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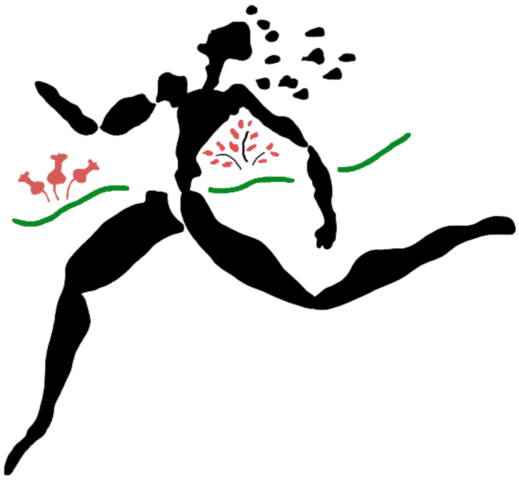
No (e)scape?

Towards a Relational Archaeology of Man, Nature, and Thing in the Aegean Bronze Age



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THE DEVELOPMENT OF MARITIME ACTIVITY IN THE AEGEAN DURING THE BRONZE AGE: NAVIGATIONAL TECHNIQUES AND SHIPBUILDING.

Human beings are an integral part of nature and every human activity is directly related to the environment in which a group of people lives. This means that humans develop their cultural traits based on the environment surrounding them and the climatic conditions they have to deal with.

The sea played a major role in communication and trade already from the late Pleistocene (11,800 – 10,500 BP).[1] The Aegean Sea was one of the places where maritime activity became the searching engine for ways and means of utilizing the liquid element for communication, transport or food acquisition[2] (Fig. 1). However, this does not mean that travelling by sea was an easy process. Nevertheless, it is noteworthy that the morphology of the Aegean Sea gave people the opportunity to travel more easily in comparison to land topography, where travelers had several difficulties to overcome, such as the high mountains and the mountain ranges (Fig. 2).

The main purpose of this paper is to focus on the local natural environment, navigational skills, sea routes, and the evolution of shipbuilding during the Early and Middle Bronze Age (ca. 3000 – 1650 BC) in the Aegean archipelago. The first archaeologically confirmed voyages in the Aegean date to the Late Palaeolithic period,[3] while preserved dugouts from the Mesolithic and Neolithic period affirm the continuity of aquatic mobility.[4] Nevertheless, during the Bronze Age there was an increased maritime mobility in the archipelago. Not only the circulation of Melian obsidian, Cypriot bronze ingots, and the import of raw materials and finished products from the eastern and central Mediterranean, but also the expansion of two of the most significant European cultures, the Minoan and the Mycenaean, affirm the development of seafaring.

In order to carry out a sea voyage, the most important prerequisites are navigational skills and shipbuilding knowledge, as ships were the means of sea transportation. Agouridis[5] has defined navigation as '*the process of directing the movement of a craft from one point to another'*. This view is connected with the question "how to go?",[6] which requires knowledge of both the seascape and landscape. Voyagers must have deep awareness of sea currents, prevailing winds and wave formations. For maritime activity, knowledge of stars and lunar circles is vital. The abovementioned factors indicate that seafaring was a specialist occupation from its very beginning.[7]

Furthermore, maritime knowledge consists of several other parameters relating to route (where to go?), spatial awareness (where am I?), time setting (how much time has passed?) and time perception (how much time is left?). Route knowledge hinges on landscape and cultural awareness. Added to that, knowledge for the most suitable sailing season was another prerequisite.[8]

Undoubtedly, the most important factor in seafaring is the weather. Although it is difficult to define ancient weather patterns, it is widely assumed that weather during the Bronze Age might have been the same as today.[9] Meteorological conditions in the Aegean, as in the rest of the Mediterranean, are the result of four continental systems (the North Atlantic low, the Atlantic high, the Indo-Persian low and the Mongolian high), which generate successive waves of pressure interacting with the cold highlands of the mountains and the effects of warm waters[10] (Fig. 3). This phenomenon produces complicated and changeable weather conditions. The result is that all sea currents and winds sometimes run contrary to each other (Figs. 4 and 5). The need for a greater control of winds and sea currents might have affected the pre-sail boats of the Aegean leading to the introduction of the sail.[11]

The extreme seasonal and local diversity in the Aegean must have influenced the effectiveness and timing of early sea voyages. And, although these alterations did not affect equally every area, shorter distances must have been more preferable. The sailing season might have started in May and finished in September, since during this period, the southern winds increase while the northern winds abate. Therefore, the absence of cyclones would make traveling easier. But, during the etesian (*meltemia*) period, which appears during July and August from a north or northeastern direction creating storms in the central Aegean, traveling might have taken place in the afternoon when the *meltemia* abate and the sky is clear providing also the means of celestial navigation[12] (Fig. 6). Sea voyages could have also taken place during the 'Halcyon days' in January, when excellent sailing conditions are experienced, too.[13]

