

# Minoan Harbour Installations in Eastern Crete<sup>1</sup>

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## Abstract

### 1. Introduction

This thesis constitutes an effort to map out the extent of the archaeological remains that have been interpreted as Bronze Age harbour installations at the eastern half of Crete. It particularly focuses on six possible cases of harbour installations; i) Poros-Katsampas ii) Nirou Khani, iii) Gournia, iv) Malia, v) Istron and vi) Kommos. During the course of my field research, all of the above sites were investigated in terms of geomorphology, coastal landscape and seascape, construction of the installations and possible connection to the closest administration centre. Moreover, based on the dimensions of the shipsheds, a discussion is conducted on the type and size of Minoan vessels that could be housed inside.

The series of questions that came up when examining the harbour installations found in Crete are the following:

- The cases under study are all found in the eastern part of the island (Chryssoulaki 2005: 82, Blackman 2011: 6). Presumably linked to the palatial sites in the area, how could one connect the palatial system and its administration centres with their harbours and shipsheds?

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- Moreover, Knossian identity is being traced in several of these harbour sites. Could this element indicate an administration control originating from specific Palaces to several harbour settlements, or was harbour administration a system run by several, smaller entities? (Watrous 2007: 103, Schoep 2010: 219)
- What information do we get for minoan ships from iconographic representations, and the harbour installations in Crete?

## 2. Methodology

My main goal when conducting my research on the harbour installations was to map the aforementioned cases in an effort to connect them with the palaces and the cities, thus create a general distribution map of Minoan harbours within the palatial territories. To collect and study the data from each site and to map the extent of the remains identified as shipsheds, as well as the palaces associated with them, I conducted two surveys in January of 2018 and March 2019. Measurements and photographs were taken for all the constructions, on land and underwater. To place each construction on the map, the archaeological and topographic plans of each shipshed site were superimposed on the corresponding GIS map. In the case of Malia submerged building and Istron's construction, the plans were turned into 3D plans to better understand the construction of its building. In order to spatially manage, represent and communicate the data, the harbour installations and palaces were mapped and placed on an interactive map in ArcGIS online. I also mapped out the aforementioned harbour constructions and the possible routes from certain palaces towards them, using the least cost path (LCP) tool on QGIS desktop programme.

## 3. Seascape Features and Factors that affected harbour selection during Bronze Age

With an area of more than 8000 sq. km, Crete's coastline extends over 1046 km, providing areas for the development of coastal settlements. These settlements were located close to some important geomorphological features that provided a sea gateway to them; the harbours (Sakellariou & Galanidou 2016: 169, 2017: 351). A variety of environmental factors are needed to render a coastal region as a safe haven for maritime activities (Morton 2001: 105, Tartaron 2013: 139, 144). Dr. Lucy Blue

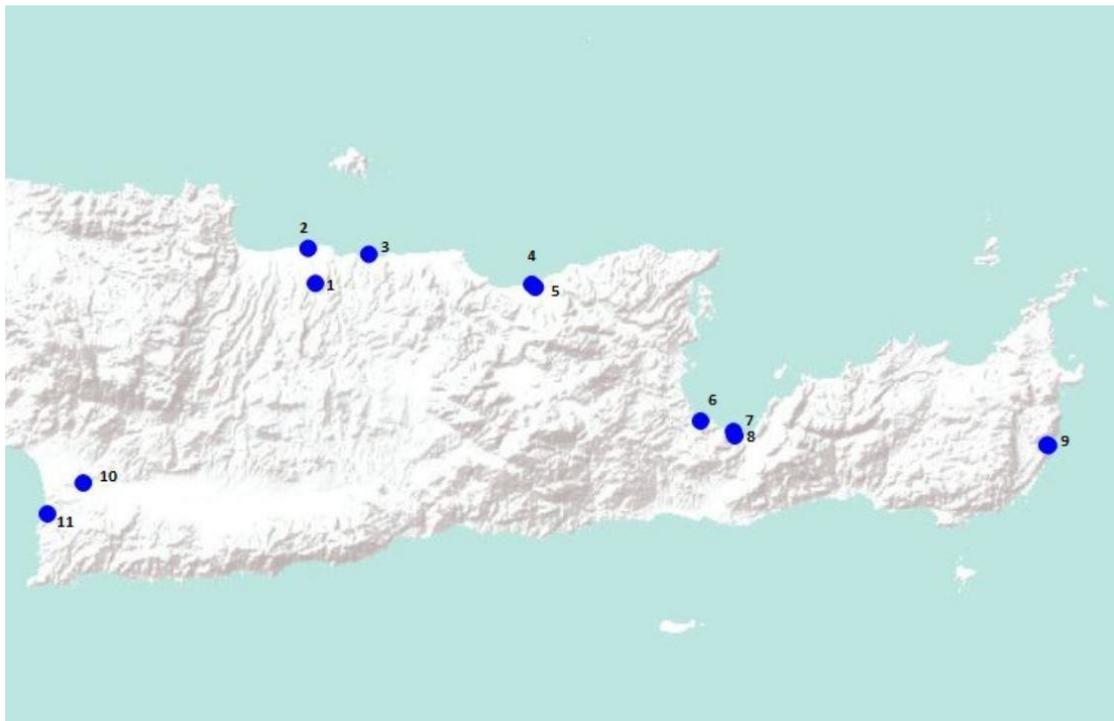
(1997: 31-34) distinguishes Bronze Age harbours in natural landscapes into two categories: a) the ones on high-energy, cliff-lined coasts; these include natural bays, almost enclosed bays, bays on either side of an anvil shaped headland, lee of a promontory, sheltered valleys and lee of offshore islands or reefs, and b) those on low-energy, low lying coasts; these ones are comprised of anchorages on the banks of navigable rivers that empty into the sea, anchorages in natural embayments, river deltas, lagoons or estuaries (Tartaron 2013: 171-172). Crete has many sites that meet the aforementioned requirements. Its coastline consists of both sandy beaches and rocky shores, and many small islets surround the island. The coastline of Crete is filled with natural and almost enclosed bays, bays in lee of islets or reefs (Knapp & Demesticha 2017: 13), as well as bays on either side of an anvil shaped land (Sarris *et al.* 2005: 2).

