

## MINOAN AND CANAANITE HARBOURS

### Foreword

As a student of the interdisciplinarian approach, I do believe that the only way one can attempt to comprehend the way our predecessors dealt with a technical, or conceptual, issue, is to study the various factors which were relevant at the time. For that reason, when I've chosen to study the history of ancient harbours in the Mediterranean, I've soon found myself studying the oceanographic characteristics of this inner sea; of what is known to the scholars of earth sciences, concerning coastal processes, quaternarian climatic and topographic changes (such as neotectonics, or eustatic changes of sea levels, isostasy, wave climate, etc.); the ever-growing bulk of archaeological data from coastal and submerged sites; the rather well exploited and rather limited corpus of historical references; and - with some measure of caution - the changing fashionable trends toward various socio-anthropological and socio-economic models.

This measure of caution toward models of social sciences, as a means of better understanding the where and how of ancient harbours derives from the simple logic: the variabilities and constant changes in political and economical layout through the ages are occupied by the tangle delicate equilibrium of coastal topography. In other words: whatever the changing demands from a harbour, as a base, or station, for human seaborne activity, will be the true challenge in maintaining its proper function is nowadays, as it was in the past, coping with the elements.

Deserts, river valleys, hill countries, were all considered to be well-defined factors, basically unchanged in their characteristics - at least through the later Holocene (= the historical era). Yet, recent studies have shown that even these topographically stable territories had gone through characteristic changes, whether due to some local, or a larger scale catastrophe, altering climatic conditions, or what becomes more and more apparent - human activities (land abuse, overgrazing, deforesting, salinating of soils through irrigation, etc.). Some scholars went so far as to give such changes in the role of the trigger for the destruction of ancient civilizations (the Summerian, the Mycenaean and so on). Without being carried away with what might be a fashionable trend in studying the history of ancient civilization, a student of the history of the coastline has to start with these issues as the basic factors of comprehending everything concerning the history of human activities at the waterfront.

So, before making an attempt to sum-up and make some deductions concerning the Bronze Age harbours in the Aegean and the Levant, one might present some geomorphological facts concerning coastal processes and the present state of the study of Neotectonic, Eustasy and other processes which dramatically affected every portal settlement around the eastern basin of the Mediterranean.

A last methodical remark: It takes some personal experience to realize what suitable haven (not to say - commercial harbour) actually means. Whoever sailed with small craft along the

coast of Crete, or the Levant, can testify how complicated it is to find and to navigate into a reasonably safe haven with suitable anchorage, or finding accessibility to a firm landing stage. Too often one might find in scholarly papers identification of harbours in locations that could not have served as such in any reasonable rate of efficiency or safety.

### The physical background

The eastern basin of the Mediterranean and the Aegean sea, as a part of it, is a tideless body of water. The tidal amplitude is nowhere of a scale that might evolve considerable tidal currents, or will cause periodical alternation in navigational channels, or would affect portual structures (such as quays, breakwaters, landing stages, etc.). This lack of tidal change and of constant currents of considerable velocity (except for some narrow straits) give the main dynamic role to the waves. Unlike open oceans, the Mediterranean has a very limited fetch for waves to build up. The alternating wind patterns is also a significant feature, both geographically and seasonally. This changeable wave and wind climates are more significant in the Aegean, with its complicated geography of islands, peninsulas, coastal mountain ranges and wide openings of river valleys. In that respect the Levantine region is much more even, with its wind and wave climates more predictable.

The unpredictable character of the Aegean sea and its hostile "personality" was vividly described by the oldest Greek poets, such as Hesiod (*Erga*: 663-691) and Homer, whose *Odyssey*, though being the "greatest maritime epos" of our civilization, is in fact also a horror story about the fatal dangers and the monstrous perils of sea voyages, within the eastern basin of the Mediterranean.

The ancient peoples of the Levant did not share that sense of horror to be associated with sailing on high seas. Though they did refer to sea monsters in their religious and cosmologic poems, man-made ships were an integral part of these scenes. Even land-locked peoples such as the Biblical Hebrews had such a notion: "Here is the great sea, in which more creatures beyond number. Here ships sail to and fro, here is Leviathan whom thou hast made thy plaything" (*Psalms*, 104: 25-6).

The sailing season in the Aegean was confined to rather short periods in the early summer (mid-April to mid-June) and the early fall (from early September to mid-October). These limited periods, so well-defined by Hesiod, are not without risks of unpredicted blasting winds and sudden storms. Yet these transitional periods between the winter "Notos", or the north wind that follows the repetitive cold fronts and passing cyclones during the winter and the constant NW fresh wind of the mid-summer (the "Melteme"), are safer and might help square rigged merchantmen to reach their port of call wherever it will be in the Aegean, the Levant, and various coastal cities en route.

The paper of Mrs. Lambrou-Phillipson in this volume deals with only one aspect of the seasonal sailing, navigational routes and prevailing winds. Yet, this typically overlooked issue might give us a better understanding of what geographical distance means when it is to be crossed over safely by sailing merchantmen.

The sailing season in the Levant might have been much longer than in the Aegean and would last all through the summer, from early April to November. The direct sailing from the Nile Delta to the Phoenician coast, Cyprus and Cilicia could be accomplished in a matter of a week or two, with constant side winds in both directions (west to NW winds, with limited force, rarely exceeding 25 knots, for the direct navigational route from SW to NE). An alternative long-shore route would take more time, but would give additional opportunities to use an overnight shelter, obtain fresh supplies of food and water and exchange goods. All in all we have both historical references and navigational logic for preferable sailing routes running anticlockwise around the eastern basin of the Mediterranean all through antiquity.

In that respect, the distance from Crete to Egypt would be five to ten times shorter than the one from Egypt to Crete. The same principals are true for the sailing on a smaller scale between Tyre and Cyprus, various centres in the Aegean and around Crete. The data derived from the Bronze Age wrecks from Cape Gelidonya and Ulu Bourun might illustrate this logic pattern <sup>1</sup>.

But when dealing with harbours the characteristics of the coastlines and coastal processes are of greater importance than the wind pattern, or wave climate. For these factors might have been crucial in the decision made by the ancients as to where to locate their harbours; and may have played a major role in the survival of these havens as active trade centres throughout the centuries. The most characteristic features of the eastern Mediterranean coastline in that respect are:

1. Except for the rather confined areas of central part of the west coast of Anatolia (Asia Minor), the bay of Argos, the south bays of the Peloponnesos, the Thermaic Gulf in Thessaly, the bay of Iskenderan in eastern Cilicia and the Nile Delta, most of the coastline is blocked off from the hinterland by longshore mountainous ranges <sup>2</sup>.

2. While some of the above mentioned "openings" are defined by perennial rivers, navigatable, at least to some distance inland, others are blocked and silted up by alluvial sediments and/or coastal sand bars <sup>3</sup>.

3. This type of valley that used to be in the past a deep marine inlet (such as the Meander valley) was the most characteristic phenomena for all river outlets in and around the Aegean and the eastern Mediterranean basin. There is only one real exception in this category, which is the Nile.

4. The more confined the watershed of a river is and the less rainfall there is in it, the sooner its outlet would be blocked and silted up. This process, of stabilizing the coastlines to their present features was initiated once the Post-Glacial transgression of the Holocene had reached its peak about 5,000 years ago; and since sea level was eustatically stable, with only gradual eustatic fluctuations of less than two metres above and below the present MSL (Pl. XXXIII, a) <sup>4</sup>.

5. Although the immediate assumption would be that rising sea would cause flooded river outlets and estuaries, the fact is that whenever this process was gradual and/or of a small amplitude (no more than a few metres) the topographic change would have been of a different type: the rising erosive base of a water course (river) would affect the gradient of the water flow at its lower part (the coastal plain) and would cause excessive deposition of alluvium. The reduced energy of water flow in the lower part of the river course might be non sufficient for keeping off the wave-carried sand from blocking its outlet by a sand bar. Even perennial streams might keep their outlets open only during the rainy season, following occasional winter

- 
- 1 L. CASSON, *Ships and Seamanship on the Ancient World* (1971), p. 270-297; C.M. PULAK, "The Bronze Age Shipwreck at Ulu Burum, Turkey: 1985 Campaign", *AJA* 92 (1988), p. 36-37; C. LAMBROU-PHILLIPSON (in this volume).
  - 2 Y. CARMON, "Geographical components in the study of ancient Mediterranean ports", *Harbour Archaeology, Proceedings of the First International Workshop on Ancient Mediterranean Harbours, Caesarea Maritime*, 24-28.6.83, B.A.R. International Series 257, p. 1-4.
  - 3 J.C. KRAFT, S.E. ASCHENBRENNER and G. RAPP, Jr., "Paleographic reconstructions of coastal Aegean archaeological sites", *Sciences* 195 (1977), p. 941-947; B. BOUSQUET, J.-J. DUFAURE and P.-Y. PECHOUX, "Ports antiques et lignes de rivage égéennes", *Déplacements des lignes de rivages en Méditerranée, d'après les données de l'archéologie, Aix-en-Provence, 5-7.9.1985* (1987), p. 137-154.
  - 4 P.A. PIRAZZOLI, "Sea-level changes on the Mediterranean", *Sea-level Changes* (1987), p. 152-181; N.C. FLEMMING and C.O. WEBB, "Tectonic and eustatic coastal changes during the last 10,000 years derived from archaeological data", *Z. Geomorph. N.F. Suppl. Bd.* 62 (1986), p. 1-29.



floods. This characteristic process is so dramatically demonstrated in the well-known cases of Miletos, Ephesos, Tarsus and ancient Smyrna - once harbour sites of prime importance and now land-locked sites. Yet, this was the destiny of numerous other harbours less well-known from historical documents. Typical cases for such a process were studied by Kraft and others at Pylos<sup>5</sup>, Mesenia<sup>6</sup>, Tiryns<sup>7</sup>, Kition<sup>8</sup>, and other locations where sea level has risen since antiquity and yet these harbour cities are presently some distance inland (Pl. XXXIII, b).

