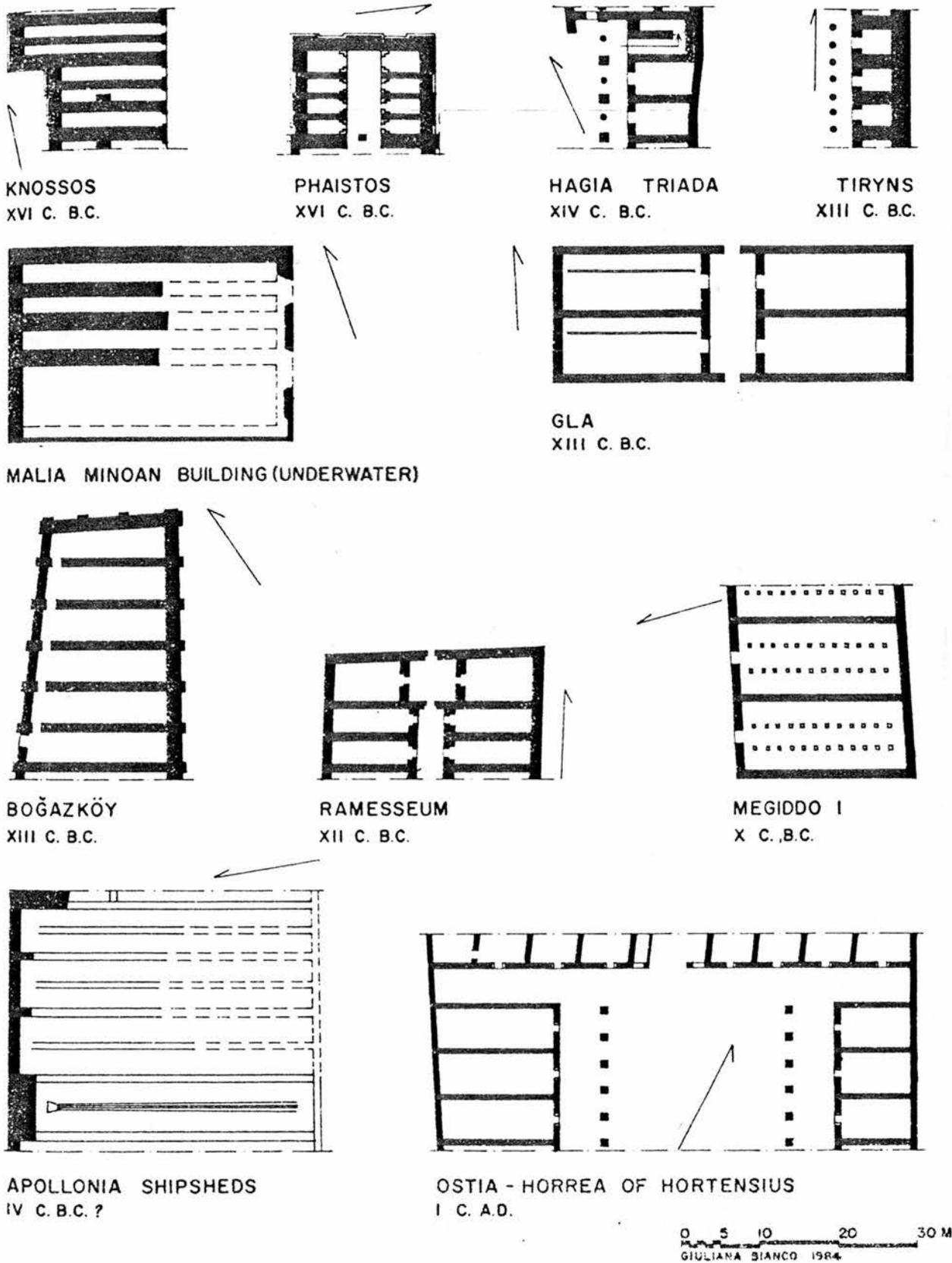
(Fig.17) A site plan of Kommos. (after Shaw)



(Fig.18) A map of southern central Crete. (after Shaw)



(Fig.19) A reconstruction of the galleries. (after M.Shaw)



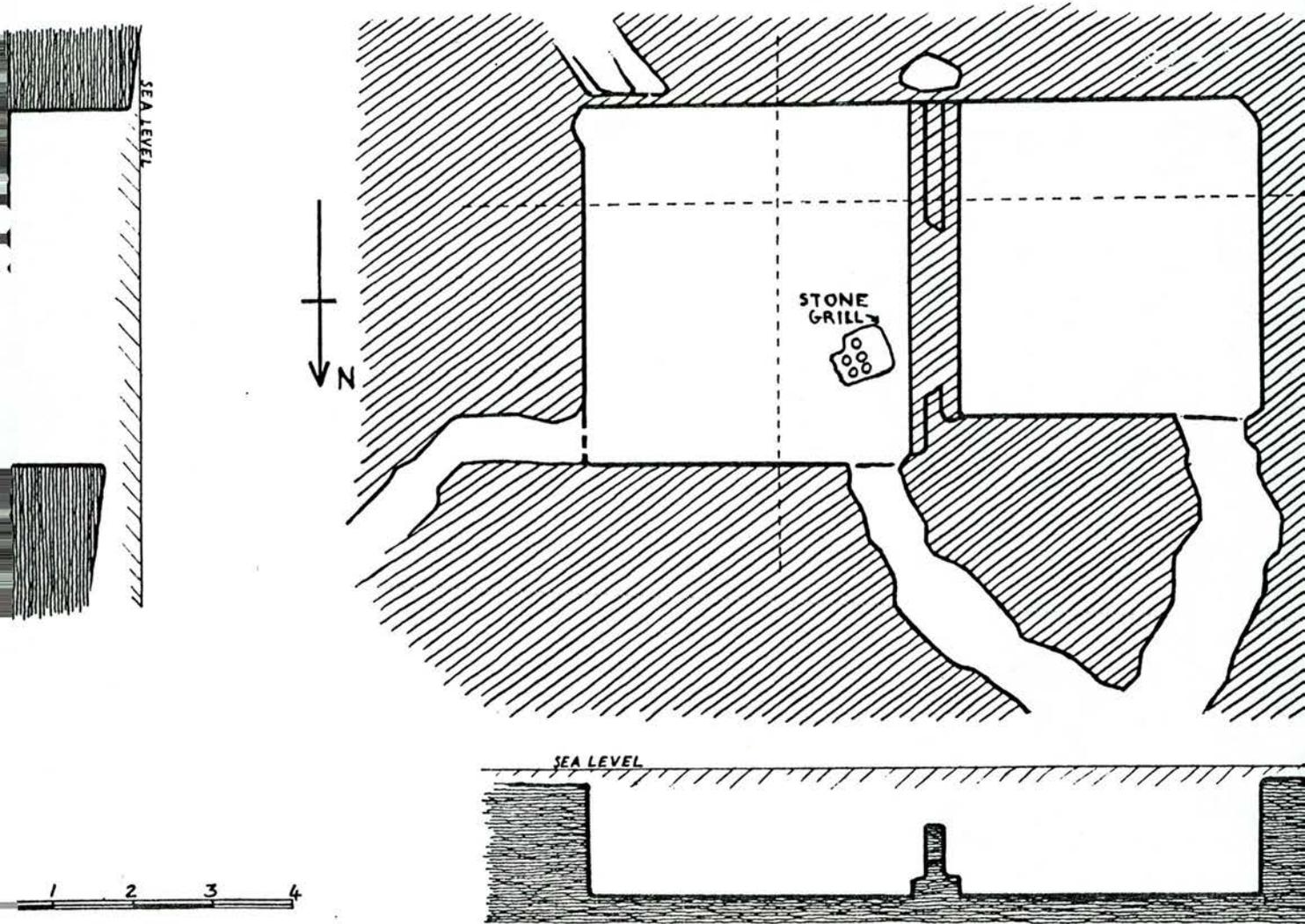
(Fig.20) Plans of various buildings with corridor rooms.
(after Shaw)