In order for sea borne trade and for economic and social relationships to be formed between Crete and the Eastern Mediterranean, various harbours and anchorages of larger and smaller expansion were required to ensure that voyaging was as safe as possible (Tartaron 2013: 139). As Crete bounded the Aegean basin to the south, it would be natural for many ports to be located at its north side, facilitating the maritime activities of both Minoan Palaces and smaller Minoan settlements. In the Mirabello gulf, at Vrokastro area, Priniatikos Pyrgos and the Istron “shipshed” were discovered, even though it is not possible to know whether the two sites are linked. In the eastern side of the Mirabello gulf, two more Minoan harbour settlements are identified; i) Pseira, and ii) Mochlos. Moving further to the east the harbours of Palaikastro and Zakros were situated in a strategic position to accommodate trade networks with Cyprus, Anatolia, Levantine Coast and Egypt. In the south part of the island, a settlement was constructed at the site of Kommos as it is the best location for a harbour in the bay of Gortyn.

#### 4. Minoan Shipsheds

The word shipshed has its roots in the German word ‘Schiffshausen’. The term refers to a covered slipway onto which ships were towed, stored and/or repaired (Blackman & Rankov 2013: 3). These installations report tangible information not only of the nautical character of ancient cities, but also of the shape and dimensions of ancient

ships (Blackman 1995: 113). In Crete, six constructions have been found in the island's coast, some partially or completely underwater, and others close to the shore line, that have been interpreted as Bronze Age harbour installations. The installations are located in i) Poros – Katsambas (Vendris street in modern day Heraklion), ii) Agioi Theodoroi beach in Nirou Chani, iii) Potamos beach at Malia, iv) Voulisma beach at Istron – Kalo Chorio, v) Gournia promontory, and in vi) Kommos, at modern day Matala (**Map 1**).

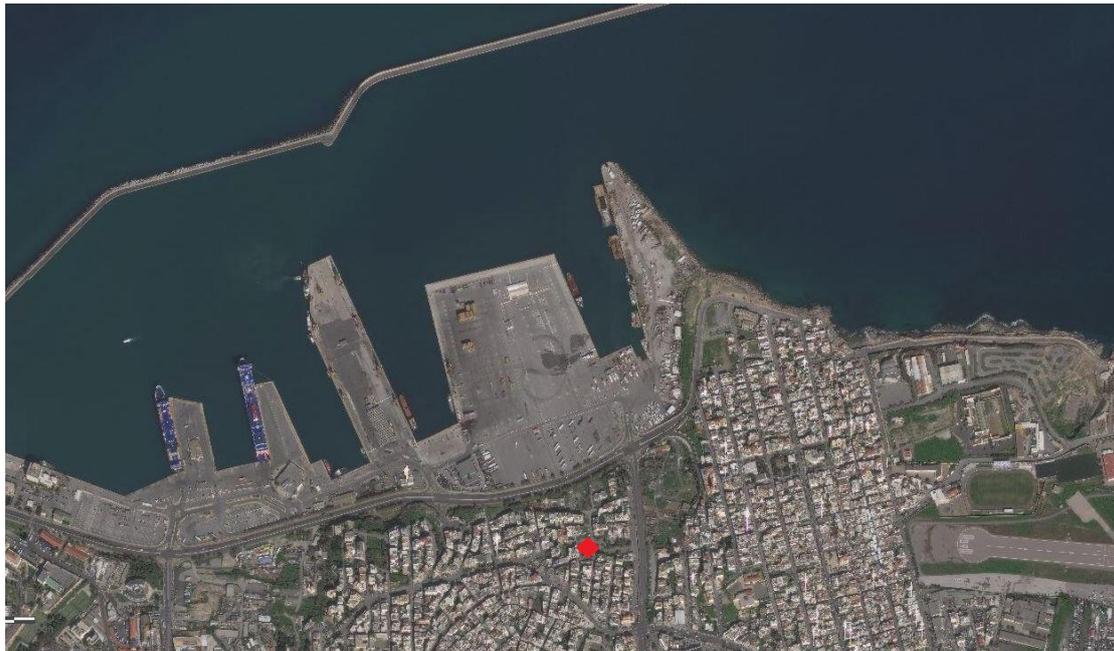


**Map 1:** Terrain map of Eastern Crete, with all the palaces and shipsheds as point features (map was created with QGIS desktop software), list of locations:

1. Knossos Palace, 2. Poros – Katsambas shipsheds, 3. Agioi Theodoroi shipshed (Nirou Chani), 4. Malia submerged building, 5. Malia Palace, 6. Istron shipshed, 7. Gournia Shore House, 8. Gournia settlement, 9. Zakros Palace, 10. Phaistos Palace, 11. Kommos harbour complex