6. The Aegean region and the Eastern Mediterranean are both within the fringes of continental blocks and most vulnerable to active tectonic movements, earthquakes and volcanic eruptions (in the south Aegean). Some major faultlines, known as measurably active at present, run along various coastal segments. The best studied of these is the tectonic system of the south Aegean region, with its volcanic arc and the tilted block of Crete<sup>9</sup>. Yet with few local exceptions, such as Caesarea<sup>10</sup>, no vertical displacement of more than three to four metres have been detected so far for man-made structures. Of these tectonically displaced marine installations most seem to have uplifted, or subsided through rather gradual processes, while a few might have changed elevation within a short period of time, or even during a single, catastrophic event, such as a major earthquake<sup>11</sup>. Displacement of segment of the shoreline even if focused as a sudden event, would maybe be topographically insignificant in the long run. A displacement of one metre, or two, would be "mended" and the topography would regain its sedimentological equilibrium in a matter of a few generations at the most, wherever the shoreline was not a rocky one<sup>12</sup>.

7. Following these principles one might expect to find the river outlets to be generally blocked by sand bars, with somewhat silted up lagoons, or more likely marshy low ground at the back shore, never mind what tectonic and eustatic displacement took place there during the historical past. The paradigm for the dynamic process of this type is well known all over and to be found in every textbook on coastal geomorphology (Pl. XXXIII, a)<sup>13</sup>. It was brought up here in certain lengths only because it seems that some historians and archaeologists with humanistic education tend to overlook these basic rules of nature and coastal dynamics.

- 
- 5 J.C. KRAFT, G. RAPP, Jr. and S.E. ASCHENBRENNER, "Late holocene paleogeographic reconstruction in the area of the Bay of Navarin: Sandy Pylos", *Journal of Archaeological Sciences* 7 (1980), p. 187-210.
  - 6 ID., "Late holocene paleogeography of the coastal plain of the Gulf of Messenia, Greece and its relationship to archaeological settings and coastal change", *Bull. of the Geol. Soc. of Amer.* 86 (1975), p. 1191-1208.
  - 7 T.M. NIEMI and E.A.W. FINKE, "The applications of remote sensing to coastline reconstruction in the Argive Plain, Greece", *Archaeology of Coastal Changes*, B.A.R. International Series 404 (1988), p. 119-136.
  - 8 A.M. COLLOMBIER, "Harbour or harbours of Kition on South Eastern Coastal Cyprus", *Archaeology of Coastal Changes*, B.A.R. International Series 404 (1988), p. 35-46.
  - 9 FLEMMING and WEBB, *op. cit.*; P.A. PIRAZZOLI, J. THOMMERET, Y. THOMMERET, J. LABOREL and L.F. MONTAGGIONI, "Crustal block movements from holocene shorelines: Crete and Antikythira (Greece)", *Tectonophysics* 86 (1982), p. 27-43.
  - 10 N.C. FLEMMING, A. RABAN and C. GUETSCHER, "Tectonic and eustatic changes in the Mediterranean coast of Israel in the last 900 years", *Progress in Underwater Sciences* 3 (1978), p. 33-94; D. NEEV, E. SHACHNAI, J.K. HALL, N. BAKLER and Z. BEN-AVRAHAM, "The young (Post Pliocene) geological history of the Caesarean structure", *Israel Journal of Earth Sciences* 27 (1978), p. 43-64.
  - 11 N.C. FLEMMING, N.M.G. CZARTORYSKA and P.M. HUNTER, "Archaeological evidence for eustatic and tectonic components of relative sea level change in the South Aegean", *Marine Archaeology, Colston Papers* XXIII (1973), p. 1-66; P.A. PIRAZZOLI, "The Early Byzantine Tectonic Paroxysm", *Z. Geomorph. N.F. Suppl. Bd.* 62 (1986), p. 31-49.
  - 12 Cf. J. DUMONT, "L'engloutissement d'Helike", *Histoire et archéologie, Les dossiers* 50 (1981), p. 82-85.
  - 13 Cf. A. GULICHER, *Coastal and Submarine Morphology* (1958), p. 179-191; V.C. FINCH and G.T. TREWARTHA, *Physical Elements of Geography* (1949), p. 331-343.

8. We do have to bear in mind that these processes are time consuming and that the rate of turning estuary to a silted-up river-outlet differs greatly from place to place. In some it is still going on, yet no real open estuary can be found east of Sicily.

9. These characteristics are irrelevant for rocky shores and bays and for off-shore rocky islets. Yet, in most cases such islets, if close enough to the shore, might have turned to peninsular headlands and eventually would be connected to the mainland by a tombolo wherever there are ample quantities of wave carried sediments to be deposited at the surf-zone.

### The historic sources

As there are no contemporary written documents for the Bronze Age Aegean that might be useful as depictions of harbours, we do have at least one good and rather detailed pictorial depiction of exactly this topic, from the miniature fresco of Akrotiri, Thera <sup>14</sup>.

Whether this illustration described particular townships and harbours, or it has the typical generic concept of the Minoan art, it is the best we have in hand, so far from both the Eastern Mediterranean and the Aegean for the Bronze Age period. There are many pictorial depictions of Bronze Age quays from Pharaonic Egypt, but these are all rather schematic and in all cases of the reverine type (the Nile, or its navigational channels).

The written sources, from Egypt and the Levant, are more abundant, yet not of much help for the exact layout and architectural features of any single harbour. In that respect, the textual documentation for the Bronze Age harbours in the Eastern Mediterranean are all of circumstantial value. Such is, for example, the famous text known as the "Palermo Stone" which refers to seaborne voyages of Snefru, a Pharaoh of the 4th dynasty (c. 2600 B.C.E.) to the north east coast of the Mediterranean (either Cilicia, or Phoenicia); it says: "Bringing 40 ships filled with cedar logs. Shipbuilding of cedarwood, one ship - 100 cubits long [54-57 metres] and of meru-wood [also a type of conifer], two ships, 100 cubits long ..." <sup>15</sup>. There is the even better known pictorial depiction of the Royal fleet of Sahore, of the 5th dynasty (about a century later), coming back from such a voyage, carrying Canaanite merchantmen on board <sup>16</sup>. The size of these ships and the commercial type of these maritime activities might tell us something about the type of harbours necessary for such a purpose. Later Egyptian texts are mainly of general geographical value, of *Onomastikon* type. Most of them are lists of cities conquered by the imperial Pharaohs of the New Kingdom, presented in some geographic order. Over twenty of these are known to be Levantine ports, known also from other literary sources (such as the Bible, the El Amarna letters, or the archives of Ugarit) <sup>17</sup>. Yet, among the many pictorial depictions of foreign cities being attacked and conquered by the Egyptians, there is not one to be shown on the seashore, or to be taken with the help of a navy. A typical example for this phenomenon is the depiction of the conquest of Ashkelon by Marneptah, from the temple of Amun at Karnak, in which the fortified town is shown to be located on a hilltop, though at present the ancient site is badly eroded by the seawaves and has about 1300 metres of straight and exposed shore next to its LB remnants <sup>18</sup>. Another, earlier and rather intriguing

14 S. MARINATOS, *Excavations at Thera VI* (1974); L. MORGAN, *The Miniature Wall Paintings of Thera* (1977).

15 J. PRITCHARD (ed.), *Ancient Near Eastern Texts* (1955), p. 227.

16 R. FAULKNER, "Egyptian seagoing ships", *JEA* 26 (1940), p. 3-5; CASSON, *op. cit.*, p. 20-21, Fig. 17.

17 S. AHITUV, *Canaanite Toponyms in Ancient Egyptian Documents* (1984); A.H. GARDINER, *Ancient Egyptian Onomastica I-II* (1947). But also P. FAURE, "Toponymes créto-mycéniens dans une liste d'Aménophis III", *Kadmos* 7 (1963), p. 139-149.

18 W. WRESZINSKI, *Atlas zur Altägyptischen Culturgeschichte II* (1935), Pl. 58; L. STAGER and D. ESSE, *Israel Explor. Jour.* 37 (1987), p. 68-72.

group of place names, is the early second millennium B.C.E. Execration texts of the Middle Kingdom. Unlike the traditional interpretation of these texts as being a list of Egypt's enemies<sup>19</sup> the writer believes them to be a type of magical omen, securing some kind of Royal trade of the Pharaoh with these foreign places<sup>20</sup>. Such as calling divine forces to punish an unfair deal of a goodwill exchange of goods with people and places which were far away from the effective reach of Egypt's political and military power at the time. In that context there are about ten places which can clearly be identified as harbour places (such as Ashkelon, Akko, Tyre and Byblos). The extensive maritime activities in the Eastern Mediterranean, either those initiated by the imperial policy of Egypt and the Hittites, or the Canaanite coastal centres, such as Ugarit and Byblos, are documented by hundreds of texts of various types. Yet none include a meaningful reference to the exact siting of a harbour or the functional components in it<sup>21</sup>. There are references to quays, in a most general manner, as to where goods were loaded and unloaded and custom dues charged. There are references to shipyards and harbour masters; lists of types of ships (both from Egypt and Ugarit), building materials for them and various professionals serving in them. These are all very impressive for documenting the extensiveness and variety of maritime activities at that period, but not very informative as for the character of the harbour facilities. Yet, some basic information can be derived from these documents, relating to the topographic setting of some harbours which might be of assistance in interpreting archaeological data:

1. Linguistically it is interesting to point out the fact that the Egyptians had the same word for harbour and for river outlet: *rhwt* all through the New Kingdom. Yet in one text, describing Tuthmosis III activities in north Syria during his 34th regnal year, a new term is used for harbours in Syria that were established and furnished with all the necessities. This term *mrj.t* (to be pronounced "Menit") is considered to be the origin of the Greek term *Limen*)<sup>22</sup>.

2. Many trade centres along the Levantine coast were located some distance inland, having a separate quarter or a "Daughter" on the shore as their harbour. Such is the case for Ugarit and what is presently known as Minet-el-Baida which was then *Ma ḥ adu* (*Mahoz* in Biblical Hebrew)<sup>23</sup>; for Tyre and her inland centre Uṣu<sup>24</sup>; Ashdod and her port (riverine one) at Tel Mor<sup>25</sup>; and Gaza. A similar phenomenon is also known from the Aegean, for centres such as Athens, Mycenae, Pylos, Knossos, Gournia, and Phaestos. In many cases there is a river course connecting the two centres and in some it was probably navigable, at least for small craft<sup>26</sup>.