(Fig.21) The Bay of Kato Zakro. (photo by author)



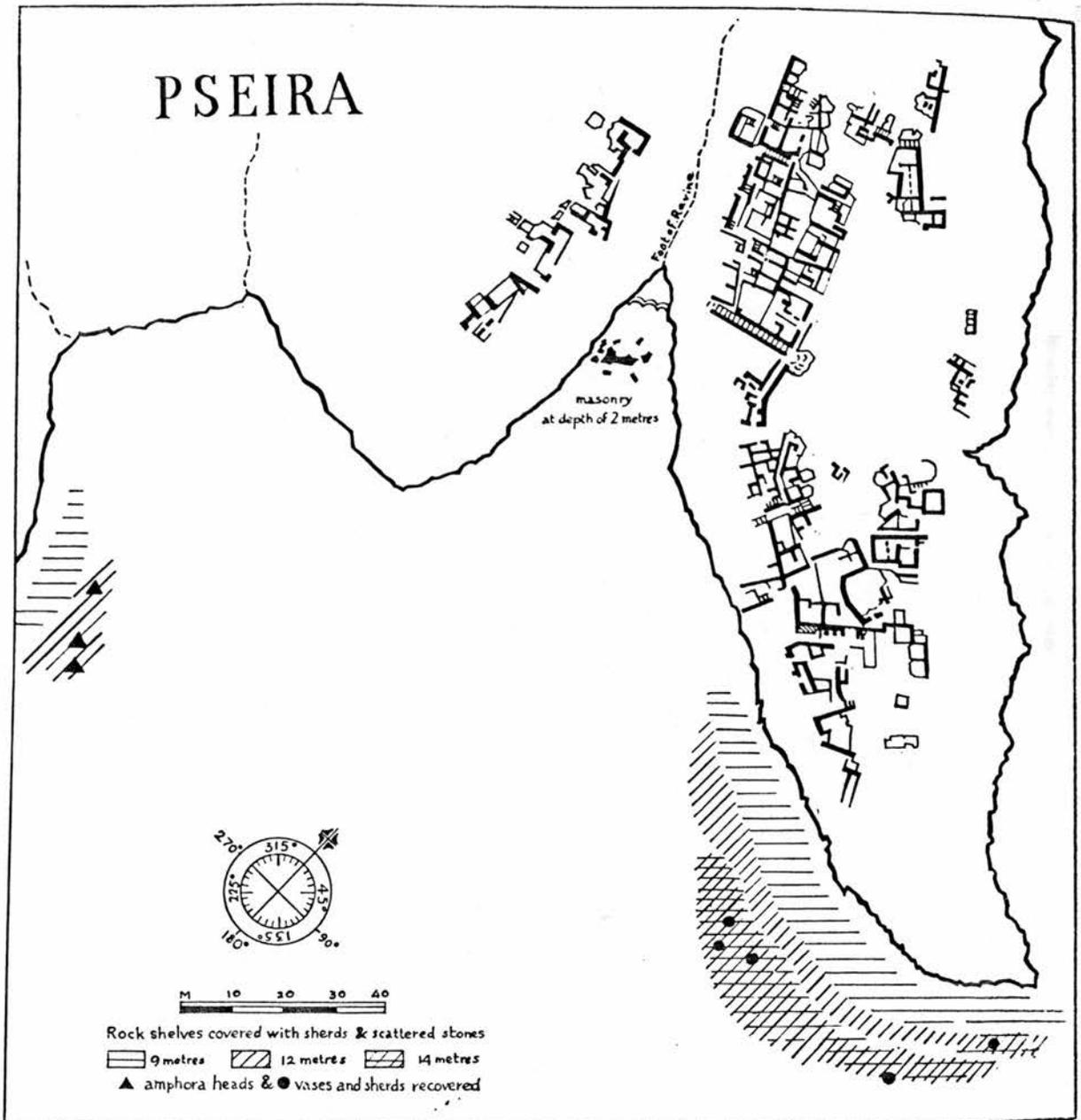
(Fig.22) The site of Mochlos. (photo by author)



(Fig.23) The fish-tanks at Mochlos. (after Leatham-Hood)



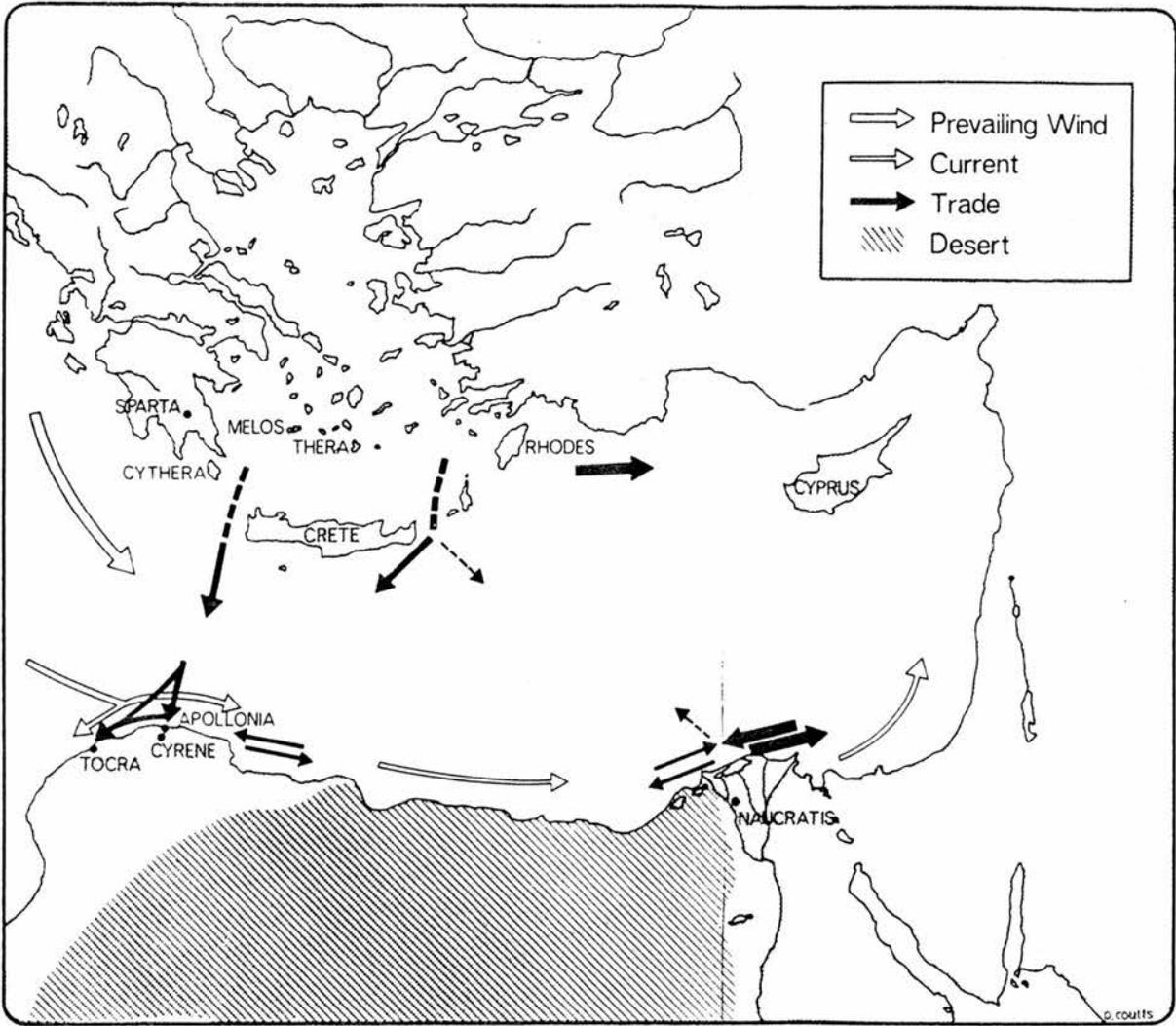
(Fig.24) The island of Pseira. The ancient remains are found at the pronounced promontory. (photo by author)