For recognising the natural phenomena, prehistoric Aegean seamen used non-instrumental navigational techniques. They would have to rely on oral traditions, personal experience, detailed observation of natural phenomena and techniques, such as the cross-staff for estimating the altitude of a celestial body or distance, and rules of thumb, fist or arm for measuring the altitude of a star.[14]

Moreover, fire signals sent from large man-made constructions could have been an efficient way of communication between the seafarers and people living on land, helping the former while approaching the coastline. These constructions, known as '*soroi*' (heaps, piles), have been found in several regions in Crete dating around 1900 to 1700 BC (Fig. 7). However, there is no archaeological evidence for fire signals in other Aegean regions.[15]

Pilotage is based on seamarks and landmarks thanks to the numerous scattered islands in the Aegean Sea and the high mountains and promontories of the mainland.[16] However, although theoretically a seaman is able to travel always with land in sight in the Aegean, practically this aspect is not the norm. The shape of the coastline depends on the position of the voyager and differs as the voyager changes his position. For example, Euboea cannot always be visible from Skyros, while Crete's high mountains are not always visible from the Cyclades (Fig. 8). Consequently, a sea voyage in the Aegean requires both visual conditions and navigational experience. But these elements are useful during the day in combination with the position of the sun.[17]

In the *Odyssey* (V, 269-281), the seafarer used the sun for sea crossings in daytime, and the moon and the stars to localize the horizon during the night. Seamen were aware that star movements take place in a circle around the celestial pole, on the same direction as the sun in daytime (from the East to the West in a circle). However, star-steering is thought to be a more accurate means of navigation than sun-steering, since the stars are in a continual motion on the visible pole always staying on the horizon (Fig. 9). Nevertheless, a shift of the distance from equator affects the visibility of specific stars each time. This change can also impact the apparent night routes of stars.[18]

The strong involvement of the Aegean people with the sea during the Early Bronze Age led to observations and discoveries regarding the position and movement of heavenly bodies.[19] Doumas[20] has interpreted the representations found on rocks and pebbles in Naxos as symbols of constellations implying development in astronomical observations during the 3rd millennium BC. What is more, Homer cites a list of stars in both the *Iliad* (XVIII, 486-89) and the *Odyssey* (V, 272-75): the Pleiades, the Hyades, the Orion, and the Bear.

Concerning sea routes, a general picture of the most important ones will be discussed by dividing the Aegean into five smaller areas: the northeastern Aegean with two important key sites (Troy and Poliochni), central Greece with main sites in Attica (Askitario, Aghios Kosmas) and Euboea (Manika), the Peloponnese (Argolid with Lerna and Tiryns, Akrovitika at the coast of the Messenian plain and Pavlopetri on the Malea peninsula), the Cyclades (Aghia Irini on Kea, Kastri on Syros, Dhaskalio-Kavos on Keros and Phylakopi on Melos), and Crete[21] (Fig. 10). The Cyclades were the most important crossroads and important mid-way stops for both N-S and E-W navigation. Thus, all the aforementioned sites might have been in frequent contact with the Cyclades, especially during the Early Bronze Age as it can be proved by the spread of "frying-pan" vessels in several sites around the Aegean[22] (see below and Fig. 15). Nevertheless, these sea routes might have been used throughout the Bronze Age since they are the main seaways among the Aegean regions.

Besides the knowledge concerning navigational skills and sea routes in combination with the environment and the natural phenomena, knowledge of shipbuilding was also an important factor in order to successfully undertake a sea voyage. Therefore, the following paragraphs focus on the most important cases of shipbuilding during the Early and the Middle Bronze Age periods where significant developments took place.

Knowledge of shipbuilding is an essential baseline for understanding the coastal interface between land and sea in the Bronze Age Aegean. A boat may be propelled by waterpower (currents), without actual control of direction, human power (paddles, oars, poles, or tow), and wind power (sail). In several cases, two means of propulsion might have been combined on the same boat, whereas in other cases, propulsion might have also been combined with steering.[23]

At the beginning of navigation, it is believed that animal skin was used for the first attempts to cross the sea. From the Mesolithic period onwards, the adequate stone tools as well as suitable logs for shipbuilding led humans to the construction of dugouts. This kind of vessels continued to be used until the Early Bronze Age as suggested by similarities in construction and typology. The construction of a dugout, although simple, required the suitable tree-stem – usually from oak or pine trees, a great investment of time, knowledge of wood-working technology and of course adapted tools, such as ax, adz, chisel and drill.[24] The construction of these wooden plank boats, also known as *monoxyla* (Fig. 11), became more complex and sophisticated throughout the Early Bronze Age. An expanded dugout, known as longboat, appeared, thanks to the expansion of bronze tools. The introduction and expansion of bronze tools gave people better opportunities for better wood-working since they were tougher and sharper, thus more suitable for fine treatment.[25]