3. In the contemporary texts of the Late Bronze Age there is the usage of "in the harbour", "Go out of the harbour", "Laying idle [in still water], during a storm, inside the

19 J. PRITCHARD (ed.), *Ancient Near Eastern Texts* (1955), p. 328.

20 G.A. REISNER, *Cambridge Ancient History* I, 2 (1971), p. 540-544.

21 See good summations in T. SÄVE-SÖDERBERGH, *The Navy of the Eighteenth Egyptian Dynasty* (1946); E. LINDER, *The Maritime Texts from Ugarit: A Study in Late Bronze Age Shipping*, Ph. D. Thesis, Brandies University (1970).

22 SÄVE-SÖDERBERGH, *op. cit.*, p. 46; J.H. BREASTED, *Ancient Records of Egypt* II (1907), ff 472, 483, 492, 510, 519, 535.

23 M.C. ASTOUR, "Ma ḥ adu, the harbour of Ugarit", *Jour. Econ. Soc. Hist. of the Orient* 13 (1970), p. 113-127. But see also for another identifications, R.R. STIEGLITZ, "Ugaritic M ḥ d - the harbour of Yabne-Yam?", *Jour. Amer. Oriental Society* 94.1 (1974), p. 137-138.

24 W.B. FLEMMING, *The History of Tyre, Columbia University Oriental Studies* X (1966), p. 3-6, n. 5.

25 M. DOTHAN, "The Foundation of Tel Mor and Tel Ashdod, A Chapter in the Relationship between a Metropolis and its harbour", *Israel Explor. Jour.* 23 (1973), p. 1-17.

26 And see details in O. PSYCHOYOS, *Déplacements de la ligne de rivage et sites archéologiques dans les régions côtières de la mer Egée, au Néolithique et à l'Age du Bronze* (1988).



harbour", etc. Such entries refer to places such as Ugarit, Byblos, Tyre, Akko and Dor<sup>27</sup> and might be understood as attesting the fact that the harbours of these cities were well protected from the marine elements and uncalled foe. None of the texts ever bring any reference for beaching vessels on sandy shores, or berthing on anchor as a harbouring practice for a merchantman.

Summing up this concise survey of the textual documents of the time, it will be just right to add what seems to be the most reliable interpretation to be written on the subject by a later historian. This is the critical observation of Thucydides:

"The first person known to us by tradition as having established a navy is Minos. He made himself master of what is now called the Greek Sea, and rules over the Cyclades, into most of which he sent the first colonies, expelling the Carians and appointing his own sons as governors; and thus did his best to put down piracy in these waters, a necessary step to secure the revenues [of seaborne trade] for his own use" (1.4)

"With increased facilities of navigation and a greater supply of capital, we find the shores becoming the site of walled towns, and the isthmuses being occupied for the purposes of commerce, and defense against a neighbour. But the old towns, on account of the great prevalence of piracy, were built away from the sea, both on the islands and the continent, and still remain in their old sites.

The islanders too were great pirates. These islanders were Carians and Phoenicians, by whom most of the islands were colonized... [here comes the archaeological, typological argument for the above claim]. But as soon as Minos had formed his navy, communication by sea became easier, as he colonized most of the islands, and expelled the pirates. The coast populations now began to apply themselves to the acquisition of wealth, and their life became more settled, some even began to build walls on the strength of their newly acquired riches... It was at a somewhat later stage of this development that they went on the expedition against Troy" (1.8).

Though written a thousand years later and based, as he admits, on oral tradition, Thucydides' description of the past is an example for historiography in its excellence. Using all available sources of reasoning, such as archaeology, ethnography, typology, social economy, geography and measured common sense, he was far from quoting the old poets (Homer and Hesiod) or from bringing in epic and semi-mythological traditions and popular stories, favoured so much by his older colleague Herodotos. Though some prominent scholars would like to dismiss his testimony as non-reliable and of no real value<sup>28</sup> for a humble student of this practically prehistoric era of the Aegean, Thucydides' arguments and reasoning (though affected undoubtedly by the values of his own culture) seem to be more settled and balanced than the presently common trend to write with "Philohellenic" or "Pansemitic" concept, by scholars who would select only those archaeological and other circumstantial data in order to substantiate their bias and ideas<sup>29</sup>. As can be learned by these scholars in other contexts, the ancient were always scientifically inferior; but as harbour technology goes, it seems as if their observance and the logical way they often solved problems presented by the elements and "Mama Nature" were more subtle than so oftenly suggested nowadays<sup>30</sup>.

27 LINDER, *op. cit.*

28 Cf. most recently J.D. MUHLY, "Black Athena versus traditionnal scholarship", *Journal of Mediterranean Archaeology* 3 (1990), p. 89-92; J. BOARDMAN, "Al Mina and History", *Oxford Journal of Archaeology* 9 (1990), p. 169-191.

29 For a recent summation of the subject, with comprehensive bibliography, see D.J. BLACKMAN, "Ancient harbours in the Mediterranean", *IJNA* 11 (1982), p. 79-104, 185-211.

30 See e.g. A. RABAN, "Coastal processes and ancient harbour engineering", *Archaeology of Coastal Changes*, B.A.R. International Series 404 (1988), p. 185-208.

## The archaeological data

The archaeological research of harbours and maritime installations is actually in its infancy. A serious comprehensive field research has been carried out in only a few of the hundreds of potential sites in the Aegean and the Eastern Mediterranean. Of these which were studied there is not one of the Bronze Age in the Aegean, and only a handful at the Nile valley and the Levant<sup>31</sup>. There are good reasons for this:

1. The prevailing notion among scholars that the Bronze Age harbours were merely natural havens in shelter bays and sandy beaches, on which the ships of the period landed. According to this assumption about "Proto-harbours", there are no significant man-made installations to look for and at most one might study the paleotopography in order to be able to conclude where the actual harbour of a coastal city might have been at the time.

2. The modern notion of "New Archeology", which is generous enough to give room for earth sciences was not shared by the directors of some major excavation projects, or else was half-heartedly presented as a supplement for the final excavation report, in some cases more as a nice decoration, rather than as data to be incorporated in the discussion and conclusion sections of the archaeological study<sup>32</sup>.

3. In many sites the field study of harbours involve an amphibious survey and excavations. The search for the paleotopography of coastal site demands geomorphologic, sedimentologic, biological and archaeological study both on land and in near-shore seafloor. The complex and technically rather expensive interdisciplinarian research which is needed is too often beyond the grasp of archaeological project expected to yield museum pieces and impressive architectural remains.

4. In most Mediterranean states the regulations are such that there are separate permits to apply for in order to excavate or even survey under water. The non-archaeological survey (geomorphological, geological, sedimentological, etc.) might be carried out by an entirely different group of scientists with no real collaboration with the archaeologists excavating the ancient site, due to the fact that it will be outside the jurisdiction of the local archaeological service. It is not surprising therefore that while not a single archaeological excavation of submerged structures was to be carried in Greek waters, there is an impressive and rapidly growing bulk of geomorphologic and paleotopographic studies carried in this country, even if mostly on land only<sup>33</sup>. The catch is that these scholars are not allowed to collect man-made data (archaeological finds) which would enable them to substantiate the historical collaboration of the reconstructed paleotopography.

5. Too often there are no visible indications as to where one should precisely look for the ancient harbour of a coastal site. The changing topography and the rate of siltage and marine erosion demands a tedious and rather frustrating preliminary survey, usually of non predictable scope<sup>34</sup>.

31 BLACKMANN, *op. cit.*, p. 90-93.

32 Cf. J.A. GIFFORD, in V. KARAGEORGHIS and M. DEMAS, *Excavations at Kition V The Pre-Phoenician Levels* (1986).

33 Cf. PSYCHOYOS, *op. cit.*; J.C. KRAFT, "Geological reconstructions of coastal morphologies in Greece and Turkey", *Déplacements des lignes de rivage en Méditerranée d'après les données de l'archéologie* (1987), p. 155-157; BOUSQUET, DUFAURE and PECHOUX, *op. cit.*; A.N. COLLOMBIER, "Modifications des lignes de rivage et ports antiques de Chypre : état de la question", *op. cit.*, p. 159-172.

34 Cf. J.A. GIFFORD, *Paleography of Archaeological sites of the Larnaca Lowlands, Southeastern Cyprus*, Ph. D. Thesis, University of Minnesota (1978).



With these facts in hand, every paper on Bronze Age harbours will be in this stage merely a tentative one. The readers might consider it more as a working hypothesis, to be reviewed and updated, hopefully in the not too distant future.

Recently J.W. Shaw has published an excellent comprehensive paper surveying most of the published data concerning Bronze Age harbours in the Aegean and Crete<sup>35</sup>. So there is no reason to repeat it here, but rather to add the relevant data from the Levant to it.

The earliest securely dated harbour works from the Levant belong to the extensive phase of urbanization along the coast, very early in the second millennium B.C.E. (the period known as MBIIa, roughly contemporary with Middle Minoan Ia-b).

As we presently assume, that period of time followed one during which there were some radical climatic changes that affected the topography of the Levantine coastline. Eventually these changes had left the coast to be more or less at its present line, but with almost no sand. Most of the lower courses of the rivers crossing the coastal plain were flooded by sea water and became estuaries. Maybe this favourable feature was one of the triggers for the rapid urbanization process, presenting the new settlers with a series of good natural havens.

The study of these settlements have suggested that this was the case. Almost all the MBIIa coastal settlements had been located at either the north side of such estuaries, on the lee of the direction from the wave-carried sand and so away from the rapidly built sand spit that hampered the navigation into the river. Other settlements were located somewhat upstream, maybe as far inland as one could sail with a laden boat. The dynamics of the coastal processes demands a constant measure to be taken in order to keep these estuary havens from becoming silted up and their entrance being eventually blocked by coastal sand bars<sup>36</sup>.

Such measures had been taken in Akhziv, Misrefot-Yam, Tell Abu Hawam, Tel Nami, Michmoreth, Tel Poleg and probably in other places which are not yet properly studied. The type of prevention measures depended on the local topography of each site, but the common issue demanded alternation of the topographic features, much earthwork, quarrying and dredging of still-water basins, and establishing siltfree navigational channels, which would connect these basins to the open sea. The basic solution was to block the natural river course, somewhere upstream the harbour basin, by a solid dam that would keep off the alluvial sediments, and to dig an alternative outlet if necessary. Then it was demanded to establish the navigational channel, connecting the harbour basin to the open sea, so that it could be kept free of wave carried silt. Such channels, if confined well enough, by limited width and rocky or stone built retained banks, might have been flushed by the overflow of water above the dam, in order to keep them silt free. Akhziv (Pl. XXXIV, a) is a good example for such a solution.