(Fig.24a) Site plan of Pseira. (After Leatham-Hood)



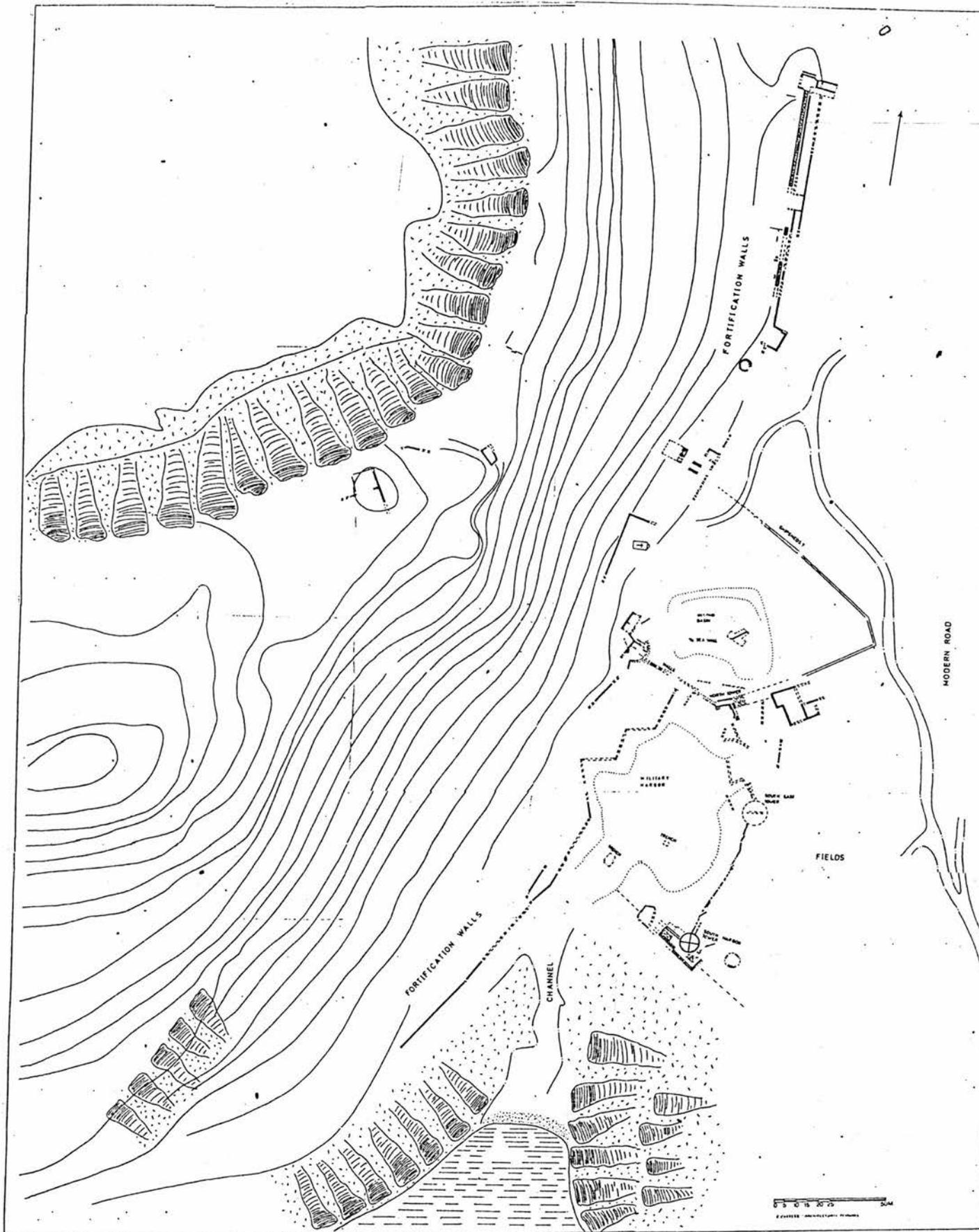
(Fig.24b) The water front in the bay of Pseira. (After Leatham-Hood)