Due to the lack of surviving physical remains, our knowledge is based mainly on representations of the era. The earliest representations of Bronze Age ships come from a significant number of rock-carvings from Strofilas in Andros and Vathy in Astypalaia dating to the later phase of the Final Neolithic period or Proto-Bronze Age, a term used by Coleman and Facorellis[26] (Fig. 12). These rock-art representations are the earliest evidence for a different type of seagoing vessels. The depicted vessels are long and narrow rowing boats with raised bows and stems. On their large stem edge there is an incised fish, which has been interpreted as the symbol of the ship and, at the same time, the weathervane. Such longboats, with unknown earlier parallels, would have had a greater variety and carrying capacity than their predecessors.[27] Their form is similar to the clay model from Palaikastro dated around 3000 BC (Fig. 13) and the boats portrayed on the Early Cycladic II (mid-3rd millennium BC) "frying-pans" from the cemetery at Chalandriani on Skyros (Fig. 14).

"Frying-pans" have also been found in several sites around the Aegean (Fig. 15). Most of them depict rowing ships with the one edge higher than the other on their bottom[28] (Fig. 16). Doumas[29] has suggested that the shorter edge is the prow, while the higher is the stem. According to his view, the vessel could move easily also avoiding possible collision while traveling.[30] Moreover, a wide and tall stem with vertical and smooth surface could play an important role in the propulsion of the ship and it could be thought as the precursor of the sail. The incised lines on both sides of the hull possibly depict paddles.[31] Similar vessels of about the same date also found on rock graffiti at Korphi t'Aroniou on Naxos (Fig. 17). In all cases, there is a low and flat hull.[32]

The hull was in use since the Neolithic period. Its presence on the boats was very important for both the buoyancy and the stability of the vessel while voyaging not only on propitious days, but mainly on rough weather, where a boat was subjected to even more complex aerodynamic and hydrodynamic forces.[33]

A pottery fragment from Phylakopi on Melos (Fig. 18) dates slightly later to 2,300 BC, and it is important as it provides the first depiction of a single steering oar and a short probable tiller extending behind it. But the stem projection is absent. Paddles are also depicted on both sides of the hull[34]. This find has led to the suggestion that the possible shift from paddle to oar as the basic means of propulsion took place as part of an inspiration of maritime technology near the end of the Early Bronze Age.[35]

Based on the available Early Bronze Age ship depictions, it has been suggested that the length of the vessels might have been about 20 meters and each of them had space for approximately 24 paddlers and possibly one steersman. The speed of these early vessels could reach 6 nautical miles per hour.[36] Broodbank[37] has proposed that the daily range of such a boat could be in the order of 30 nautical miles. Consequently, travelling by longboat to the greater part of the Aegean would take about 2 weeks.

Furthermore, the fact that all these boats are flat-bottomed crafts with rudimentary stability and control of direction relates to their flotation in island waters into the Aegean archipelago. On the contrary, travelling at sea requires a greater lateral stability and ability to stand the winds and waves in the large. In this case, steering and a more powerful means of propulsion are necessary.[38]

The abovementioned representations also imply that the islanders, and specifically those in the Cyclades, might have been the first to develop their knowledge and experience in shipbuilding.[39] The case of Dokos, if we accept it as being a shipwreck, testifies this development and maritime activity in the Cyclades already from the Early Cycladic II period. No physical remains have been found, but the assemblage of pottery findings is notable for the period.[40]

The longboat tradition continues throughout the Middle Bronze Age. Besides the few representations, there is a significant finding dating to the early 19th century BC (early Middle Helladic II), which relates to the only surviving physical remains of a small wooden boat found at the small coastal islet of Mitrou on the shore of the Northern Euboean Gulf. This boat is the earliest actual seagoing vessel ever found in the Aegean and the only one that may safely be accepted as a fishing boat of local construction. It was made of planks and it had an elongated shape. The length of the hull is estimated to be about 6 meters and the width at least 1 meter (Fig. 19). The gas chromatography analysis suggests that it might have been constructed of oak. Its characteristics suggest an expanded longboat with no identified parallels in the Aegean and the Mediterranean.[41]

During the same period, the appearance of the sail on Aegean ships marked the greatest step in the development of shipbuilding in the region. The earliest Mediterranean depiction of a sail occurs on a Naqada II (Gerzean) pottery vessel in Egypt dated between 3500 and 3100 BC (Fig. 20). The ship has a single square sail placed well forward toward the prow, in clear contrast to the conventional position of the sail amidships in Bronze Age iconography.[42]