It is always difficult to securely date earthworks and rockcut installations, unless within the immediate context with non-disturbed occupation levels. In the case of Akhziv it was archaeologically documented that the MBIIa fortifying rampart of the tell was built on its east side, the one next to the alleged harbour basin, by silt that was quarried in order to expand and deepen this basin<sup>37</sup>. In other sites, such as Tel Nami, there was no occupation after the Bronze Age<sup>38</sup>. If one recalls the fact that the MBII in the Levant was a period of major earthworks demanded for building the fortification ramparts so typical as the urban defensive system of the period, the scope of establishing quarried harbour basins and navigation channels is of no

35 J.W. SHAW, "Bronze Age Aegean Harboursides", *Thera and the Aegean World III* (1990), p. 49-74.

36 A. RABAN, "The ancient harbours of Israel in Biblical Times", *Harbour Archaeology*, B.A.R. International Series 257 (1985), p. 11-23; "Alternated river courses during the Bronze Age", *Déplacements des lignes de rivage en Méditerranée d'après les données de l'archéologie* (1987), p. 173-189; "Akko in the MBIIa Period", *Michmanim IV* (1991) (forthcoming).

37 M.W. PRAUSNITZ, "The planning of the Middle Bronze Age town of Achzib and its Defenses", *Israel Expl. Jour.* 25 (1975), p. 211-225.

38 M. ARTZY, *Israel Explor. Jour.* 40 (1990), p. 73-76.

surprise and would fit in well with the scheme as an additional source of materials for these ramparts.

The MBIIa ramparts of the port town of Akko, for example, contained over one million cubic metres of beach sand <sup>39</sup>. Such a volume if quarried at the nearby shore, would create a hollow of let say 200 x 100 metres long and 5 metres deep. Such a hollow would be more than sufficient for a harbour basin.

During the 1989 season of excavations in Akko we did find evidence for such quarrying that took place all through the Middle and Late Bronze Ages. Not only from the beach nearby, but also from the bedrock within the southern half of the tell itself. Rubble stones were found *in situ* incorporated in 13th century structures, coated by marine *ostrea* shells that were undoubtedly still alive, when these stones were quarried. Being 10-12 metres above sea level and with no other indications for the area to have been flooded by seawater to that level in a later period, the alternative explanation is that the people of the Bronze Age Akko had quarried stones below the sea level of the time. When there was no shortage in sources for building materials of the same quality on dry land at the site.

The concept of quarrying a harbour basin beside a riverine navigation route is known from the Indus valley and dated to about the same period, or somewhat earlier <sup>40</sup>. Docks, or harbour basins were excavated by the Sumerian people of Ur in south Mesopotamia, already in the 3rd millennium B.C.E., and navigational channels were quarried from the Nile to the site of the great Pyramids in Giza and other locations already in the 27th century B.C.E. <sup>41</sup>. The largest known basin of this type is the one called Birket Malkata in western Thebes (in the valley of the west side of the Nile), dated around 1400 B.C.E. <sup>42</sup>.

In regard to the major earthworks of the MBII period, it is interesting to note that no such works and actually no other types of major fortifications which might be attributed to the Late Bronze Age period have been traced in coastal sites excavated till now in Israel. The same is true for harbourworks, except in the case of Dor, where such works are dated to the later phase of that period (and see below).

There was another type of siting for MBA harbours in the Levant, though in most cases it had been already in use earlier, during the Early Bronze Age.

This type is a rocky bay, or a promontory with seasonally protected waters on either side of its lee. Of this type one may count Byblos, probably one of the most important Emporia in the Levant for Egyptian seaborne trade since the time of the Old Kingdom; and other north Canaanite sites, such as Ullaza and Ras Ibn Hani; and Ashkelon and Yavneh-Yam on the south coast of Israel. The problem is that such sites lack the protecting deposition of sediments, so the odds for finding archaeological evidence for harbour installations or even for ancient maritime activities are rather meagre.

Similar siting characterizes the Aegean settlements of the Early Helladic Period, such as Ayia Irini, on the island of Kea, Manika on Euboea, Ayios Kosmos and Askitarion in Attica, and Kolonna on the island of Aegina. In Crete the near-shore islands of Mochlos and Pseira are good examples for this type of siting <sup>43</sup>. The Early Minoan site of Myrtos might have been also of a peninsular type at the time <sup>44</sup>.

Yet, when considering the overall corpus of coastal settlements in the Aegean and Crete during the Middle Bronze Age, the predominant type of siting which characterizes the Levant is

39 A. RABAN, "Akko in the MBIIa Period", *Michmanim* IV (1991) (forthcoming).

40 S.R. RAO, *Lothal and the Indus Civilization* (1973), chapt. 3.

41 BLACKMAN, *op. cit.*, p. 90-92.

42 B. KEMP and D. O'CONNOR, "An ancient Nile harbour: University Museum excavations at the 'Birket Habu'", *IJNA* 3 (1974), p. 101-136.

43 SHAW, *op. cit.*, p. 9, 49-50.

44 P. WARREN, *Myrtos: An Early Bronze Age Settlement in Crete*, BSA Suppl. 7 (1972).

the more common one also in this area. Of such siting one would count Pylos<sup>45</sup> and Elaphonisos<sup>46</sup> in the south Peloponnisos, Lerna and Tyrins in the bay of Argos<sup>47</sup>; Smyrna, Ephesos and Miletos, on the east coast of the Aegean<sup>48</sup> (Iasos was probably also of the same topographic type during the Bronze Age)<sup>49</sup>. In Crete most of the major coastal sites were located in this type of siting. Such is the case for Kydonia, Rethymnon, Amnisos, Nirou Khani, Itanos, Kato Zakro and Malia<sup>50</sup>. The selected sites for these harbours were mostly a combination of river outlet (ancient estuary ?) and a near-shore reef, or an islet (Pl. XXXIV, b).

Probably the best example for Middle Minoan harbours is that of Malia. This palatial centre, with its surrounding town, is under excavation for over half a century by the French school. Yet no serious attempts were made until recently (and see Michel Hue's and Olivier Pelon's contribution in this volume) to study the maritime aspects of the largest coastal site in Minoan Crete. Not long ago it was claimed that Malia never had a real major harbour<sup>51</sup>. Such a claim was made based on the present topography of the site. At the same time a discovery of what seems to be the foundation course, built of large rubble blocks, of a rectangular structure, divided into a parallel series of narrow galleries, has been understood as a probable boat house of the Minoan period<sup>52</sup>. There are potential parallels for this type of installation at nearby Nirou Khani and at Kommos. The deepest part of this submerged structure is presently under 1.3 metres of water or more. These stone walls were laid on a sandy seafloor and undoubtedly suffered some excessive subsidence due to fluidation and undertrenching, as it is always the case with structures which are laid on non-consolidated substratum, where wave energy and currents are present. Actually the very fact that this structure, as well as those found on the sandy beaches at Nirou Khani and Amnisos, are tilted down toward the open sea, indicates that such a process did take place. Yet data from other coastal sites in central Crete support a good case for vertical subsidence of Malia's coast by as much as one to two metres, since the Minoan era<sup>53</sup>.

Taking such a displacement into consideration, one might understand why there is on the west side of the site an extensive hollow, which is at present of a marshy type, with its drainage channel to the sea seasonally blocked by sand. Next to this hollow, to the north, there is a small sandy bay (on the bottom of which the above mentioned structure was found, and see Pl. XXXV). This bay is separated from the much larger one, further to the west, by a low rocky ridge. Some time in the past three through channels were quarried across this ridge. A narrow (1.6 m wide) channel was cut next to the east side of the rocky outcrop, diagonally toward the sea, within the small bay. Though the cutting continues well below the present sea level, it was argued that it was made only after the second world war (Pl. XXXVI, a). About 20 metres farther to the west there is a channel 5-6 m wide, and almost 40 m long, leading due north, through rocky substance. The bottom of this channel is partially silted at present by scattered blocks and sand, being with less than two metres of water. Some random probes with

45 KRAFT *et al.* (*supra* n. 5).

46 NIEMI and FINKE, *op. cit.*

47 FLEMMING *et al.* (*supra* n. 11), p. 9.

48 FLEMMING *et al.* (*supra* n. 11), p. 22 (for Smyrna), 33-34.

49 M. MELLINK, "Archaeology in Anatolia", *AJA* 92 (1988), p. 115.

50 N.C. FLEMMING and P.A. PIRAZZOLI, "Archéologie des côtes de la Crète", *Histoire et archéologie, Les dossiers* 50 (1981), p. 66-81.

51 For the arguments for and against see H. van EFFENTERRE, *Le Palais de Mallia I* (1980), p. 75-79; *EtCrét* XIX (1974), p. 9-13; A. RABAN, *IJNA* 12 (1983), p. 230-240, Fig. 11; SHAW, *op. cit.*, p. 9, 51-52, Fig. 11-12.

52 A. GUEST-PAPAMANOLL and R. TREUIL, *BCH* 103 (1979), p. 668-669.

53 FLEMMING and PIRAZZOLI, *op. cit.*, p. 68-69.



a metal stick showed that the bedrock at this base is much deeper (and no less than 3 m below MSL).

On the west side of the channel there is a quarried ledge, which is paved by square ashlar slabs along its south part (Pl. XXXVI, b). This channel functions during the winter as a drainage for the overflow of rainwater flooding the nearby hollow (Pl. XXXVI, c). A wider channel, or a natural opening across the low ridge is about 15 m farther to the west. It is 12-15 m wide and though at present being blocked on its lee by a substantial sand bar, the locals claim that sometime during rainstorms the combined forces of the seawaves and the overflow from the marshy hollow do clear some of this bar away (Pl. XXXVI, d-e).

It seems that a simple survey with a series of water probes might yield the necessary information concerning the presently buried configuration below the beach sand <sup>54</sup>. A retaining wall has been traced along the back of the small bay, probably as a protective measure aimed to keep off the deposited sand from silting the estuarian hollow that was used as a harbour basin. Channels 2 and 3 were probably used for navigation, and maybe also for maintaining ample circulation of water within the basin, as a flushing agent. It seems that even when sea level was two metres lower, such a system would have properly functioned with the hampering process of siltation being a lesser menace.