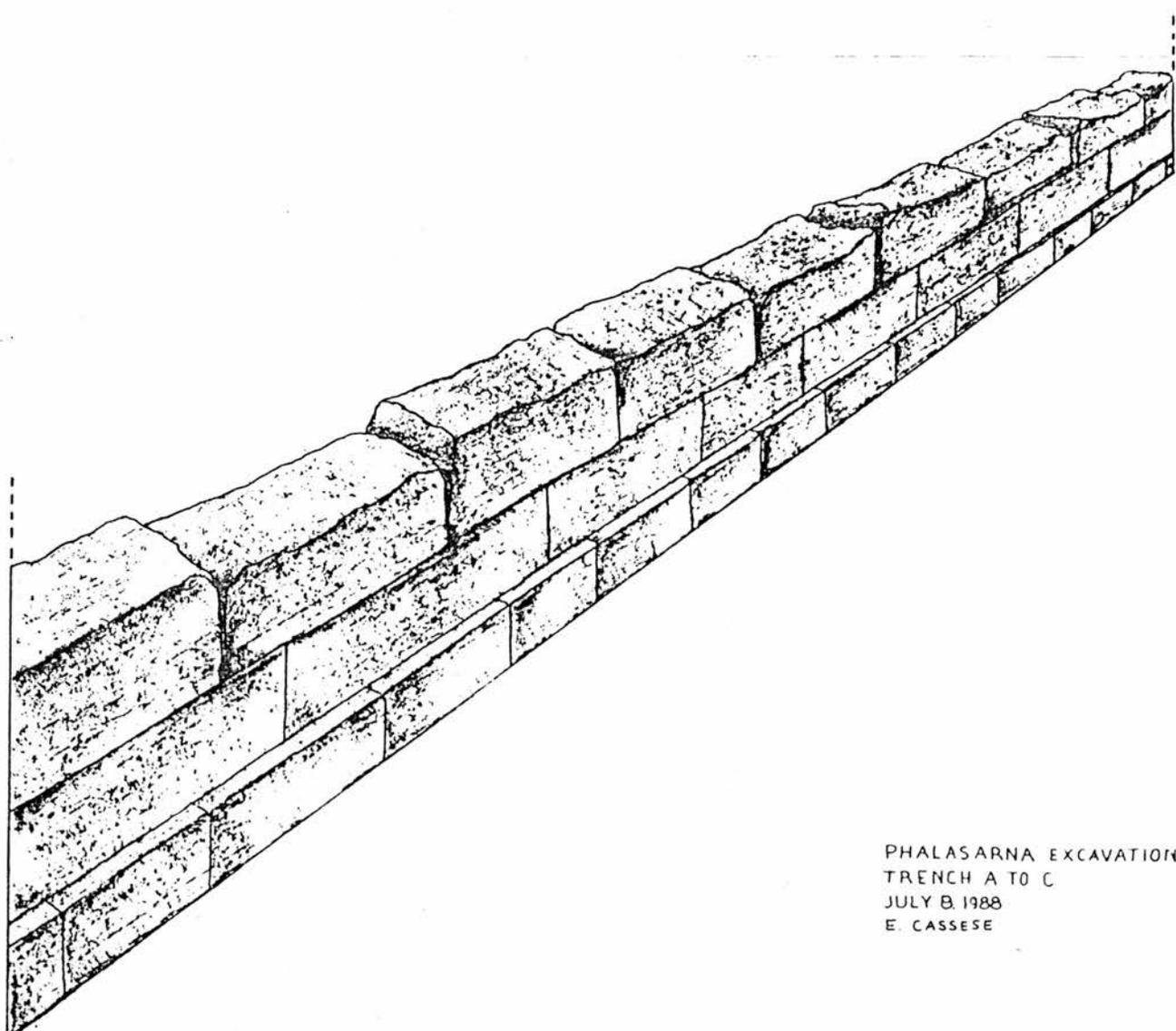
(Fig.24c) Greek trade in the 6th c B.C. (After Schaus)



(Fig.25) The Aegean in the Iron Age.

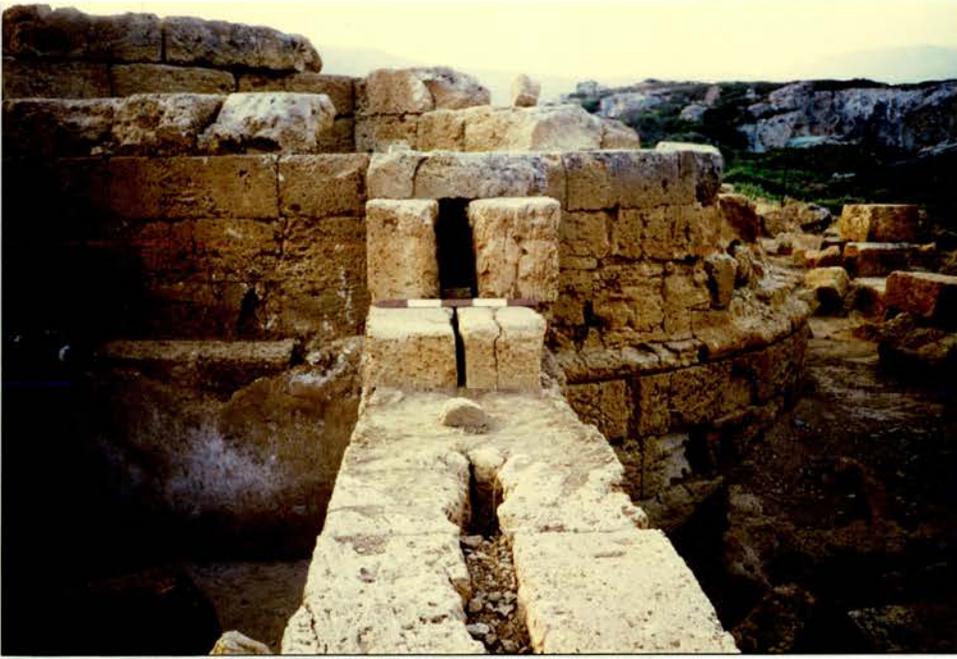


(Fig.25a) A site plan of Phalasarna after the 1988 excavation. (after Hadjidaki)



PHALASARNA EXCAVATION
TRENCH A TO C
JULY B. 1988
E. CASSESE

(Fig.25b) The wall at the inner basin.



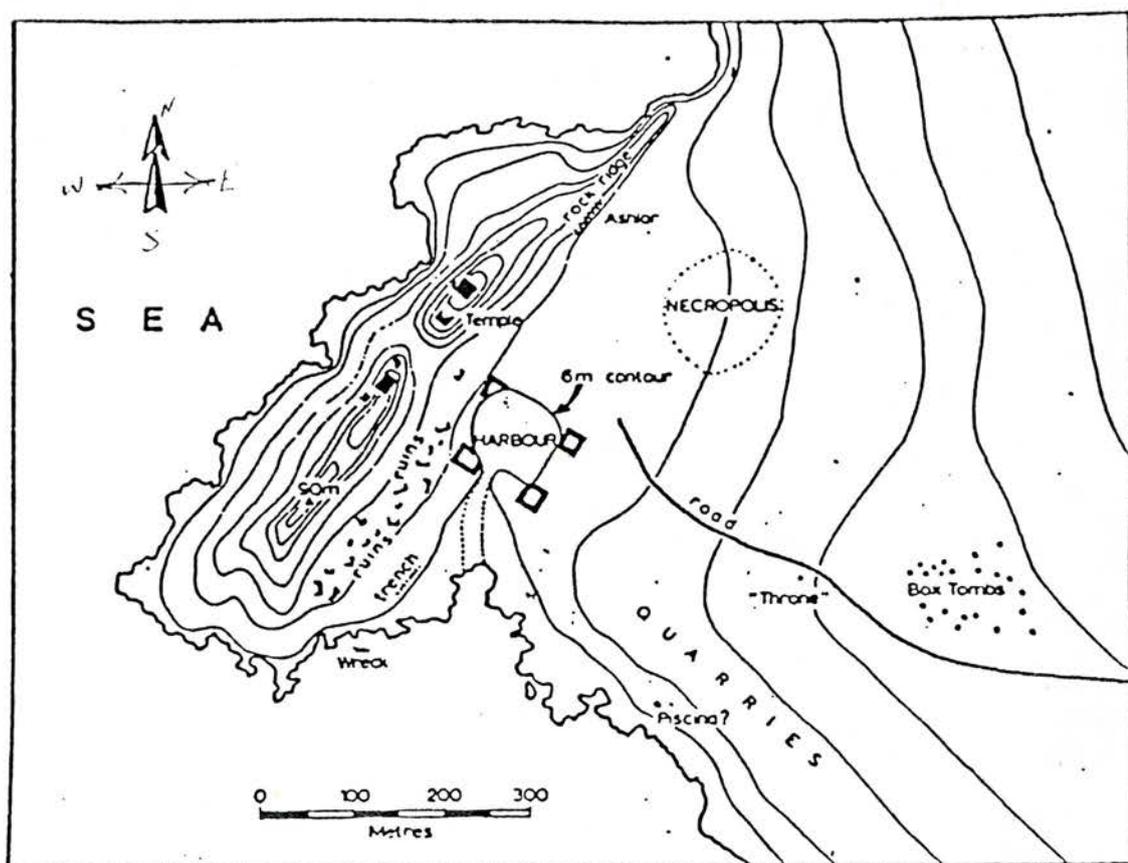
(Fig.26) A section of the circular tower. -from the west-(photo by author)