According to Yule[43] and subsequently to Broodbank,[44] the sail was probably introduced to the Aegean, in particular Crete, via Egypt. This hypothesis could explain the fact that the sail in the Aegean iconography is first represented on a series of Minoan seals dating to the Middle Minoan II period[45] (Fig. 21). The illustrated ships have a simple mast amidships, two or three fore- and backstays, and a variable number of oars. Their crescent shape is the characteristic type of Minoan vessels.[46] The same characteristics are also seen on the boats depicted on pottery vessels from Kolonna on Aegina dating to the Middle Helladic II period.[47]

A remarkable case of a boat depiction on a seal comes from Middle Minoan IIB Pseira (1800-1675 BC). The characteristics of the illustrated ship are similar to the aforementioned examples, but without oars (Fig. 22). This ship has been associated with the contemporary shipwreck found near the islet. Although no wooden remains have survived, the distribution of the pottery led the excavator, Elpida Hadjidaki, to estimate that the ship might have been between 10 and 15 meters long, comparing it with the ship depicted on the seal. It is worth underlining that, although no actual physical remains were recovered, this shipwreck is one more proof for sea voyages around the Bronze Age Aegean.[48]

The introduction of the steering oar slightly before the end of the Early Bronze Age and, subsequently, the use of the sail in the Middle Minoan II period imply changes on the hull design. These changes include a broadening of the beam in order to accommodate the mast and rigging as well as the positioning of the oars and the oarsmen.

Unfortunately, besides the Aiginetan boat depiction, representations of sailing boats during the Middle Bronze Age have not been found at other sites yet. But this does not mean that this innovation did not spread throughout the Aegean since the Minoans traveled around the archipelago expanding their trading networks and colonies. Nevertheless, this absence poses questions regarding the speed of the spread of the sailing tradition in the wider Aegean region during this period.

Taking everything into consideration, it could be suggested that Aegean Bronze Age maritime development was a way to approach the natural environment and address a sequence of specific needs. These factors, and possibly many others, which cannot be traced in the archaeological record, influenced the construction and morphology of the ships,[49] also adapting the navigational skills according to the local environment. The progressive improvement of the hull and the dimensions of the ships are the first stages of this evolution. The introduction of the sail was a breakthrough in prehistoric Aegean shipbuilding history. From that period onwards, ships were able to travel more quickly and cover longer distances. Thanks to maritime knowledge, people understood the environmental conditions surrounding them and developed their culture not only on the landscape but also through their voyages.

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FIGURES

Fig. 1: Map of Greece (From Google Earth).

Fig. 2: The morphology of the Aegean Sea and land topography (From Google Earth).

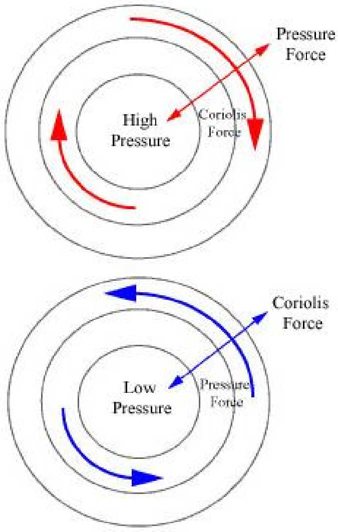

Fig. 3: Wind circulation. High pressure: lighter winds in a clockwise route, Low pressure: stronger winds in a counterclockwise route (Wofsy S. C. 2006. Abbott Lawrence Rotch Professor of Atmospheric and Environmental Science, lecture notes. Published in: https://www.learner.org/courses/envsci/unit/unit_gloss.php?unit=2).

Fig. 4: Directions of surface sea currents during the winter (Bathrellos et al. 2009, fig. 19).

Fig. 5: Directions of surface sea currents during the summer (Bathrellos et al. 2009, fig. 20).

Figure 6. Meltemia (http://www.esys.org/wetter/meltemi.html).


Fig. 7: Pantelis soros from Pediada region, Crete (Panagiotakis et al. 2013, fig. 5).

Fig. 8: Landmarks and visibility during travelling (From Google Earth, the additions have been made by the author).