In Poros – Katsambas, excavations by Antonis Vasilakis have revealed a row of six long chambers, three on either side of a narrow passage, running north/south, perpendicular to the coast, which is now 150 m away (Vasilakis 2010: 286, Blackman 2011: 5) (**Fig. 1**). They have an average width of 5.5 m. and a surviving length of 21-25 m; neither their back wall nor their seaward end have yet been defined, but the

excavator, as well as Dr. Theodoulou and Dr. David Blackman estimate an original length of 45-50 m. and that there would have been space for up to five plus five chambers, taking into account the space available as far as the west bank of the river Kairatos goes (Shaw 2019: 93). Based on the pottery, the site should be dated to the final palatial period (1450 – 1300 BC) (Franchet 1917: 63, Dimopoulou-Rethemniotaki 2004: 365, Blackman 2011: 6). Only two galleries are visible nowadays (**Fig. 2**).



**Fig. 1:** Location of the Poros – Katsampas prehistoric harbour installations in Ventris street, modern Heraklion. The shipsheds are located 2.1 km. to the east of present day harbour. The red dot indicates the position of the shipsheds. (Property of ArcGIS online satellite maps, last access: 4/2/2020).



**Fig. 2:** The north-eastern galleries, view from north to south (photograph by the author).

Further to the east of Poros-Katsambas, on the coast of Agioi Theodoroi, carved galleries and foundations of Minoan buildings on land and underwater were found, as well as long rock carvings which had originally been interpreted as shipyards by Marinatos (1929: 141-142) (**Fig. 3**). The heavily carved nature of the rocks around the galleries suggest that the area functioned as a quarry, although the period cannot be specified (Frost 1963: 278, Blackman 2011: 11, Mourtzas *et al* 2015: 13). The biggest gallery, the one considered to be a shipshed measures 53 m. at its north side and 40 m. at its south side. The constructors seem to have left a wall at the middle, 1 m. wide and with a preserved height of 1 m. that extends for 14 m. (Shaw 1990: 425) (**Fig. 4**). If the gallery was used as a shipshed, this wall could have been created to split it into two, so that more than one ships could be accommodated.

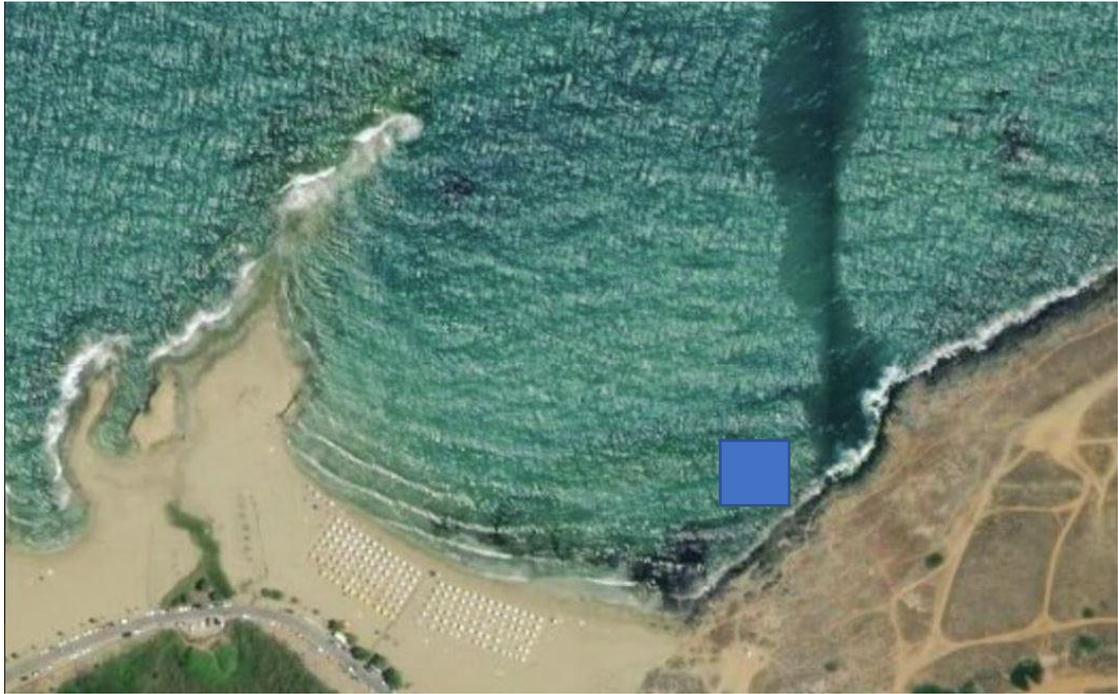


**Fig. 3:** Satellite image of the “shipshed” of Agios Theodoros, Nirou Chani, the plan of Marinatos was carved on Adobe Illustrator and then superimposed on ArcGIS map with minor adjustments. The blue line indicates the middle “separation” wall (map by author).