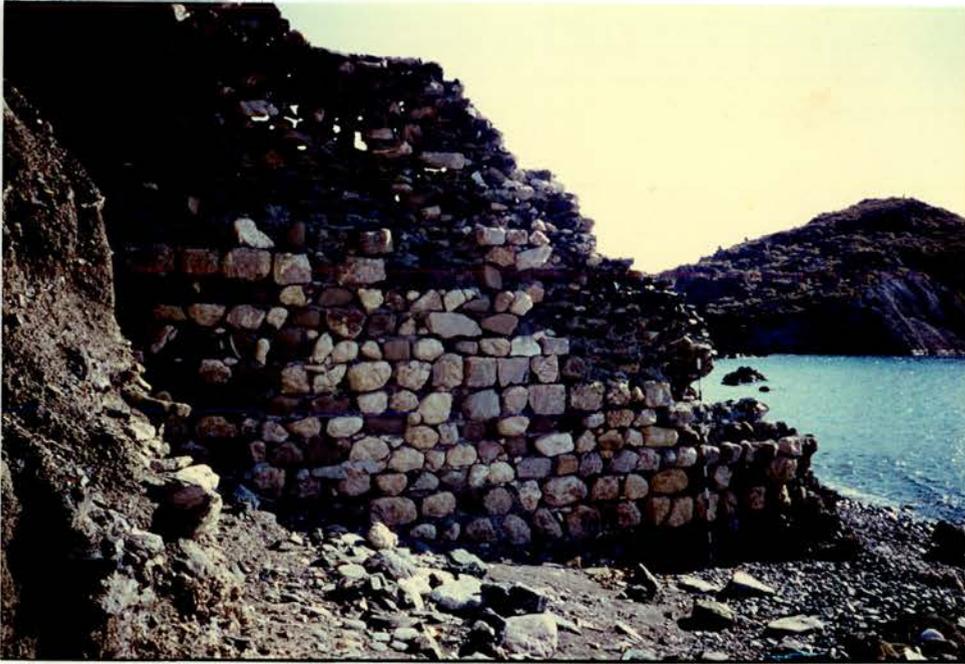
(Fig.27) A cistern adjacent to the west part of the round tower. -From the east- (photo by author)



(Fig.28) The quarries of Phalasarua supplied with rock the construction of the harbour and the city. (photo by author)



(Fig.29) Map of Phalasarua. (after Flemming)



(Fig.30) Buildings on the shore of Lassaia. (photo by author)



(Fig.31) The breakwater of Lassaia and Traphos island. (photo by author)

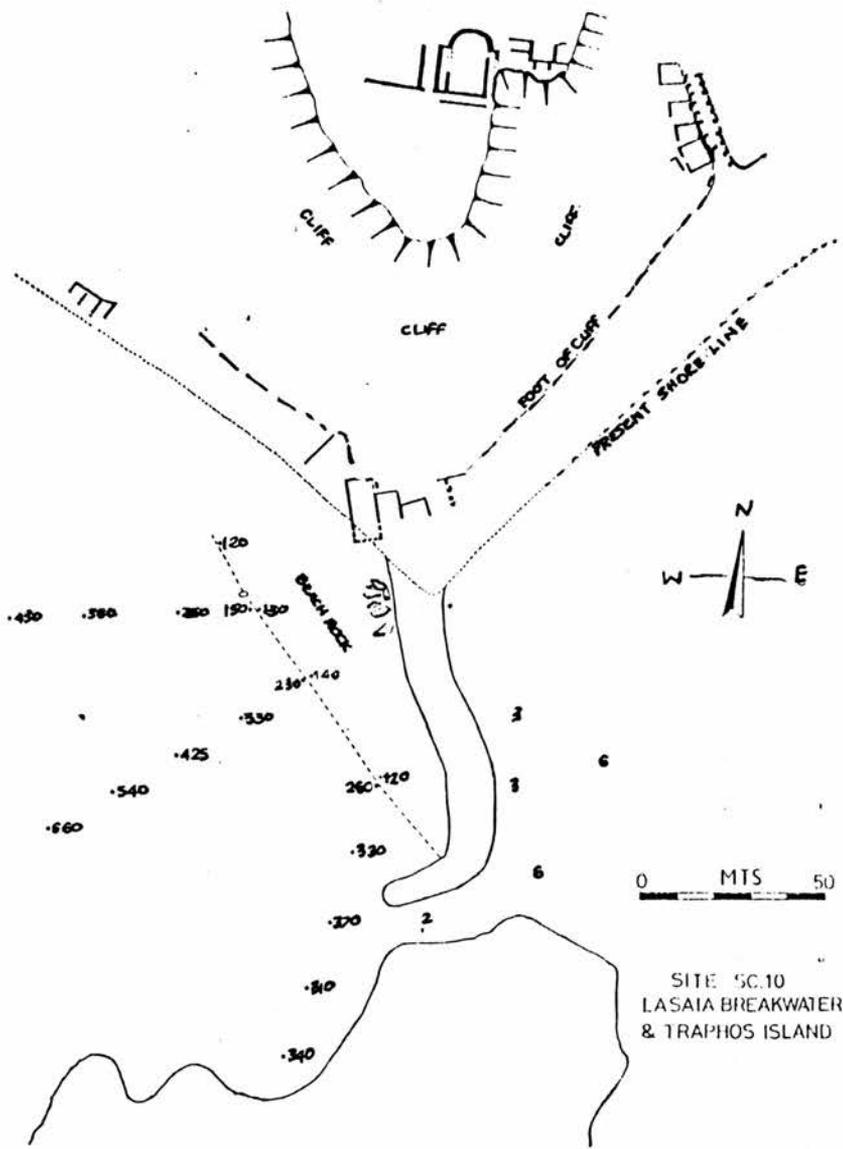
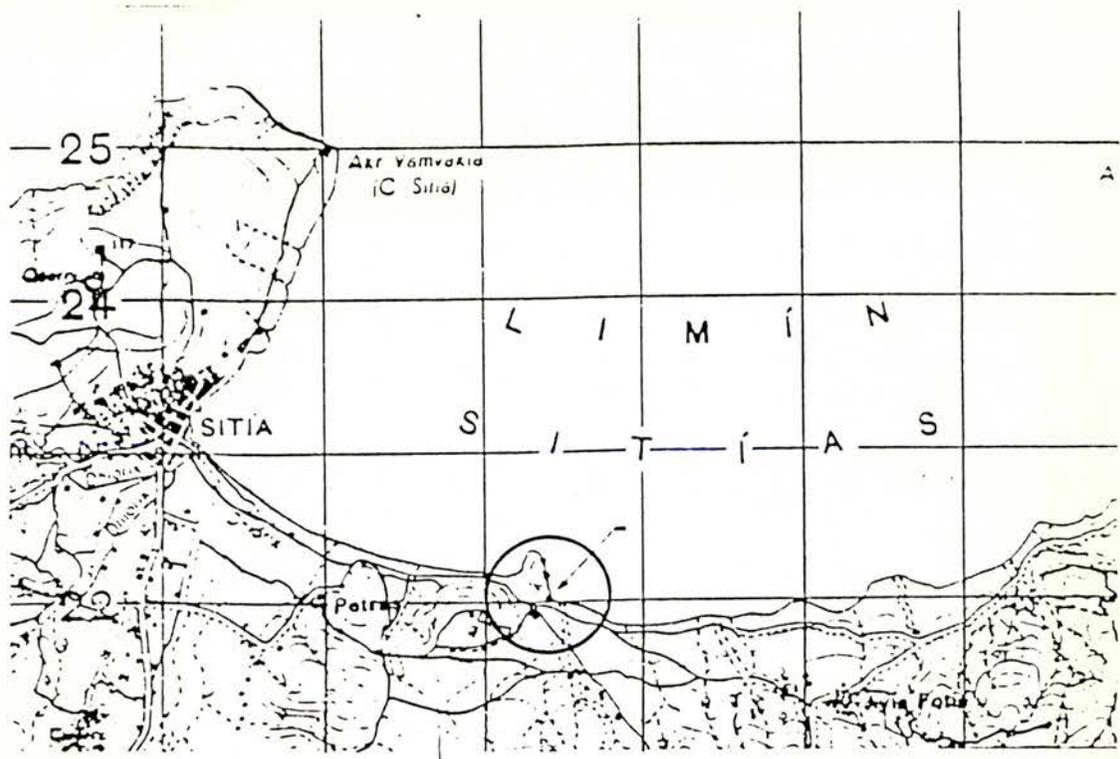