On the east side of Malia there is another stream, reaching the sea beyond the Chrysolakkos, in a rocky area. The outlet of this river is protected on its east side by the promontory of Ayia Varvara, on which Middle Minoan sherds and stone walls are visible, scattered on the surface (Pl. XXXVII, a). This promontory defines a small bay, with an off-shore rocky islet on its NW side. This body of water had been divided in antiquity by an artificial rampart, about 150 m long, which ran from the lee of the islet to the centre of the river bed (Pl. XXXVII, b). There is a retaining wall across the eastern half of the river bed, at the present waterline, blocking the riverine load of sediments during winter flooding from reaching the eastern part of the bay, between the rampart and the promontory. These artificial features seem to serve the aim of creating a weather protected and silt-free basin, which was probably used as a mooring place for sea-going vessels. Calculating a lower sea level, by about 1.5 m for the Minoan period would still give ample topographic configuration for that basin to serve its portual purpose, with both the rampart and the wall retaining the riverine silt functioning even better.

The above description, of what may have been the layout of the two Minoan harbours of Malia, falls within the general concept of river outlets being used as favourable sites for Middle Bronze Age in the Levant and the preventive measures for retaining the topographic feature from being affected by coastal processes are also of the same standard of sophistication and understanding.

One is intrigued by the resemblance of the topographic features of sites such as Itanos and Kato Zakro with those of the western harbour of Malia. In Itanos (Pl. XXXVII, c) there is presently a submerged river outlet on the south side of the ancient acropolis. The subsiding coast and the disrupted gradient of the river left for the present a marshy coastal lagoon which is gradually silted by alluvium of winter floods (Pl. XXXVII, d). Similar case might be reconstructed for the palatial site of Kato Zakro, on its south side, as it has been suggested by Flemming and Pirazzoli (Pl. XXXVIII, a) <sup>55</sup>. This river outlet character with the associating high level of ground-water, reeds and palm trees, brings to one's mind the famous mural depiction - the miniature fresco from the West House of Akrotiri. Recently Shaw has made a very interesting attempt to identify the three coastal towns depicted in this fresco with localities

54 See e.g. A. RABAN, *The Harbours of Caesarea Maritima 1 The Site and the Excavations*, B.A.R. International Series 491 (1989), p. 235-238.

55 *Op. cit.*, p. 78.

around and at Akrotiri <sup>56</sup>. There is no room to argue for or against his proposal, especially when it is quite reasonable to assume that the scene is more generic than realistic and the depicted towns characterize the general type of coastal settlements involved in maritime activities within the Minoan cultural and geographic sphere.

The town depicted on the left side of the fresco from the south wall of room 4 is referred to as the second town by Shaw, upon which the processional fleet is passing by <sup>57</sup>. In my mind there is no reason why this town cannot be the sailing-off place of the procession, with one of its local vessels tailing the festivities with a rowing team of no ceremonial ornamentation <sup>58</sup>. But this is trivial. The important point is, as Shaw emphasizes, that this coastal town is actually located not on the seashore but rather on a river bank, with the typical vegetation of reeds (?) depicted on the water line (Pl. XXXVIII, b).

There is no reason why not to use this as a generic illustration for harbour sites such as Kato Zakro, Itanos, Malia, Amnisos, Pylos, Lerna and even the contemporary harbours at Akhziv, Nahariya, Tel Abu Hawam, Tel Nami, Michmoreth and Tel Gerisa in Israel <sup>59</sup>.

As for the "Arrival" town, number three, on the right hand side of the same fresco, the topographic features, the built quay on the waterfront and the protected bay next to it - deep enough for boats to moor afloat, on their anchors, rather than being dragged on the beach - might illustrate the type of installations that characterized the east harbour of Malia, the one at Asine in the Argolid, Kition in Cyprus and the south one of Dor, Israel, as well as the suggested harbour of Akrotiri herself (Pl. XXXIX, a-b) <sup>60</sup>.

As for the types of procession vessels which are depicted on that fresco, much has been written in recent years, including my own interpretation <sup>61</sup>. Yet, it will be proper to indicate once more that the only way one can explain all the components, devices and characteristics of these vessels is by considering them as double intended types of frequent altering sailing direction, with the stern turned to be the prow and vice versa. That is suitable for navigation in and out of a narrow river course.

As for the idea that the main building depicted on the other fresco from the same room (the north wall) is to be interpreted as a ship shade, with parallels at Kommos, Malia and Nirou Khani <sup>62</sup>, it is quite convincing and would make sense for a maritime culture deeply involved with seasonal sea-borne trade and probably also sea battles against pirate fleets. Sophisticated marine vessels, either for long-range, heavy laden voyages in open waters (such as between Crete, Egypt and the Levant), or for swiftly manoeuvred fighting in open waters, would have to have dry shaded hangars for proper storage during the idle winter and mid-summer seasons <sup>63</sup>. Though less vital for the coastal and occasionally year round nautical activity in the Levant and the Nile Valley, such ship's sheds well might be found there in future archaeological excavations.

56 SHAW, *op. cit.*, p. 9, 53-56, Fig. 16-21.

57 MARINATOS, *op. cit.*, p. 43-47, Pl. 9.

58 Cf. L.M. BROWN, "The ship procession in the miniature fresco", *Thera and the Aegean World I* (1978), p. 630-634; A. RABAN, "The Thera Ships: Another Interpretation", *AJA* 88 (1984), p. 11-19.

59 For the Cretan sites see illustrations in FLEMMING and PIRAZZOLI, *op. cit.*; for the Peloponnian sites see FLEMMING *et al.* (*supra* n. 11); and for the Israeli sites see A. RABAN, "The ancient harbours of Israel in Biblical Times", *Harbour Archaeology*, B.A.R. International Series 257 (1985), for Akhziv, Naharia, Tel Nami and Michmoreth; A. RABAN and I. GALANTI, *Israel Expl. Jour.* 37 (1987), p. 179-181, for Tel Abu Hawam; and Z. HERZOG, *Israel Expl. Jour.* 33 (1983), p. 121-123, for Tel Gerisa.

60 For Asine, see FLEMMING *et al.* (*supra* n. 11), p. 7; for Kition and Dor see further on.

61 *Supra* n. 58.

62 SHAW, *op. cit.*, p. 9, 54-56.

63 And see VITRUVIUS, *De Architectura*, V. 12. 7.

Toward the end of the Bronze Age period, the trade relations between Crete, the Aegean, Cyprus, the Levantine coast and Egypt intensified and seem to have reached the level of imperialistic economical relations (in which Egypt was the centre). Yet, we cannot point out new harbour sites which might have been built in that period, either in the Levant or in Crete.

Earlier harbours had gained new installations and it seems as if a new technology for maritime structures was introduced into Cyprus and the northern half of the east coast of the Mediterranean. This new technology was characterized by ashlar built quays, seawalls and stone slab-paved landing stages. These technical innovations might have been introduced from Egypt, where ashlar quays were in use already in the 14th century B.C.E., both at Thebes and, on the other side of the Nile, in Birket Habu <sup>64</sup>. In Ugarit, at its "White Harbour" (Minet-el-Beida), at least two long walls of ashlar "Headers" were exposed not far from the present water line and in some context with harbour magazines of the final phase of the city (13th century B.C.E.). Yet, the ashlar walls might predate these magazines and were probably built during the 14th century B.C.E. The overall architectural context of these structures seems to incorporate also the Mycenaean type of tombs of ashlar chambers with false arched gables <sup>65</sup>. Ashlars were then in frequent use also in palatial structures and in the latest fortifications of the main site of Ugarit in Ras Shamra <sup>66</sup>. Similar structures were recently excavated at the 13th-12th centuries occupation levels of the North Syrian coastal sites of Ras Ibn Hani and Ras Basit <sup>67</sup>.

The best documented harbour installations of that period in the Levant are those of Dor, in Israel <sup>68</sup>.

The historical importance of Dor derives from two main sources:

1. In the Bible Dor, being one of the 31 Canaanite cities that Joshua had managed to conquer, is the only with the unique epithet "Napha" (12.24) which though in later Hebrew has the meaning of "District" is quite probably a loaned proto-Greek word with the meaning of "Park Forest" (such as Oak grove) in that particular context, being synonym with the Biblical term "Sharon" <sup>69</sup>.

2. Dor is the only settlement in the Levant that was depicted as a port of the Sea People. The famous Wen-Amon papyrus dated to about 1100 B.C.E. describes the city as being of the Sikulli and having a harbour, into which the Egyptian official entered with his ship and in which he was robbed by one of his crew members. The same ethnic groups (SKL) is known from Papyrus Harris as one of the Sea Peoples who had attacked Egypt during the reign of Ramesses III, three generations earlier. They are also mentioned in at least two Ugaritic texts dated to the end of the 13th century as exercising piracy and being mariners <sup>70</sup>.

64 KEMP and O'CONNOR, *op. cit.*; G. GOYON, "Les ports pyramides et le grand canal de Memphis", *Revue d'Egyptologie* 23 (1971), p. 137-153.

65 C.F.A. SCHAEFFER, *Syria* 18 (1937), p. 135-137, Fig. 5-6.

66 ID., *Ugaritica* IV (1962), p. 105-150, 171-174, Figs. 7-8.

67 A. BOUNI *et al.*, *Syria* 56 (1979), p. 224-236; P. COURBIN, "Ras Bassit", *Syria* 63 (1986), p. 175-220, Fig. 13; G. HULT, *Bronze Age Ashlar Masonry in the Eastern Mediterranean, Cyprus, Ugarit and Neighbouring Regions* (1983); A. RABAN, "The constructive maritime role of the Sea Peoples in the Levant", *Society and Economy in the Eastern Mediterranean (c. 1500-1000 B.C.)*, *Proceedings of the International Symposium held at the University of Haifa*, 28.4-2.5.1985 (1988), p. 276-284.

68 ID., *IJNA* 10 (1981), p. 293-308; 12 (1983), p. 229-241; *Biblical Archaeologist* 50 (1987), p. 18-126; and E. GALILI, *IJNA* 14 (1985), p. 332-349.

69 M. BEN-DOV, "Napha - a geographical term of possible 'sea people' origin", *Tel Aviv* 3 (1976), p. 70-73.

70 M. DIETRICH and O. LORETZ, "Das 'seefahrende Volk' von sikila", *Ugarit Forschungen* 10 (1978), p. 53-56; G.A. LEHMANN, "Die Sikilayu, ein neues Zeugnis zu den 'Seevolken' - Heerfahrten im späten 13. Jht. v. Chr. (R.S. 34129)", *Ugarit Forschungen* 11 (1979), p. 481-494.