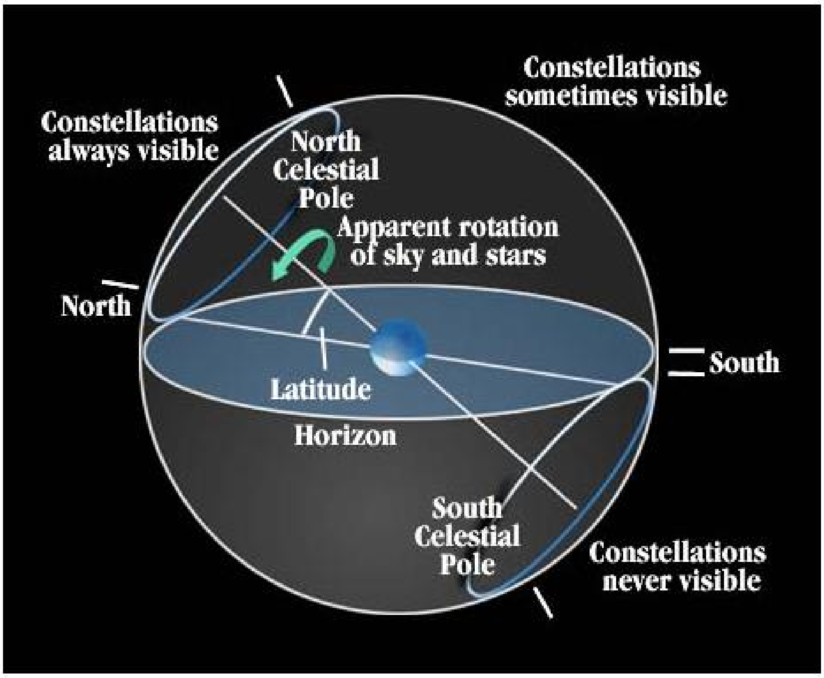

Fig. 9: The celestial sphere (http://w.astro.berkeley.edu/~basri/astro10-03/lectures/CelestialSphere.htm).

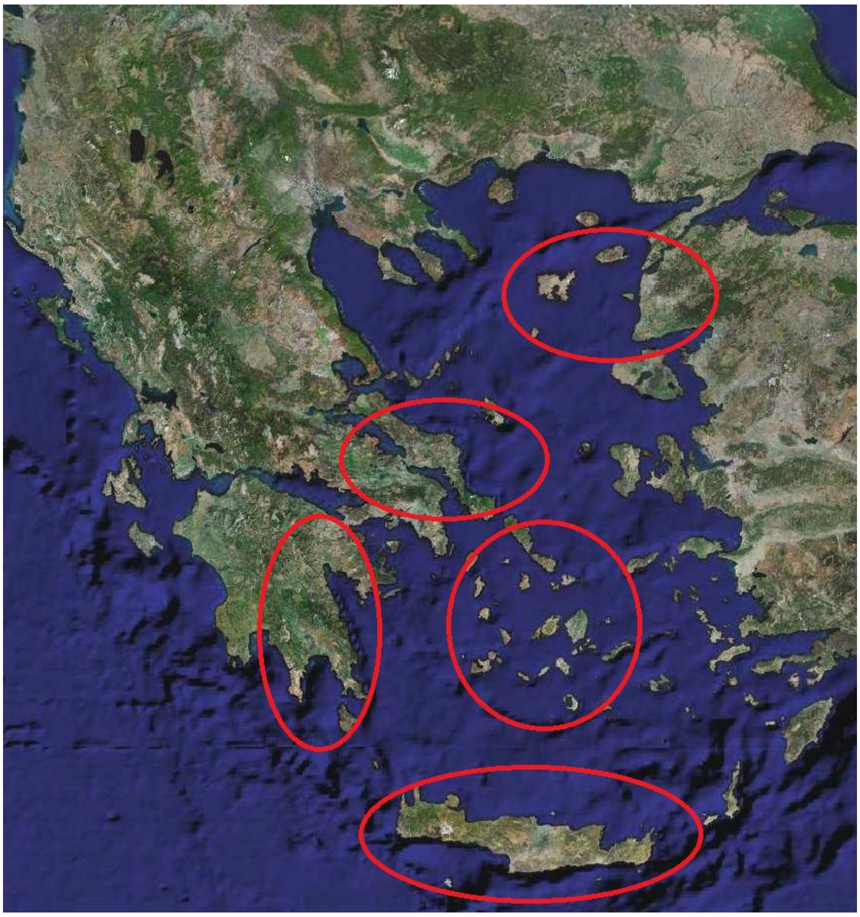

Fig. 10: Map with the main sites of sea routes in the Bronze Age Aegean (From Google Earth, the additions have been made by the author).