FIG. 7. (Depths in metres)

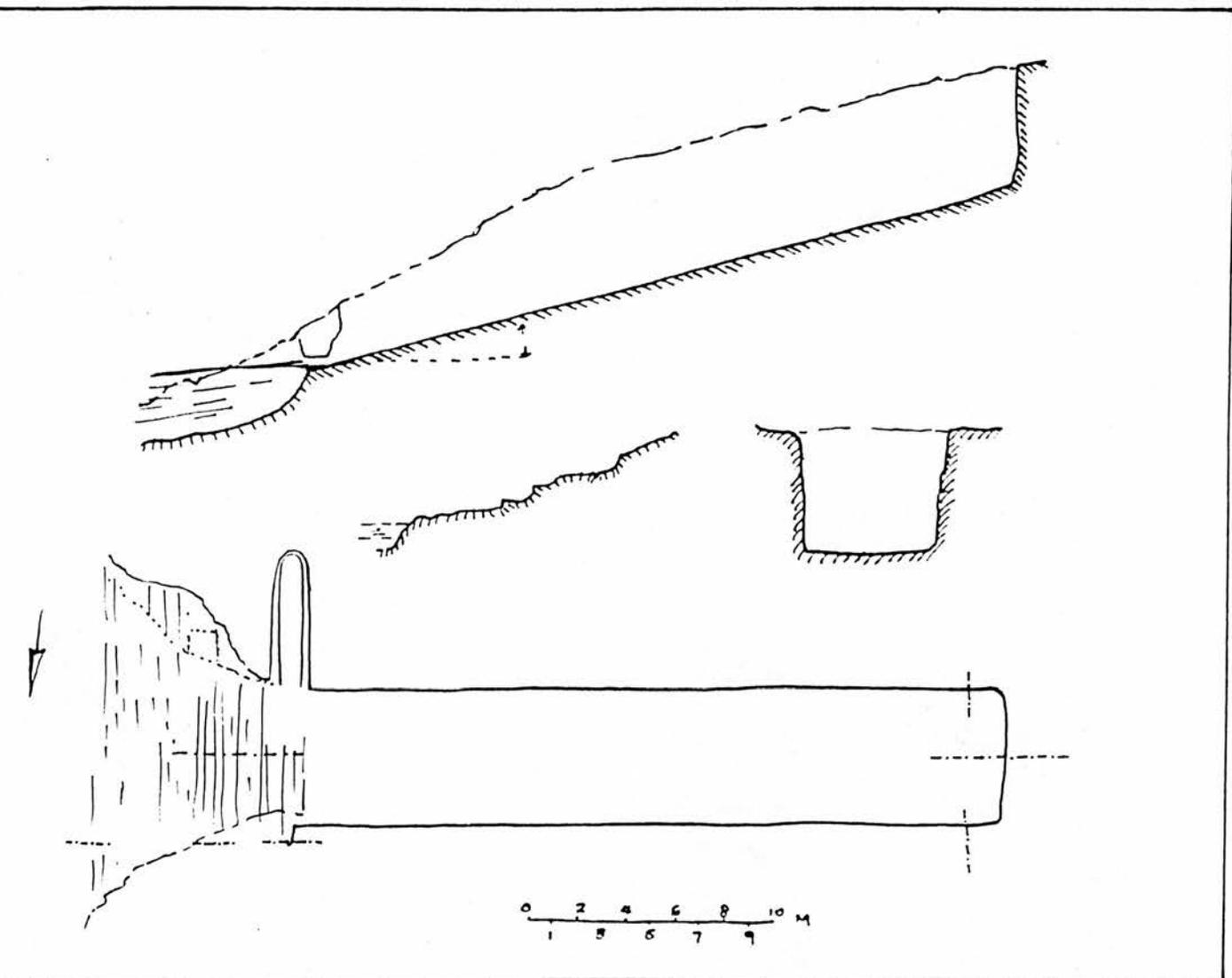
(Fig.31a) The Lassaia breakwater and Traphos island. (after Blackman-Branigan)



(Fig.31 b) The gulf of Siteia.