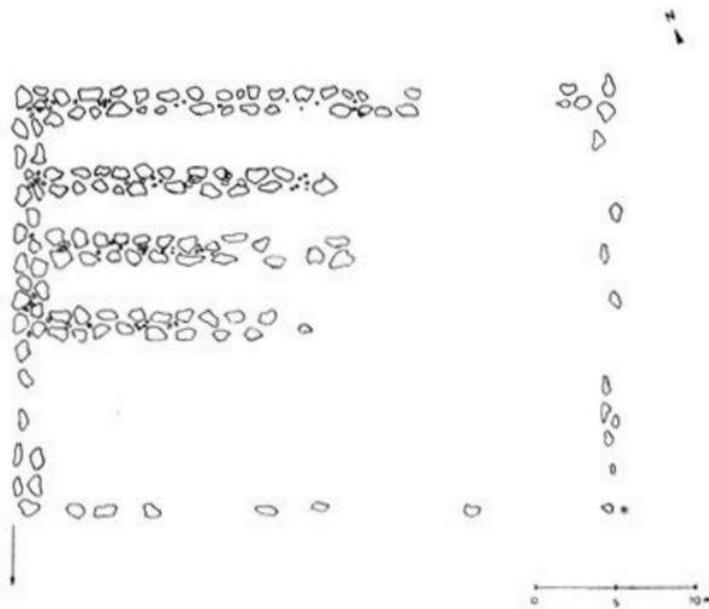


**Fig. 4:** The heavily deteriorated wall which separates the two galleries, view from the west side (photograph by author)

Moving further to the east on the Cretan coast, in 1978, Papamanoli and Treuil (1978: 668) discovered a submerged building directly to the west of the palace (**Fig. 5**). The building is located in the eastern part of the bay and it is exposed to the north winds, directly where the waves break. The northern wall was visible for a length of about 25 m., while the southernmost wall seemed to reach 37 m. The visible length of the west wall is approximately 25 m. The width of the walls is approximately 1.50 m. and each wall is separated from the other by intervals of 2.50 to 3 m. (**Fig. 6**). While the building does have measurements that fit in the same pattern as the other shipsheds, it is very risky to assume that these galleries were used for ship storage as well. The building is enclosed by both ends by constructed stone walls, and, if all walls were contemporary to each other, that is a fact that could not favour the entrance and exit of ships (**Fig. 7**). It is mostly believed that the structure was used as a storage facility facility (Shaw 1990: 427-428, Blackman 2011: 8, Knapp & Demesticha 2017: 15).



**Fig. 5:** Map depicting Potamos beach in the Malia bay, west of the Palace. The submerged storage rooms were found to the east of the bay (property of ArcGIS online satellite maps, last access: 4/2/2020). Square indicates the approximate position of the building.

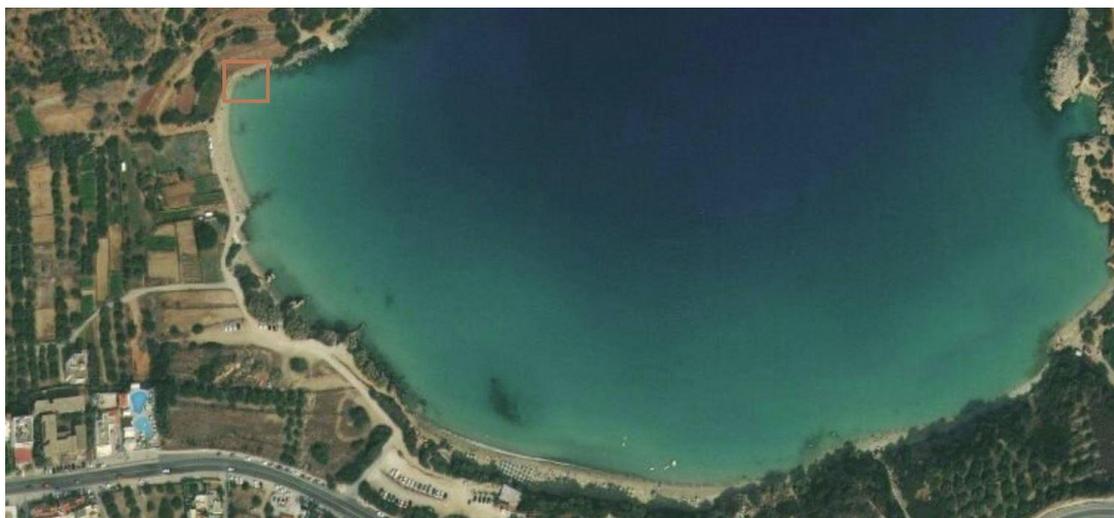


**Fig. 6:** Sketch plan of the building (Papamanoli & Treuil 1978: 668)



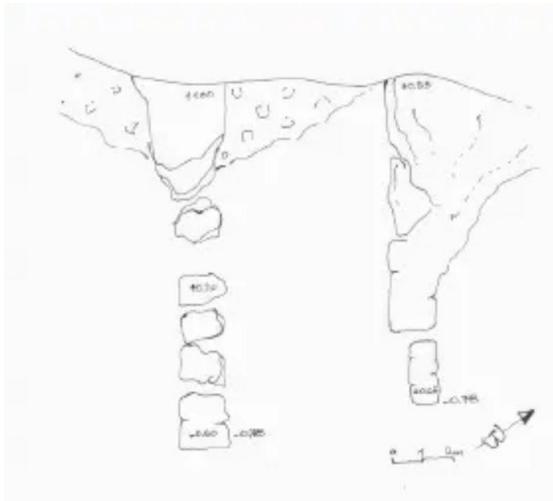
**Fig. 7:** 3D plan of Malia submerged building superimposed on drone photograph of the eastern side of the bay (approximate position), photograph by the author.

Another possible harbour installation has been found in Voulisma beach, Istron at the deepest end of the Mirabello bay (**Fig. 8**). The construction is comprised of two parallel walls that extend towards the sea front at the northwest side of the beach.