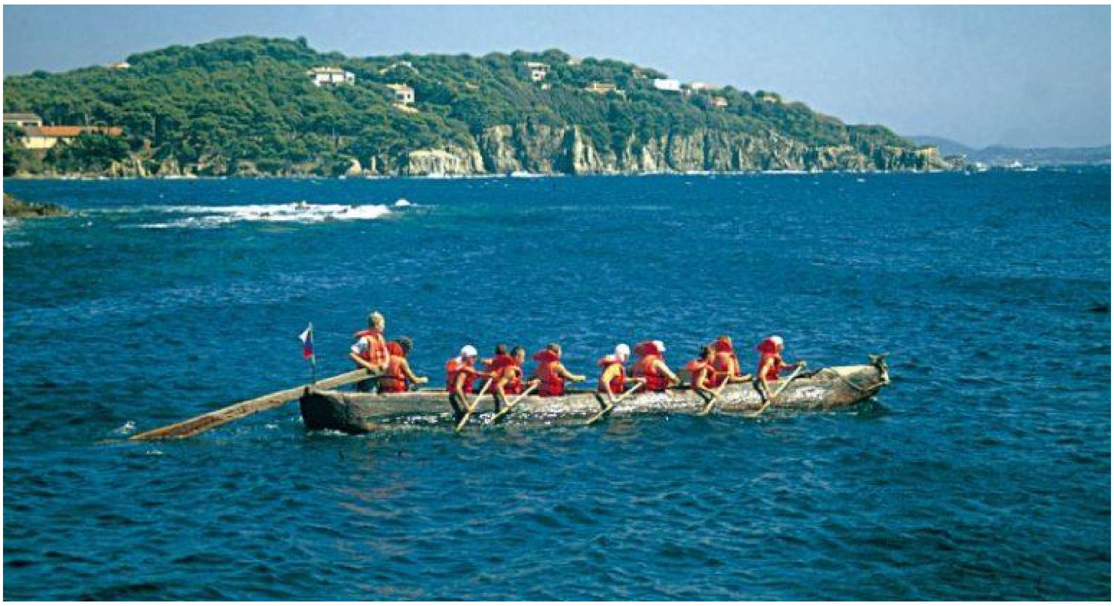

Fig. 11. Expedice Monoxylon II 1995
(http://www.historiedobrodruzstvi.cz/reportaze/expedice-monoxylon-1995/).

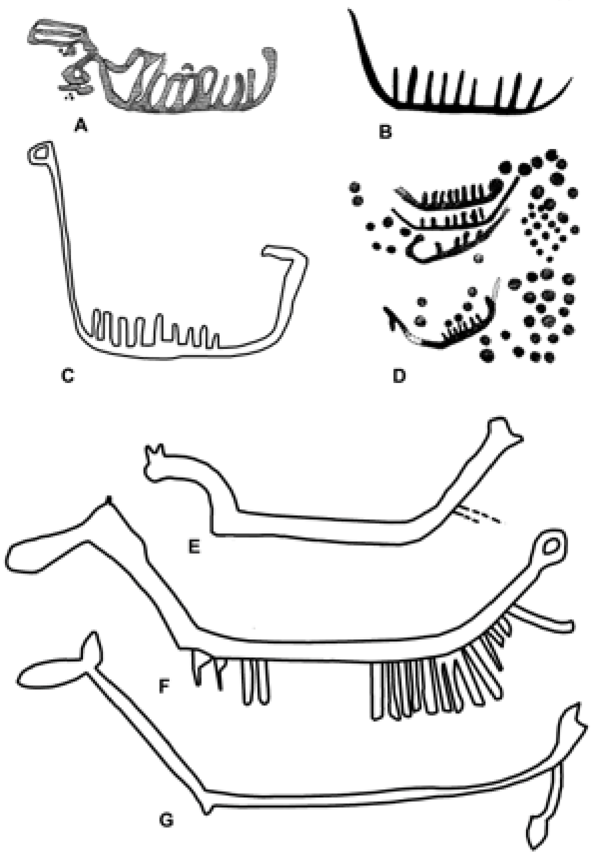

Fig. 12: Rock art images of ships from Strophilas (A-D) and Astypalaia (E-G) (Coleman and Facorellis 2018, fig. 5).

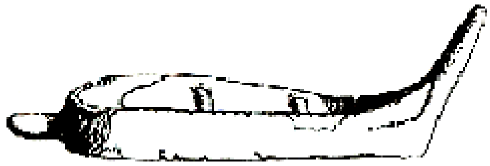

Fig. 13: Clay model of a boat from Palaikastro (Bosanquet and Dawkins 1923, fig. 4).