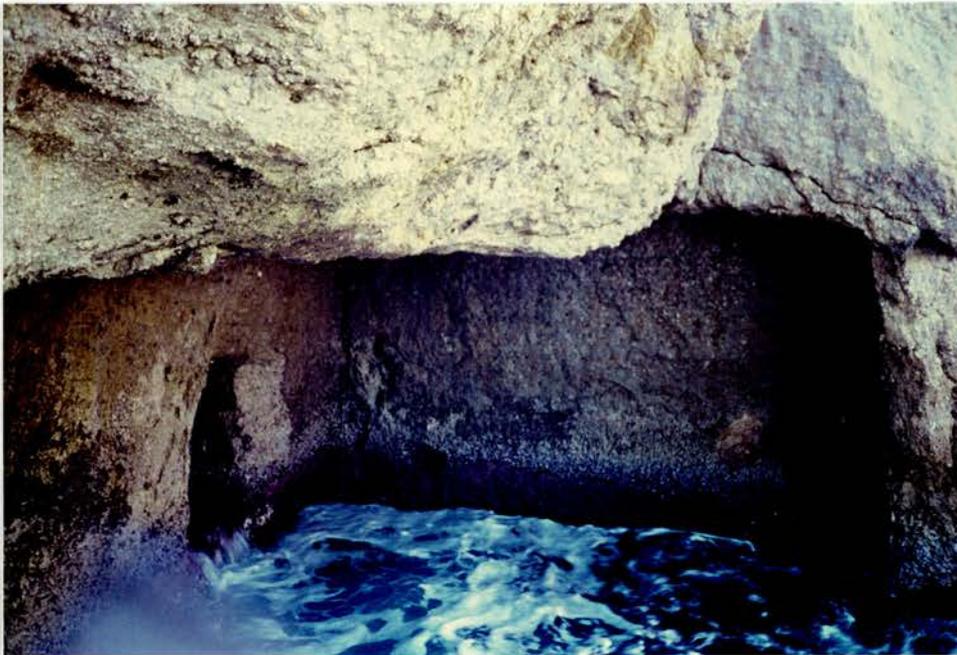
(Fig.32) The slipway of Siteia from the west. (photo by author)



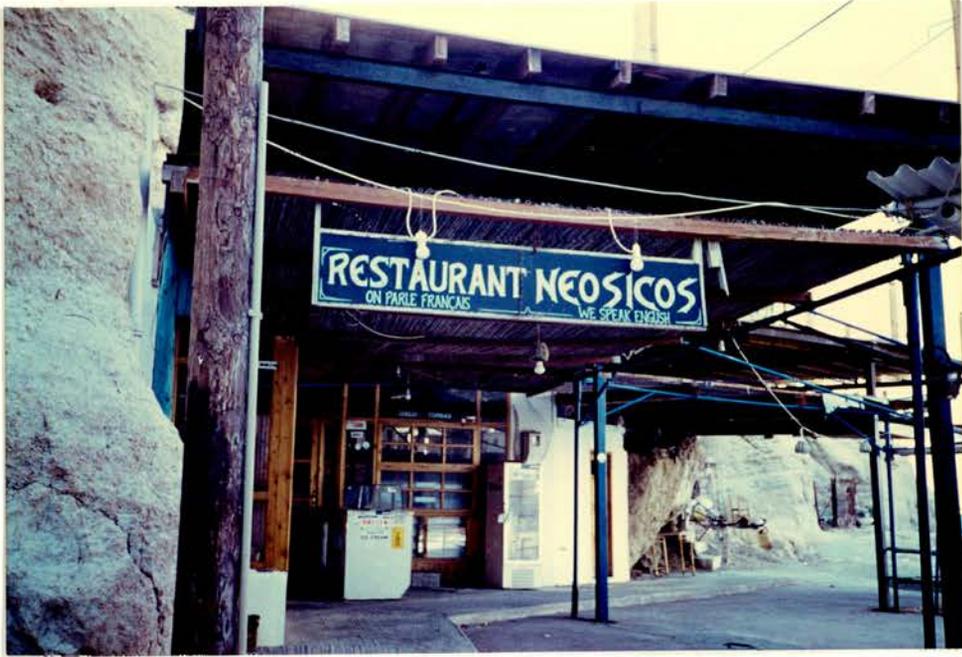
(Fig.33) Plan and side view of the Siteia Neosoikos. (after Davaras)



(Fig.33a) The bay of Matala. (photo by author)



(Fig.34) A Cave on the south-eastern side of the bay of Matala. (photo by author)



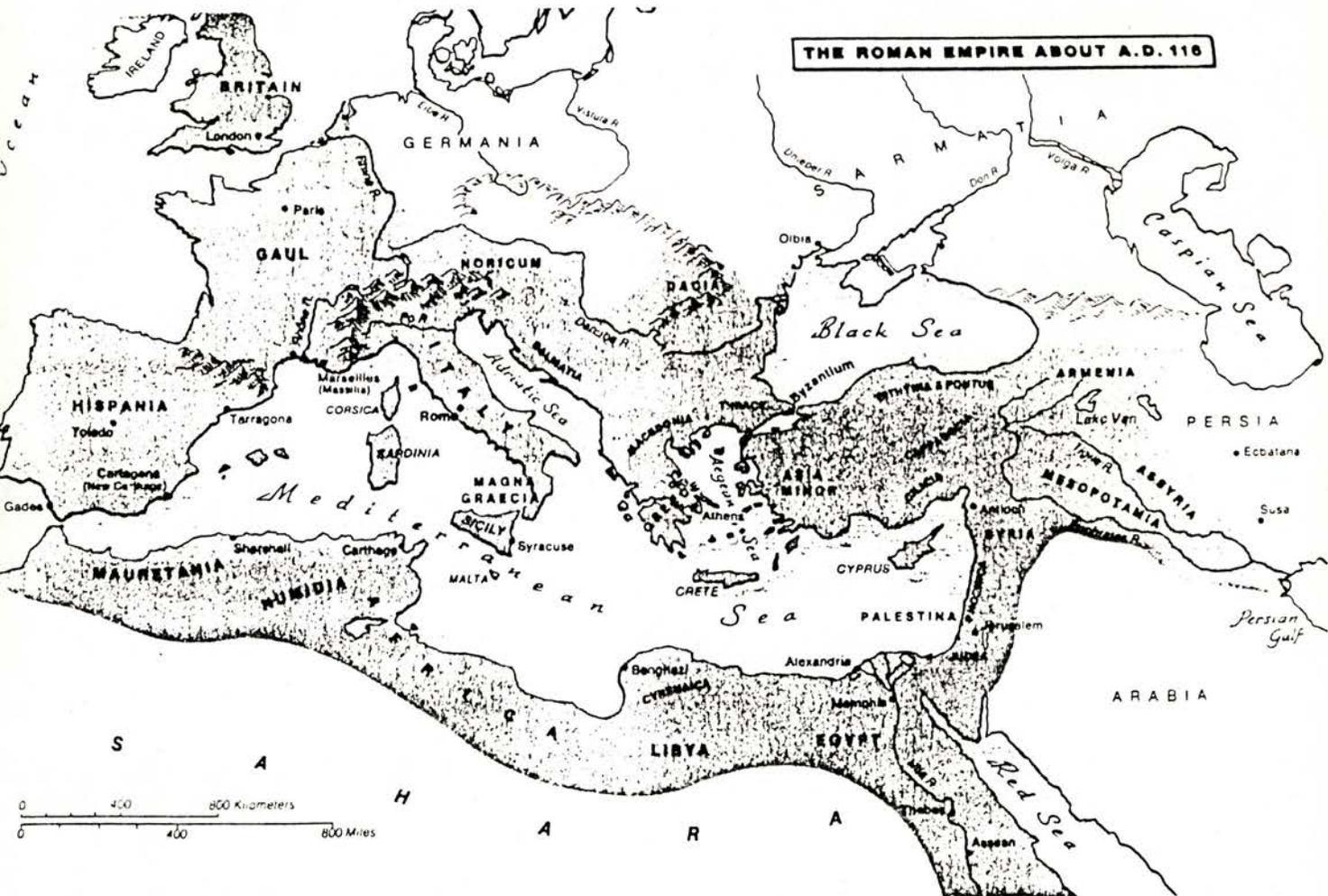
(Fig.35) Today part of the Neosoikos has been incorporated into a restaurant. (photo by author)



(Fig.36) The northern bay of Itanos. (photo by author)



(Fig.37) Quarrying in the northern bay. (photo by author)



(Fig.38) The Mediterranean under the Romans.