During the archaeological excavations of the site a series of at least three successive quays have been studied, dated to the 13th, early 12th and late 12th centuries B.C.E. respectively.

In the earlier phase there was a quay, paved by ashlar slabs, which were laid on courses of slim headers. This quay, over 40 m long and 10 m wide was flanked by two rectangular structures of a very massive type, built of ashlar headers 1.2 x 1.2 x 3 m each. The western structure incorporated in it a rectangular fresh water well, which was dug down to the bedrock and was paved with rectangular slabs within, much like the contemporary structures in Enkomi <sup>71</sup>, Hala Sultan Tekke and Kition in Cyprus. The best parallel for rectangular wells near the sea are those found in Kato Zakro <sup>72</sup> and Hala Sultan Tekke <sup>73</sup> (Pl. XL, a).

There is clear continuity between the first and the later two architectural phases of the quays in Dor; and the well was in use through the entire period. It seems as if the main reason for the repeated renovation of the quays was the gradual rise of the sea level (total vertical rise of over one metre within about 150 years, relative to the local coast) <sup>74</sup>.

Although the later quays were built largely by reusing blocks from earlier ones and on the same general plane, the third, latest installations included at least one new element - a 9 x 5m free standing structure, which was paved by large slabs of rectangular shape <sup>75</sup>. Each of these slabs had two of their corners scarfed off to have a rectangular recess. On the surface of these slabs there are two pierced holes next to each other as if for inserting some hoisting device through them (Pl. XL, b). Slabs of exactly the same peculiar shape and sizes were found paving the so-called "Bastions" of the earlier (Achaean) wall at the temples site of Kition (area II). These "Bastions" were built inside the marshy ground of a silted hollow, an ancient lagoon, on a bay that might have been used as a harbour during the early stage of the site <sup>76</sup>. The numerous stone anchors that were found both in this hollow and in secondary use at the temple site itself (some were settled as votive gifts in shrine 4) may confirm our notion that the "Bastions" were actually quays <sup>77</sup>. The fact is that their elevation and architectural orientation make it impossible to reconstruct them as bastions which were supposedly incorporated with a cyclopiian wall, which runs a few metres away and its base course is higher than the paved surface of these alleged Bastions (Pl. XL, c).

The resemblance of the paving slabs from Kition and Dor is so exact in detail that one might argue that they were fashioned and cut by the very same people.

The archaeological finds at Kition and Dor were possible due to the fact that changing topography had made their sites unsuitable for a harbour already before the end of the second millennium B.C.E. In other harbour sites of the time such changes were probably less effective and later harbour works had covered the LBA ones. Such is the case at Tyre, Sidon and Byblos (?). Yet, there is no doubt that more harbour installations will be discovered in the years to come through a properly carried field study.

## Conclusions

In this paper there was an attempt to bring together two geographically distanced cultural units and to match them through the narrow technical aspect of their harbours. There are two reasons why such a matching might be legitimate:

71 P. DIKAIOS, *Enkomi Excavations 1948-1958* (1968-1971), p. 521, 895, 907-912.

72 N. PLATON, *Zakros. The Discovery of a Lost Palace in Ancient Crete* (1971), p. 192-199.

73 G. HULT, *Hala Sultan Tekke IV* (SIMA XLIV:4, 1978), Fig. 6, 8, 14.

74 RABAN and GALILI, *op. cit.*, p. 348, Fig. 26.

75 RABAN, *op. cit.* (supra n. 67), Fig. 6-7.

76 V. KARAGEORGHIS, *Kition: Mycenaean and Phoenician Discoveries in Cyprus (New Aspects of Antiquity)* (1976), p. 53-55, Pl. 42.

77 *Op. cit.*, p. 60, 69, 72.

1. The coastal processes and the way they might affect harbours are basically the same all over the world and much more so within the Eastern basin of the Mediterranean. It is therefore logical to assume that similar challenging problems will be solved in a comparable way by distanced contemporaneous cultures.

2. The geographic distance might be measured not by miles or kilometres, but by the travelling time across it. Land voyage from the Nile Valley to Phoenicia might have taken two to three months in ancient times and would have been cumbersome, involving the crossing of hostile territories and depending on carrying means which were limited to muscular energy. In the sea, such a voyage may have taken a few days without trespassing alien territory and aided by the non limited energy of the wind for shifting cargos of any size, shape and weight.

In that respect, the distance between the Levantine coast and Crete was by far shorter than any international trade route on land, within the Levantine countries.

Being so easily crossed by maritime voyage, this geographical gap was not a true cultural one as generally accepted. Knowing nothing about the geographic understanding of the Minoans, or of their Canaanite counterpart, we have to use the indirect sketchy textual documents from either the geographically isolated Nile Valley, or the ambiguous and heavily biased stories in the Bible, complemented by a few entries from the Royal archives of Mari and Ugarit. The Egyptian sources refer to Keftiu (Crete) only as late as the time of the 18th dynasty, yet Cretan artifacts were found in 12th dynasty sites in many places along the Nile Valley (such as Kahun, Gurob, Abydos and even in the oasis of Farafra) <sup>78</sup>. Egyptian artifacts of that period were found at Cretan Middle Minoan context including the statue of an Egyptian official who might have been the royal emissary as the commercial ambassador to Knossos. Similar Middle Minoan II artifacts were found in Levantine trade centres, such as Byblos, Ugarit and even the inland Qatna (on the Orontes river) <sup>79</sup>.

Sargon I of Akkad (Agade) mentioned Crete (*Kap te-ra*, the Biblical Kaphtor) together with sources of metal ores from over the Mediterranean, already in the 24th century B.C.E. <sup>80</sup> and a broken Akkadian cuneiform inscription of around 1800 B.C.E. was found in the island of Kythera <sup>81</sup>. An early Babylonian cylinder seal of about the same period was found in Tholos B at Platanos, in the Messara valley in Crete <sup>82</sup>. In the Royal archive of Mari, on the Euphrates, Crete was referred to as a source of excellent composite objects of various metals and also as a residence of the king's agent to whom a shipment of lead was sent from Mari (a similar shipment was probably sent to the Carians, which, according to Thucydides, had been expelled from the Aegean islands by Minos) <sup>83</sup>.

According to the Biblical Ethnographic and genealogical list (Genesis 10), Crete was an offspring of Egypt. In two later entries, Crete is referred to as the place of origin for the Philistines, the best known ethnic group of the Sea People and the only one to be mentioned in the Bible (Amos, 9.7; Jeremiah, 47.4).

78 A good survey of these artifacts in W. CULICAN, *The First Merchant Ventures - The Ancient Levant in History and Commerce* (1968), p. 19-32, 42-50.

79 *Op. cit.*, p. 27-28. One might add the recent discovery of the Minoan Palace at Tel Kabri (see W.-D. NIEMEIER in this volume).

80 W.F. ALBRIGHT, "A Babylonian geographical treatise on Sargon", *Jour. Amer. Oriental Studies* 45 (1925), p. 244.

81 M.C. ASTOUR, "Ugarit and the Aegean", *Orient and Occident* (1973), p. 20; E. WEIDNER, "The Inscription from Kithera", *JHS* 59 (1939), p. 137-138.

82 J.D.S. PENDLEBURY, *The Archaeology of Crete* (1939), p. 121.

83 G. DOSSIN, *Syria* 20 (1939), p. 111-112; *Revue d'Assyriologie*, 64 (1970), p. 97-99.

So it seems that we have an ample corpus of textual and archaeological documentation for establishing a case that the sea crossing between Crete, Egypt and the Levant was not only theoretically easy and simple, but had been used as such since early days.

While these overseas connections open a vast and tempting field for study of the intercultural influences, the immediate subject to be studied must be the mutual technological contributions in the development of the very means enabling such seaborne interrelations: the ships and the harbours.

So far we have nothing to illustrate the Middle Bronze Age maritime vessels of the Levant, and from Crete we have only a rather crude iconographic depiction of Middle Minoan boats<sup>84</sup>. Yet, for harbours of the time, in both areas we have some initial archaeological data to work on. The data, surveyed above, suggest a close technical and conceptual resemblance for the type of siting and the layout of the portal installations in the Aegean, Crete and the Levant. I do not think it is important to argue which cultural centre was the innovator of whatever technical or conceptual character of the Middle Bronze Age harbours. So far we have no evidence for the case of a Thalassocracy in the eastern basin of the Mediterranean for either the Minoans, the Canaanites, or the Egyptians. If one will deduce from the recent finds concerning Late Bronze Age shipping and seaborne trade in these waters, it would appear that such a concept was altogether alien to the Bronze Age mariners<sup>85</sup>.

One tentative conclusion can be made though: the soaring demand for maritime facilities which instigated by the rapid urbanism of the Levantine coast and the palatial economy of Crete (to which Thucydides may have referred to in his description of Minos' deeds) had brought about the new type of estuarian harbours, the extensive artificial remodification of coastal topography and the introduction of stone blocks quays in Crete and in the Levant. The proposed addition of ship-sheds, so far suggested only for Cretan sites, may have been introduced later on, during the heydays of the sea-borne trade of the 16-15th centuries B.C.E.

A later phase of soaring maritime activities came about toward the end of the imperial era in the Levant, the period when piracy and international disorder became such a menace that what Minos allegedly had done earlier in the Aegean was to be repeated on a much larger scale in the Levantine arena. This ongoing campaign seems to have lasted for over a century before a new modified equilibrium was achieved. During this period new types of ships developed, the revolutionary loose-foot sails with brailed rigging was introduced, composite anchors had replaced the older stone-weight ones<sup>86</sup>, many new coastal sites were settled in Cyprus and along the Levantine coasts, most of them by immigrating Sea People from the west who had brought with them the technical know-how and aesthetic concept of ashlar paved structures. Soon they innovated the vertical sea walls which were built by accurately cut and carefully laid ashlar headers that became later the trademark of their offsprings, the Phoenicians of the Iron Age.

Avner RABAN

84 For a detailed corpus see L. BASCH, *Le musée imaginaire de la marine antique* (1987), p. 93-106; and the papers of C. Marangou and of M. Wedde in this volume.