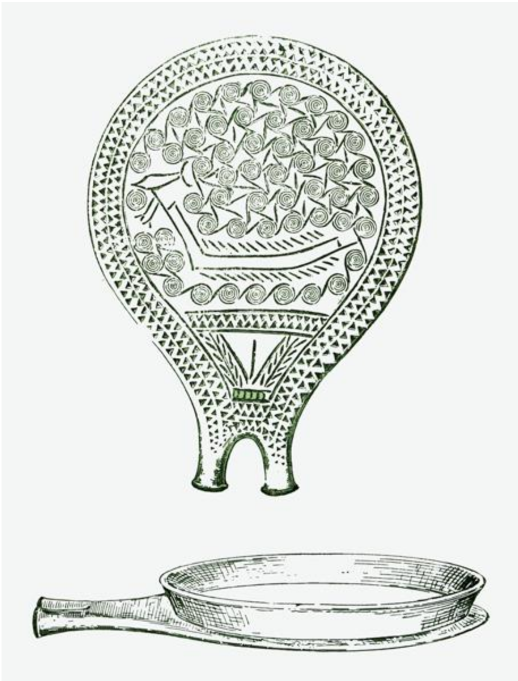

Fig. 14: “Frying pan” from the Chalandriani cemetery, Syros (http://www.namuseum.gr/).

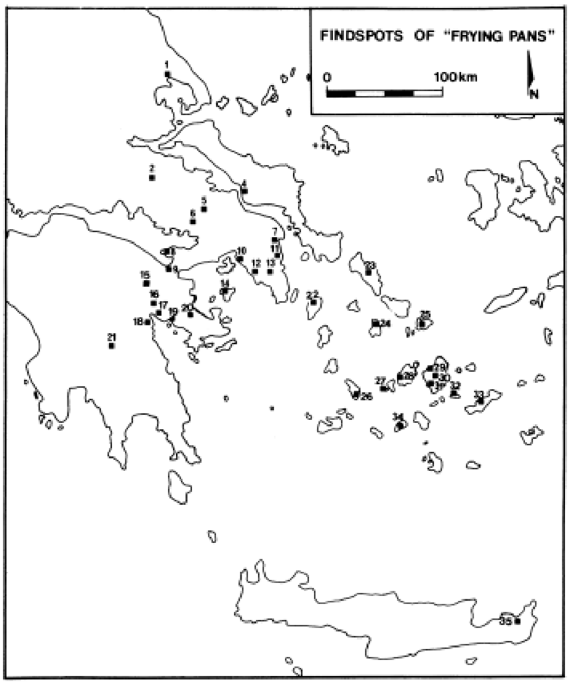

Fig. 15: Map of Greece with findspots of “frying pans” (Coleman 1985, fig. III. 1).

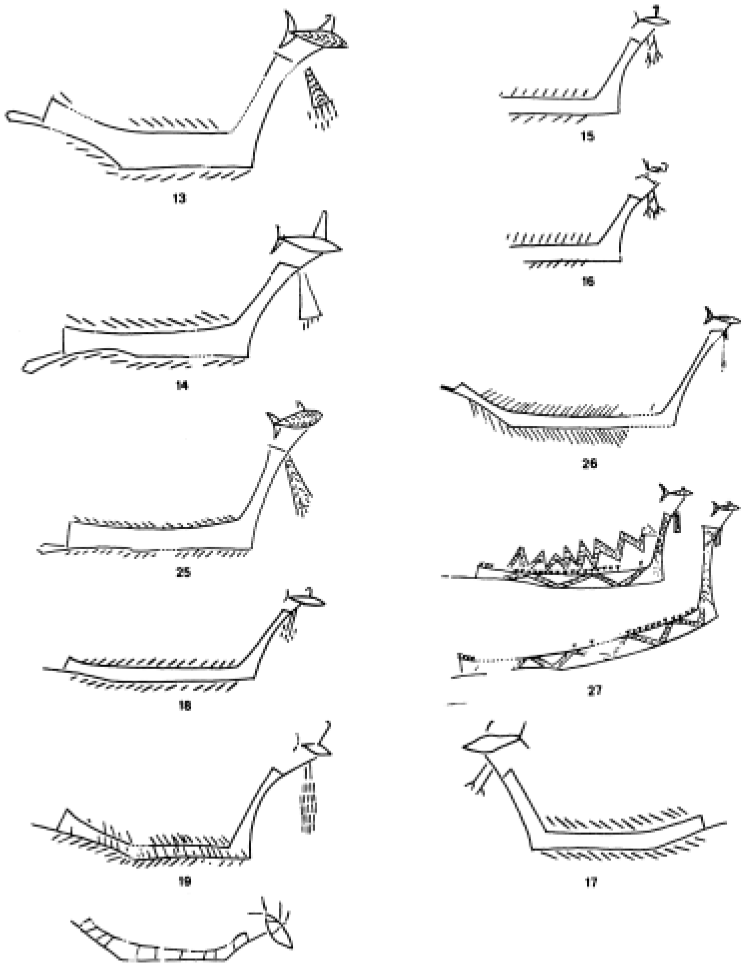

Fig. 16: Ships on “frying pans”, drawing depictions (Coleman 1985, fig. III. 5).