(Fig.39) The bay of Kissamos. Visible is the breakwater and the submerged jetty. (photo by author)



(Fig.40) The breakwater of Kissamos and the submerged jetty in the foregroun. (photo by author)



(Fig.41) A Roman amphora piece *in situ* under a block of the breakwater. (photo by author)



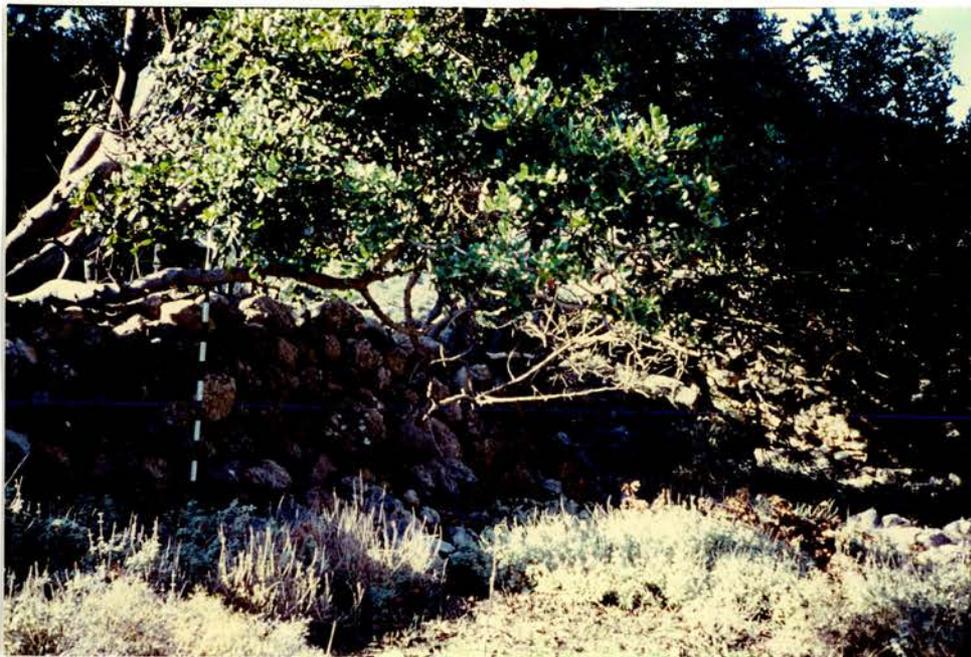
(Fig.42) The bay and the site of the ancient city of Lissos. (photo by author)



(Fig.43) The water line is visible towards the middle of the sea wall. (photo by author)



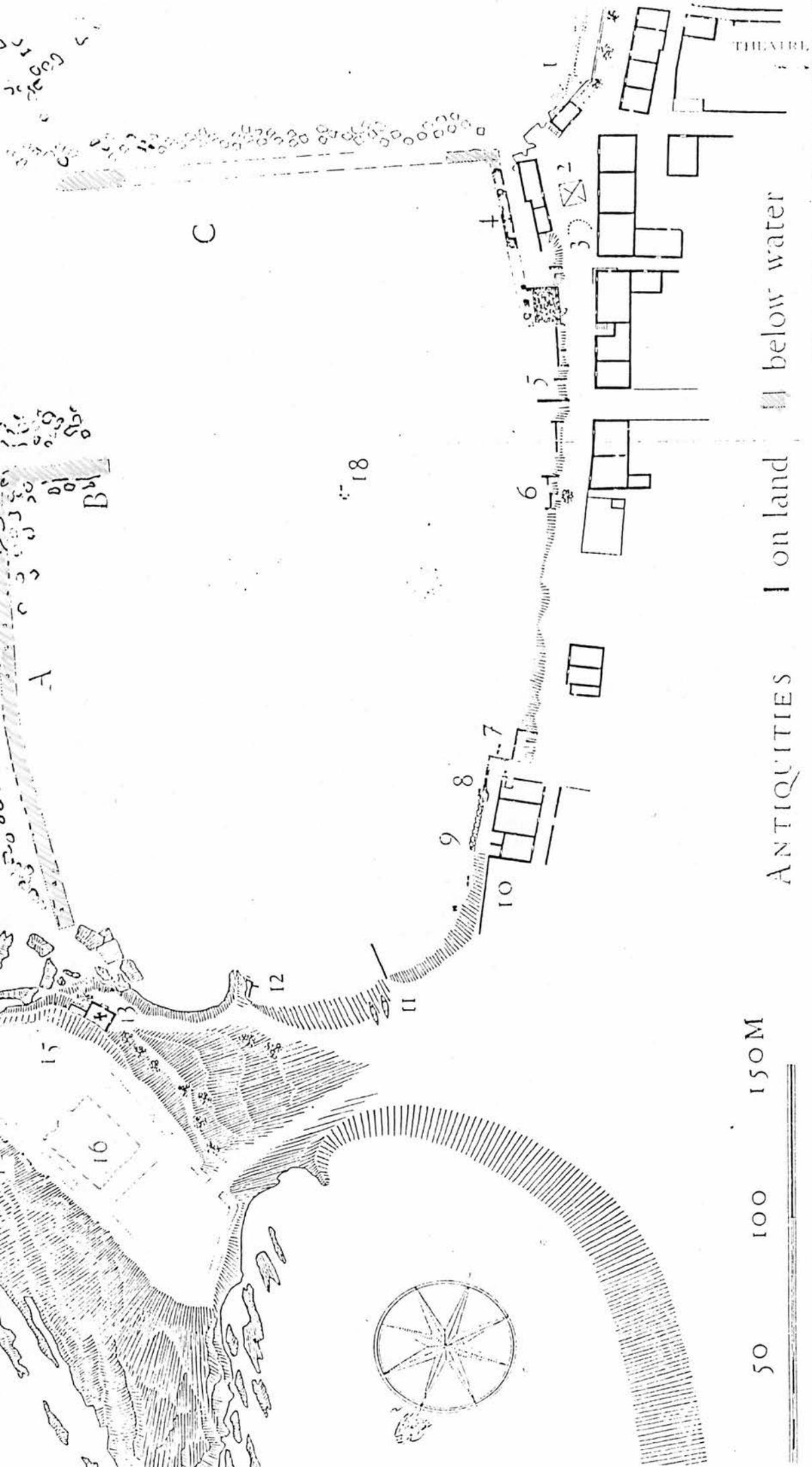
(Fig.44) A recess built on the harbour wall. Probably the end of a sewer. (photo by author)



(Fig.45) A wall running vertically towards the sea. (photo by author)



(Fig.45a) The mark of the ancient water level is clear upon the cliffs. (photo by author)



(Fig.46) A sketch plan of Hersonisos harbour. (after Leatham-Hood)



(Fig.47) A section of a jetty. (photo by author)



(Fig.48) Ancient masonry of the harbour overbuilt by modern structures. (photo by author)