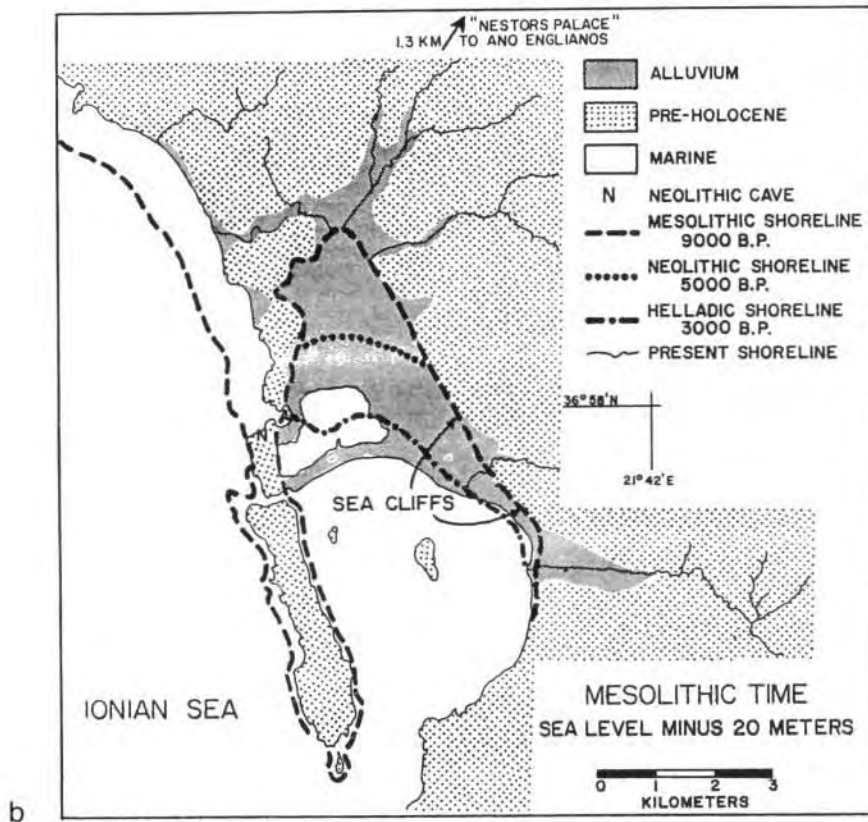
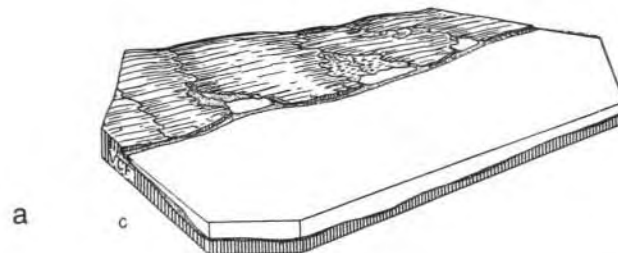
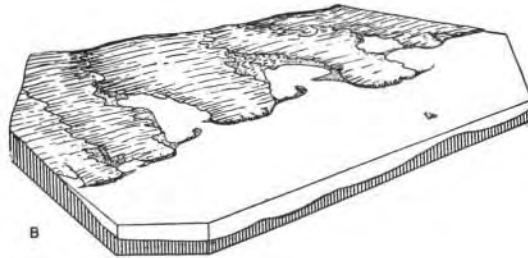
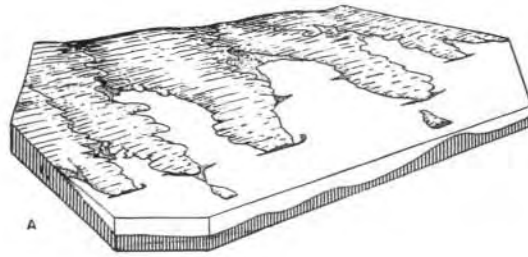
85 R.S. MERRILLEES, *Trade and Transcendence in the Bronze Age Levant* (1974), p. 7; G.F. BASS, "A Bronze Age shipwreck at Ulu Burun (Kas): 1984 Campaign", *AJA* 90 (1986), p. 296.

86 RABAN, *op. cit.* (*supra* n. 67), p. 261-272, 284-288.



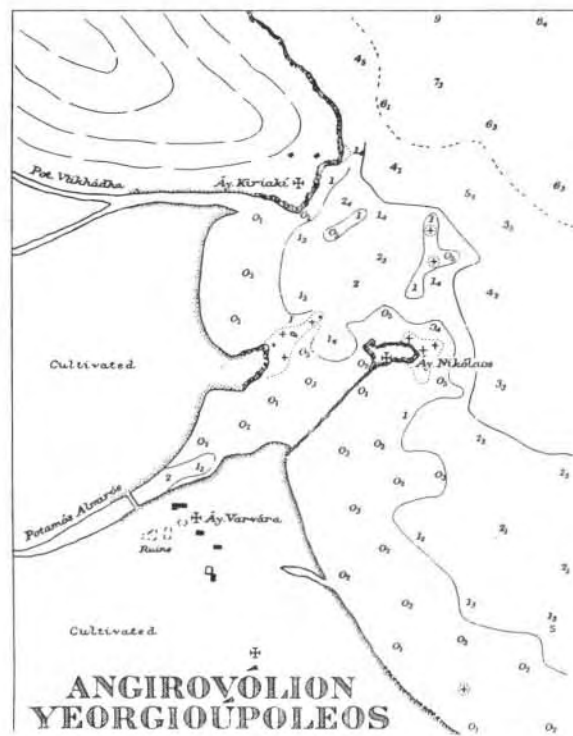
## LIST OF ILLUSTRATIONS

- Pl. XXXIII, a : Typical development of a transgressed coastline (after V.C. FINCH and G.T. TREWARTHA, *Physical Elements of Geography* [1949], Fig. 238).
- Pl. XXXIII, b : The evolution of the Holocenian Coast line at Pylos (After J.C. KRAFT, G. RAPP, Jr. and S.E. ASCHENBRENNER, "Late holocene paleogeographic reconstruction in the area of the Bay of Navarine : Sandy Pylos", *Journal of Archaeological Sciences* 7 [1980], Fig. 6).
- Pl. XXXIV, a : An aerial view of Achziv with the suggested MB II topography (photo by the author).
- Pl. XXXIV, b : Plan of the coastline of the ancient harbour of Yeorgiopolis in north-west Crete (after Admiralty chart No. 1655).
- Pl. XXXV : A plan of Malia with her suggested ancient harbours.
- Pl. XXXVI, a : Channel 1 at Malia, looking NE (photo by the author).
- Pl. XXXVI, b : Channel 2 at Malia, looking to the north (photo by the author).
- Pl. XXXVI, c : The overflow across the beach to channel 2, looking to the south (photo by the author).
- Pl. XXXVI, d : Channels 2 and 3 at Malia, from the south (photo by the author).
- Pl. XXXVI, e : The western harbour of Malia, from the East (photo by the author).
- Pl. XXXVII, a : The site of Ayia Varvara, looking SW (photo by the author).
- Pl. XXXVII, b : The bay and the submerged rampart at Ayia Varvara, Malia, looking to NE (photo by the author).
- Pl. XXXVII, c : The akropolis of Itanos, looking NE (photo by the author).
- Pl. XXXVII, d : The flooded river outlet at Itanos, looking east (photo by the author).
- Pl. XXXVIII, a : Plan of the bay of Kato Zakro and the suggested haven (after N.C. FLEMMING and P.A. PIRAZZOLI, "Archéologie des côtes de la Crète", *Histoire et archéologie, Les dossiers* 50 [1981]).
- Pl. XXXVIII, b : The "Departure" town from the miniature fresco at Akrotiri, Thera (after S. MARINATOS, *Excavations at Thera VI* [1974], col. Pl. 9).
- Pl. XXXIX, a : The bay and the submerged structure at Asine (photo by the author).
- Pl. XXXIX, b : The "Arrival" town from the miniature fresco at Akrotiri, Thera (after S. MARINATOS, *Excavations at Thera VI* [1974], col. Pl. 9).
- Pl. XL, a : Artistic rendering of the "Sea Peoples'" harbour at Dor.
- Pl. XL, b : A typical scarfed slab from Tel Dor (photo by the author).
- Pl. XL, c : One of the "Bastions" at Kition, with the base of the cyclopiian wall next to it, looking SE (photo by the author).