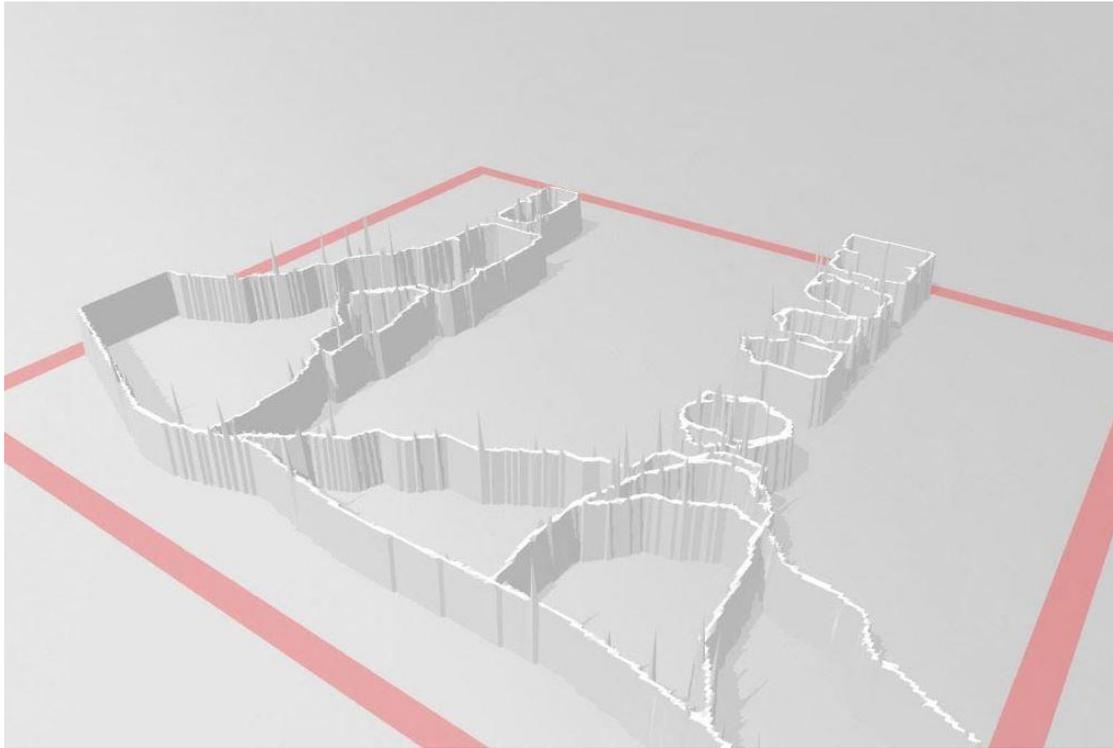


**Fig. 8:** Map depicting the enclosed bay of Voulisma beach, in Istron, Mirabello bay. The square frame marks the location of the remains at the western end of the beach (property of ArcGIS online satellite maps, last access: 4/2/2020)

The width of the walls is 80 cm and the length of the preserved part of the north wall is 10.5 m. while the south one extends for 12 m. The distance between them is 5.5 m.. At the northern ends of the construction, the depth is 80 cm (**Fig. 9**). According to Theodoulou, the construction probably extends further inland but its beginning is completely covered by sand of the beach and other modern constructions (**Fig. 10**). Also, the bottom layer seems to be well buried in the sand and only a small portion of its upper part can be seen (Theodoulou 2013: 155) (**Fig. 11**). Thus, it is not possible to calculate the actual length of this construction, without excavating the site.



**Fig. 9:** Sketch plan the two parallel walls in Istron (Theodoulou 2013: 155, fig. 154)



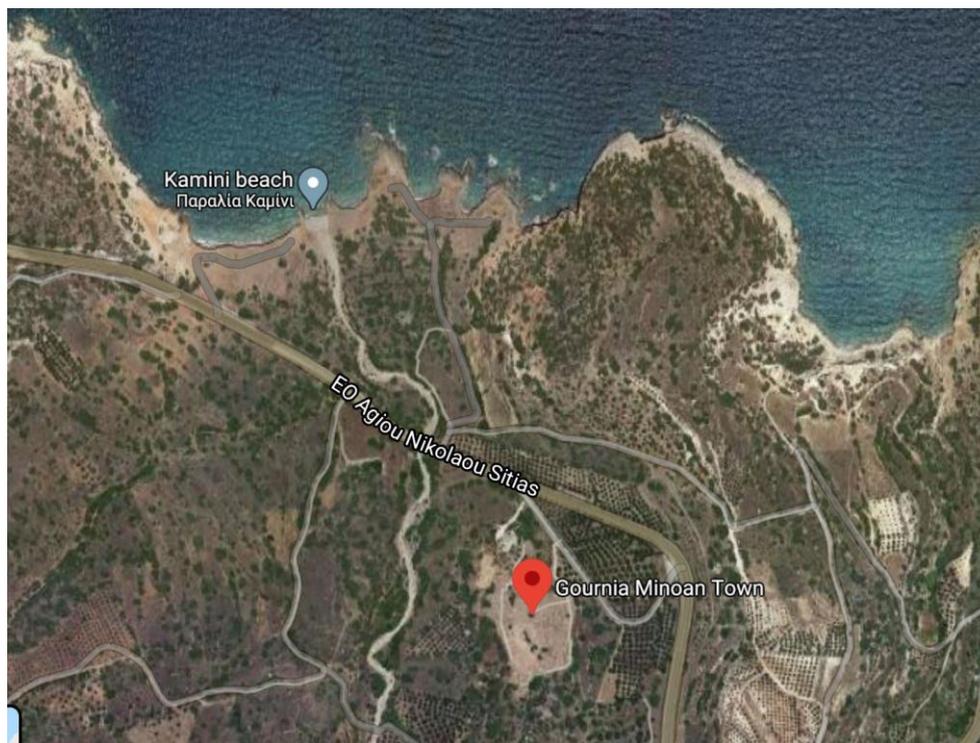
**Fig. 10:** 3D plan of the construction, after the published plan (created in Autocad by the author).