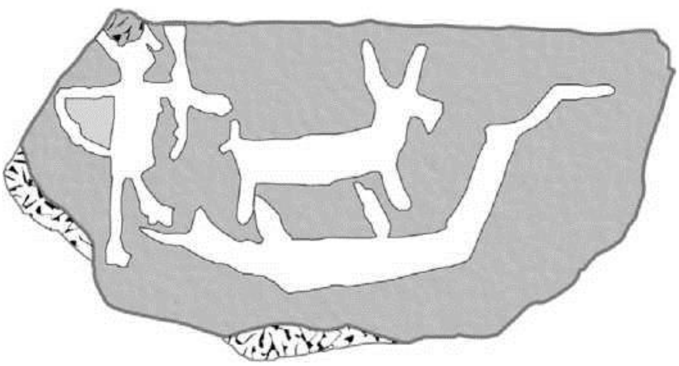
Fig. 17: Incised image of a boat with human and animal, Korphi t'Aroniou, Naxos, 2500-2000 BC (Wedde 2000, fig. 3.15).

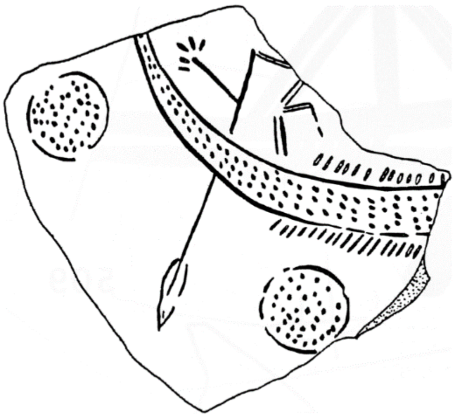

Fig. 18: Pottery fragment from Phylakopi, Melos, ~2300 BC (Wedde 2000, fig. 7).

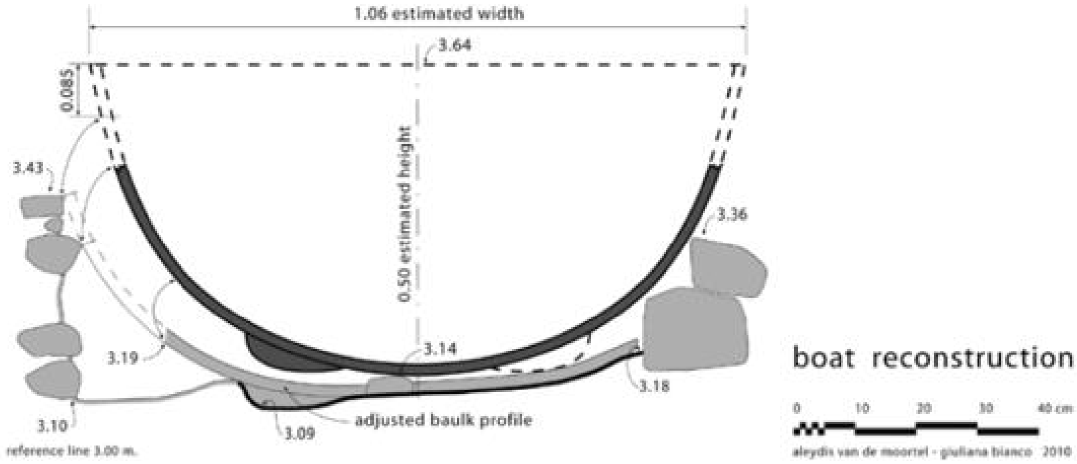

Fig. 19: Reconstruction drawing of the boat found on Mitrou islet (Van de Moortel 2009, fig. 3.7).

Fig. 20: Naqada II pottery vessel from Egypt, 3500-3100 BC (British Museum, Room 64).

Fig. 21: Minoan seal from Palaikastro with depiction of a sailing boat, around 2000 BC (http://maritimehistorypodcast.com/).

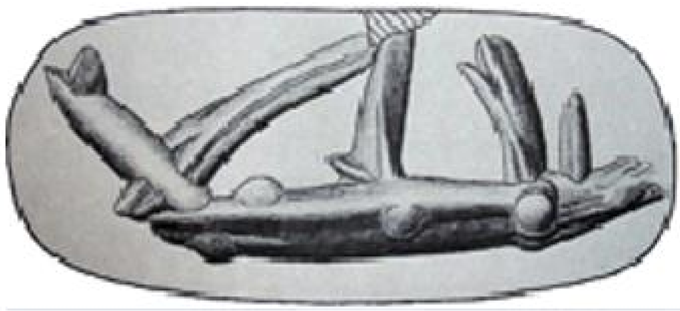

Fig. 22: Boat depiction on a seal from Pseira, Crete (Bonn-Muller 2010, fig. 3).

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