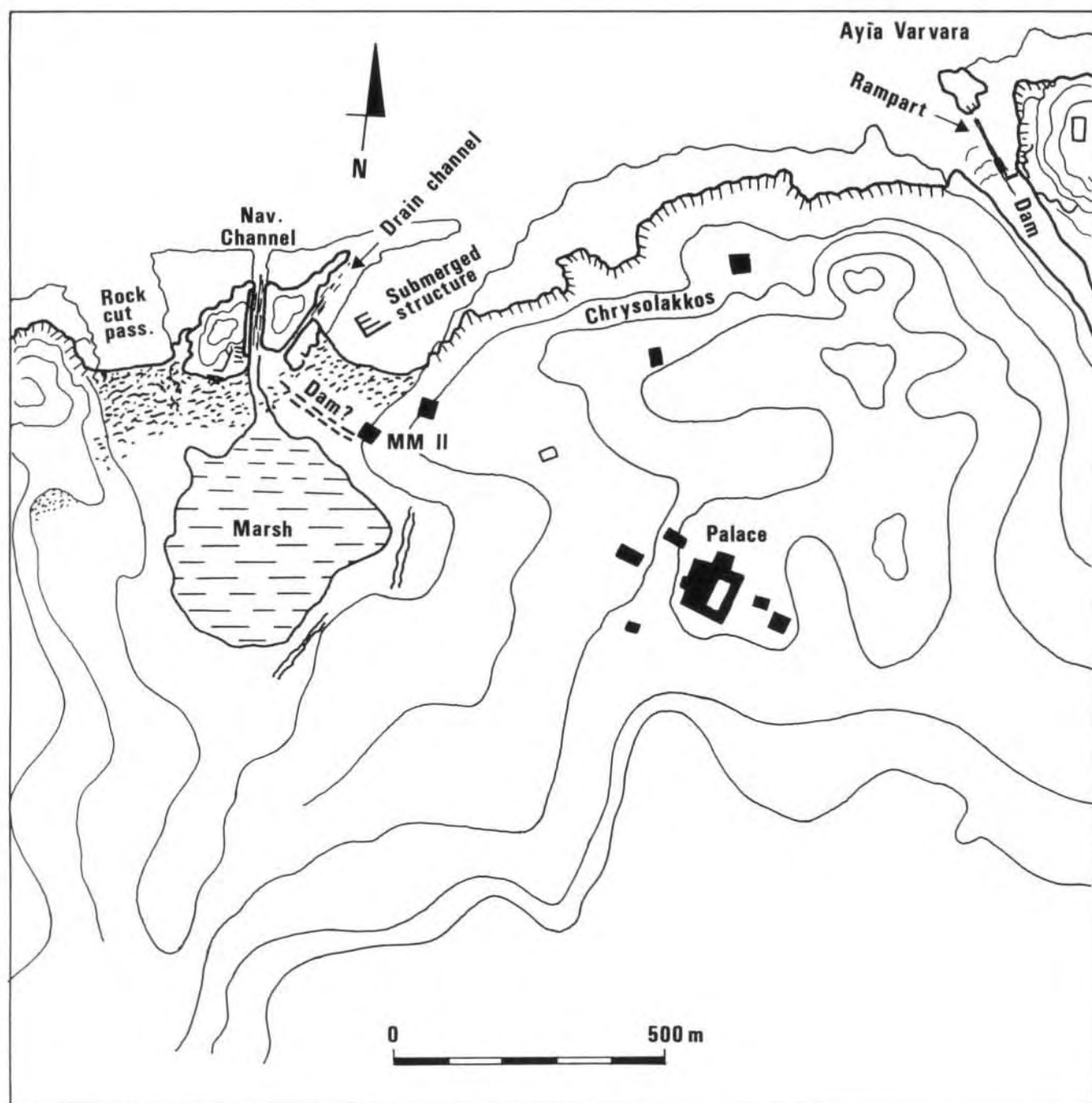


a



b







a



b



c



d



e



a



b

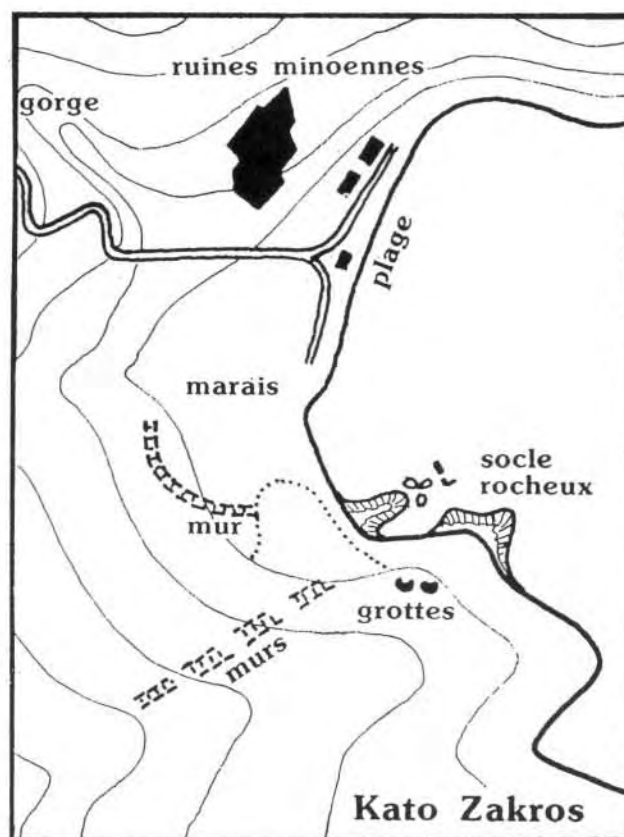


c



d





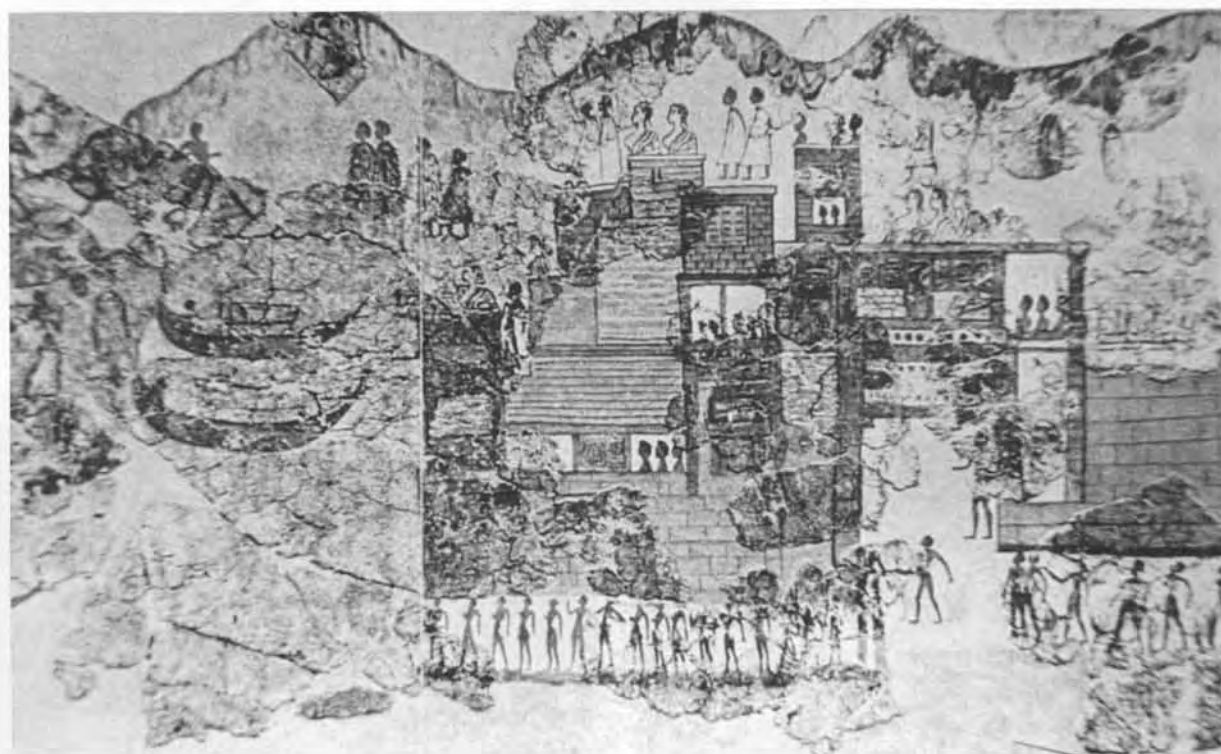
a



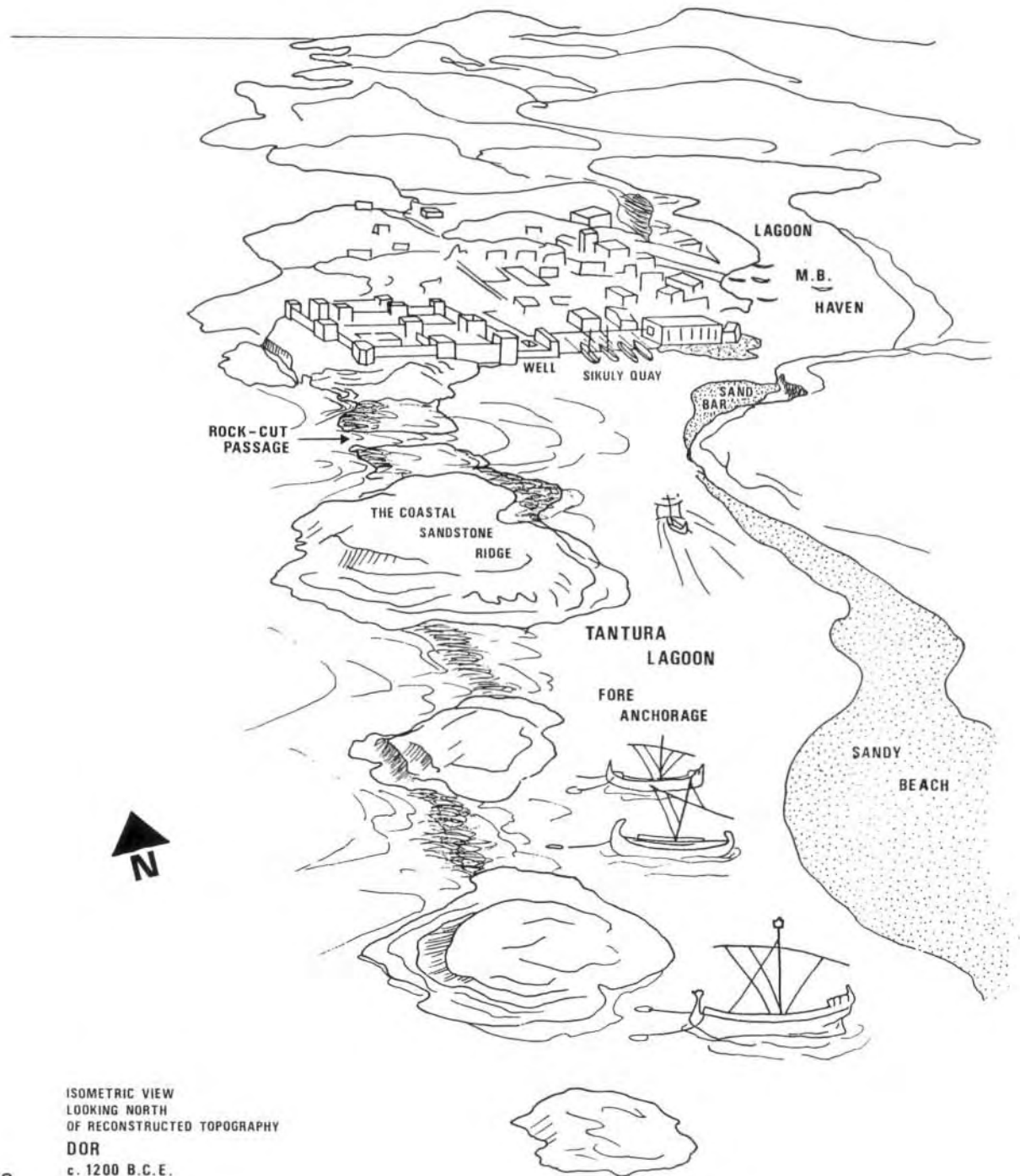
b



a



b



b



c