**Fig. 11:** Close up view of the end of the eastern wall, from the north to south (photograph by the author)

The Minoan site of Gournia is located in Lasithi, in the municipality of Ierapetra (**Fig. 12**). It is believed that the town of Gournia upon the hilltop was connected to the coast where a harbour complex has been excavated, through a narrow strip and a river to the west, as well as a burial hill to the east. The coast is exposed to the winds, but it

could be used for ship mooring, under certain weather conditions (Watrous 2012: 522). The “shipshed”, first excavated by Harriet Boyd, was named *Shore House* and it was found on the second of the four consecutive promontories of the area. The structure, built by the same architectural material as the Minoan settlement on the hilltop is at least 25 m. long and 10 m. wide. The west wall now extends for 13 m. and the east wall for 9 m. Davaras and Watrous believe that it was the site of a shipshed with two long, narrow chambers, each five 5 m. wide, extending north towards the sea (Boyd 1908: 20, Watrous 2012: 523) (Fig. 13).



**Fig. 12:** Location of the Minoan site in Gournia, and the harbour complex, lying directly to its north, at a distance of 750 meters (Property of Google maps, Last Access 4/2/2020. Least cost path distance measurement by QGIS).

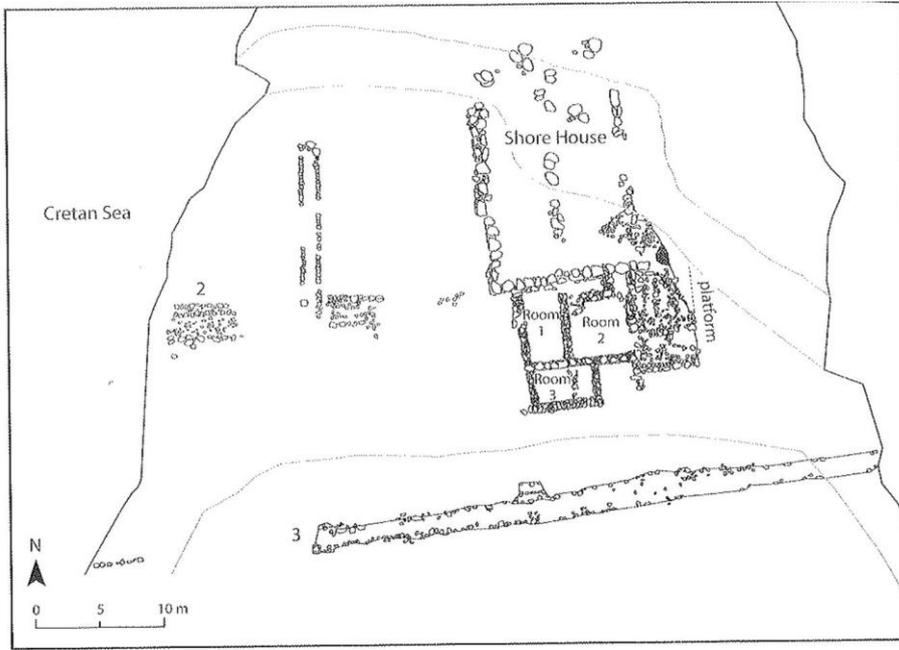
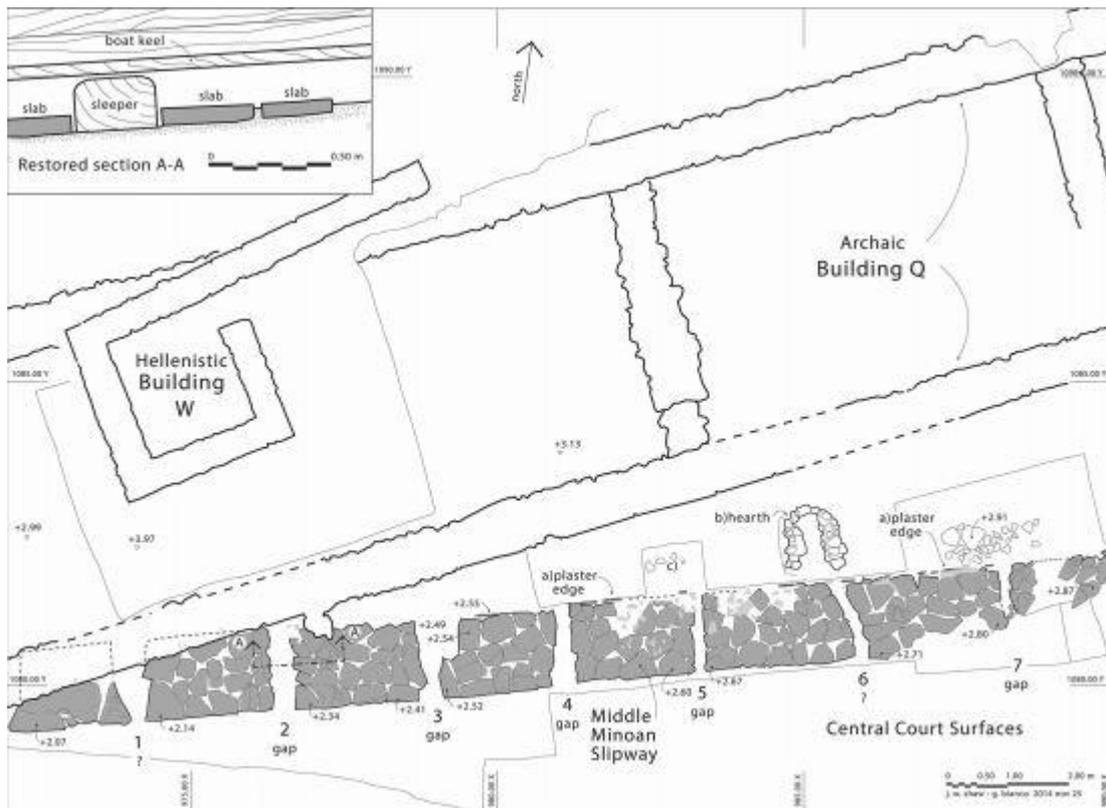


Fig. 13: Plan of the Gournia harbour complex (Watrous 2012: 526) superimposed on ArcGIS satellite map.

Moving to the south side of the island, the site of Kommos is located very close to the seafront west of Mesara plain north of Pitsidia village, 6 kilometers to the southwest of the Phaistos Palace. Joseph and Maria Shaw conducted a series of excavations at Kommos harbour site, where architectural remains start appearing from the hilltop and they continue further on to the south (Shaw 1985: 219, Blackman & Rankov 2013: 10). To the east of the site, Building P extends south to west; it consists of six long and narrow galleries (not preserved at their entirety) and it is interpreted as a shipshed complex for the storage of ships and other maritime activities (**Fig. 14**). The galleries, approximately 38 x 5.5 m., are long and narrow. They are constructed with ashlar masonry and each wall is 1 m. thick (Shaw 2006: 124). A paved way which crosses the courtyard right in front of the shipsheds, passing through building T leading towards the south, is believed to have been used potentially as a form of slipway, where wooden beams could have been placed in between the stones to help the ships move (Shaw 2019: 86-87) (**Fig. 15**).



**Fig. 14:** Satellite photo of the harbour installations (Property of Google Maps, last access 04/02/2020). The plan of Building P is superimposed on the image to depict the excavated parts of the structure (in green) and their hypothetical continuation (in purple).



**Fig. 15:** Plan of the Kommos slipway (below) with restored section A-A (upper left) (G. Bianco) (Shaw 2019: 87, fig. 3)

In the easternmost part of the island, a stone quay has been found at the sea bed at Zakros bay, at the waterfront east of the palace and has been interpreted as sort of harbour facility by Nicolas Platon. No excavations or surveys have been conducted in the area however and these are only hypotheses (Platon 1974: 232).

Of the six cases of harbour installations examined in this essay, only the three of them (Poros Katsambas, Kommos, Gournia) have been dated to the Late Bronze Age. The rest of them in Istron, Nirou Chani and Malia have only been placed in the same chronological frame out of spatial context, therefore, it is risky to assume that they are all contemporary to each other without further research and excavation. Even though they do present similarities in shape and dimensions, we cannot be sure of their date therefore all assumptions regarding their use should be made with caution.

## 5. Minoan Palaces and Shipsheds, a possible connection

Six cases of possible harbour installations in the Eastern part of Crete were reviewed, and most of them are located in close proximity of a Minoan Palace. By calculating the distance between these sites, it could be possible to examine how these sites were related to the nearest palace in an effort to place them in their spatial context and better understand the maritime administration in Minoan Crete.

At the north central part of Crete, Knossos was dominating the area. Waltrous (2007: 103) distinguishes Knossos and Poros – Katsambas as two independent yet correlated entities that might have controlled trade in the area. The number of workshops, the spatial distribution within the urban network, the variety and the access they had to raw material, can support the interpretation of Poros-Katsambas as a somewhat autonomous and independent unity within the palatial system (Dimopoulou-Rethemniotaki 2004: 377). Phaistos Palace could control the harbour complex in Kommos or the both settlements could function together in the harbour administration control (Adams 2017: 205). Kommos location provided nevertheless a sea gateway for the palace (Shaw 1990: 426, 2006: 68).

For Malia, archaeologists think of it as the final stopover at a transit route of maritime trade and hinterland connections between Knossos and the easternmost Cretan region (Evans 1928: 253). The palace stands on the west side of the western promontory forming the Mirabello bay, and it could be connected through the Siteia coastal route with other Minoan settlements such as Palaikastro and Zakros. In the heart of Mirabello basin, Gournia present a Knossian influence, with a similar looking palace built in its centre at the hilltop. Industrial activity such as metal and pottery workshops, as well as elite goods, is traced within the palace and a few elite households. This economic organization suggests the existence of a small elite, benefiting from the Knossos like the case of Poros (Waltrous 2007: 105). Knossos could potentially use the harbour complex in Gournia, as one of the many secondary gateways. In terms of harbour use and craftsmanship that could be influenced by the Knossos Palace, Knossian control is definitely apparent in the cases of Poros Katsambas, Nirou Chani, Malia, Gournia, and Zakros district. They were all harbour sites, functioning independently as harbour towns regarding their craft, ritual, and

economic agenda. Zakros, for example, demonstrates several traits that propose a more personal identity that is not necessarily affected by Knossos influence.

6. Minoan Ships; Collecting information about the Minoan ships from iconographical representations and harbour installations

One of the most important sources of iconographic representations that indicates the variety that Late Bronze Age ships presented in shape, size and function is the fresco of the West House in Akrotiri, Thera. At least four reconstructions have been conducted for the “ikria” and the “peleias” ships depicted in the Thera fresco (McGrail 2001: table 4.2, Tartaron 2013: 62) (**Table 1**).

L	B	D	Author	B/D ratio	L/B ratio
24.0 × 3.7 × 1.9 m			Gillmer	1.95	6.49
35.0 × 4.0 × 2.3 m			Giesecke	1.74	8.75
34.0 × 2.2 × 0.8 m			Toby	2.75	15.45
17.6 × 2.6 × 1.4 m			Gifford	1.86	6.77

**Table 1:** Reconstructions of a Thera ship (ikria/peleias) (McGrail 2001: 120)

The scale was estimated by measuring the proportion of the overall length of the depictions occupied by the paddlers. Space between the paddlers was assumed and after that an overall length and depth was determined. In order to estimate the general hull shape, the distribution of body volume along the profile of the representation was considered (McGrail 2001: 120, Tartaron 2013: 62). Should the space between the paddlers was considered to be approximately 1 m., and the paddlers would be 20-25, the ship could reach a length of at least 33-35 m. (McGrail 2001: 120) This discussion helps us understand more about the shipsheds and possibly about the Minoan ships’ dimensions. For example: some of the aforementioned estimations of the ship’s dimensions do coincide with the length and width of some of the shipsheds mentioned in this essay. All of the cases, apart from Malia, share a similar width (**Table 2**).

Case	Length	Width
<b>Poros - Katsambas</b>	21-25 m. (known length) 45-50 m. (estimated)	5.5 m.
<b>Agioi Theodoroi/Nirou</b> <b>Chani</b>	53m. (north wall) 40 m. (south wall)	4 m. (south gallery) 5 m. (north gallery)
<b>Malia</b>	25 m. (north wall) 37 m. (south wall)	2.5 -3 m.
<b>Istron</b>	10.5 m. (north wall) 12 m. (south wall)	5.5 m.
<b>Gournia</b>	25 m. (estimated to extend for up to 60 m.)	10 m. (estimated to host two ships)
<b>Kommos</b>	38 m.	5.5 m

**Table 2.** Shipsheds dimensions.

Studying the six cases of harbour installations in Eastern Crete has demonstrated a pattern in shape and size that could lead us to a better understanding of the dimensions of Minoan ships, if all the constructions are contemporary to each other and if they were indeed used for ships, the maximum dimensions of the vessels should have been between 30-35 m. in length and 5 m. in width, without ruling out the possibility of smaller vessels.

#### 7. Conclusion remarks

It is impossible to know for sure whether these installations actually housed ships. However, according to the reconstructions discussed previously, where the minimum length of a minoan ship would reach 30 m. in length and 5 m. in width, they would be able to fit inside almost all the installations. While the theory that Poros – Katsambas and Kommos galleries were used as shipsheds is quite plausible, it is fair for one to express doubts as to how they could have stored the ships since they are not as close to the sea as the other examples. Moreover, at least for the case of Kommos, it has been proven that Building P was never actually touching the water. This is why Joseph and Maria Shaw believed that these galleries could have functioned more as long-term

storage for the ships in between their travel seasons, and not only as covered slip ways.

Questions are also raised regarding the types of ships that could be housed inside the aforementioned galleries. The dimensions of the Bronze Age harbour installations in Crete indicate a pattern of long and narrow constructions. This could suggest that the shipsheds were used for long oared ships rather than round ones, but we cannot rule out the possibility of smaller merchantmen housed in the galleries as well. It is possible, also, that each “shipshed” housed different kinds of vessels. Moreover, the sheds could potentially be used for more than one type of vessel at different seasons and according to the demand.

The coastline of Crete, even without many potential Bronze Age harbour installations, does possess many geomorphological features that apply to the typology of a Bronze Age harbour. It is not possible to know which exact bays bronze age settlers were using to beach their vessels, we can see however that their known settlements studied in this essay were located close to the coast. This could indicate a certain connection between the settlements and these harbours. Surveys conducted across the coastline of Eastern Crete have not located any other similar sites thus far. If this is a situation close to reality, then these structures could reflect an interesting aspect of the administrative character of the island. Since all the palaces found thus far are found on the eastern part of the island, they may have served as harbour facilities to house ships, owned either by the palaces or by smaller centres, associated with the central palatial administration. Moreover, in the cases of Poros-Katsambas and Kommos, where the galleries exceed the number of one or two, if they housed ships the fleet would reach a number of 150 people, and it would most certainly be administered by a central palatial entity rather than a smaller one.

The development of Minoan nautical activity requires the existence of a structured and adequate socioeconomic axis that can support construction and maintenance of oared ships and merchantmen. When looking at these harbour installations, we are not only looking at several artificial structures that could have functioned as shipsheds. They are remains of a larger, more organized socioeconomic system; it is a

clear expression of a maritime economy involving installations that organically belong to the harbour.

Those Minoan harbour systems belong in a promising field of research as they hold more answers on how the Minoans created such a significant trade network and managed to maintain it for hundreds of years. For now, there is only so much we are able to know on these intriguing harbour facilities, as they have not been thoroughly excavated. Technological advances in archaeological research, as well as systematic excavations and surveys can give us more results on the subject and provide us with important information regarding this fascinating field.

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