

The adoption of the sail in the Early Bronze Age Aegean (ca. 2550–2200 BC) and its impact on later Minoan, Aeginetan, and Mycenaean seafaring¹

Aleydis Van de Moortel

Abstract: This paper redates the adoption of the sail in the Aegean to ca. 2550–2200 BC – significantly earlier than previously thought. It argues that the sail was introduced first in the East Aegean and from there in the Central and West Aegean, reaching Minoan Crete only ca. 1900 BC. Sailing technology seems to have come from Egypt via the Levant to the Aegean in the context of the Early Bronze Age Anatolian Trade Network. This new maritime technology had a major impact on the Aegean in the Middle and Late Bronze Ages, facilitating the rise of Aeginetan, Minoan, and Mycenaean maritime trade networks.

Keywords: Bronze Age Aegean, seafaring, sailing ships, Kastri/Lefkandi I group, Anatolian Trade Network

It is widely believed that the Minoans of the island of Crete were the first people in the Aegean to adopt the sail, and that this happened towards the end of the Early Bronze Age (Basch 1987: 93–114; Wedde 2000: 76–80; Broodbank 2013: 353–354; Tartaron 2013: 51). It will be argued here, however, that new evidence places the first use of the sail in the Aegean much earlier, ca. 2550–2200 BC, and it first appeared not in Crete but in the East Aegean, i.e., the western Anatolian coast and its nearby islands, which was the most urbanized and technologically advanced part of the Aegean at that time (Şahoğlu 2005; Kouka 2013). The knowledge of the sail may have come from Egypt via the Levant to the East Aegean, and from there it spread to the Central and West Aegean. Only in the early Middle Bronze Age, ca. 1900 BC, is there hard evidence that it reached Crete. This technology transfer will be situated in the broader historical context of Early Bronze Age trade and human mobility. Finally, it will be briefly indicated how the adoption of the sail facilitated the rise of Aeginetan, Minoan, and Mycenaean maritime trade networks.

Our evidence for ships in the prehistoric Aegean is based mostly on about 400 two-dimensional images and boat models (Wedde 2000; Van de Moortel 2017). Actual boat remains are extremely few and do not give indications about their mode of propulsion (Van de Moortel 2012: 24). Before ca. 2550 BC, there is no evidence for the use of the sail in the Aegean. We have more than 150 boat representations from that era, most of which date to the Final Neolithic (Tel-avantou 2008a) and Early Bronze 2a phases (ca. 4500–2550 BC). Many representations show paddles or oars, and none have a mast or sail. It must be pointed out, however, that in spite of their large numbers, the geographical distribution of these boat images is limited to only ten sites, and only six of those representations do not come from the Cycladic islands: a Neolithic clay model was found at Tsangli, in southeastern Thessaly (Marangou 1991) and five Early Bronze I and II clay models derive from three different sites in East Crete (Fig. 1). Thus, large swaths of the Aegean have not produced boat images in these periods, even though we know that they were active in maritime trade. For instance, Troy and Limantepe (near modern Izmir, Turkey) were important harbor towns in the Early Bronze Age East Aegean, but have not produced a single boat representation. Thus, much information is missing from the archaeological record.

Most of these earliest boat representations are too rudimentary to tell us whether these boats were paddled or oared. However, a well-known clay model from Mochlos, probably dating to the Early Minoan (EM) II phase (Soles 2012: Fig. 12.14) is thought to have thole pins, and would thus have been oared. Thole pins may also be shown on an Early Cycladic (EC) II rock-cut boat from Korphi t'Arioniou on Naxos (Doumas 1965: Fig. 4). Until recently, there has been

¹ The absolute chronology of the Early Bronze Age Aegean is changing as the result of ongoing fieldwork. In this paper, I adopt the chronology proposed by Kouka, Menelaou 2018.

much debate about the identification of the extremities of EC II boats, because none of the then known boat representations showed steering oars to allow the identification of the stern (cf. Marinatos 1933: 182–185; Casson 1971: 31, 41; Basch 1987: 84–85; Wedde 2000: 35–39). In recent years, two rock-cut images of longboats with steering oars have been discovered at the EC II settlement of Vathy, on the island of Astypalaia, which clearly show that the steering oar is at the lower extremity, and that the higher extremity, which often carries an emblem, is the bow, thus finally laying this long-standing debate to rest (Fig. 2a-b; Vlachopoulos 2021: 104–107, 128, 130, Figs 27, 34).

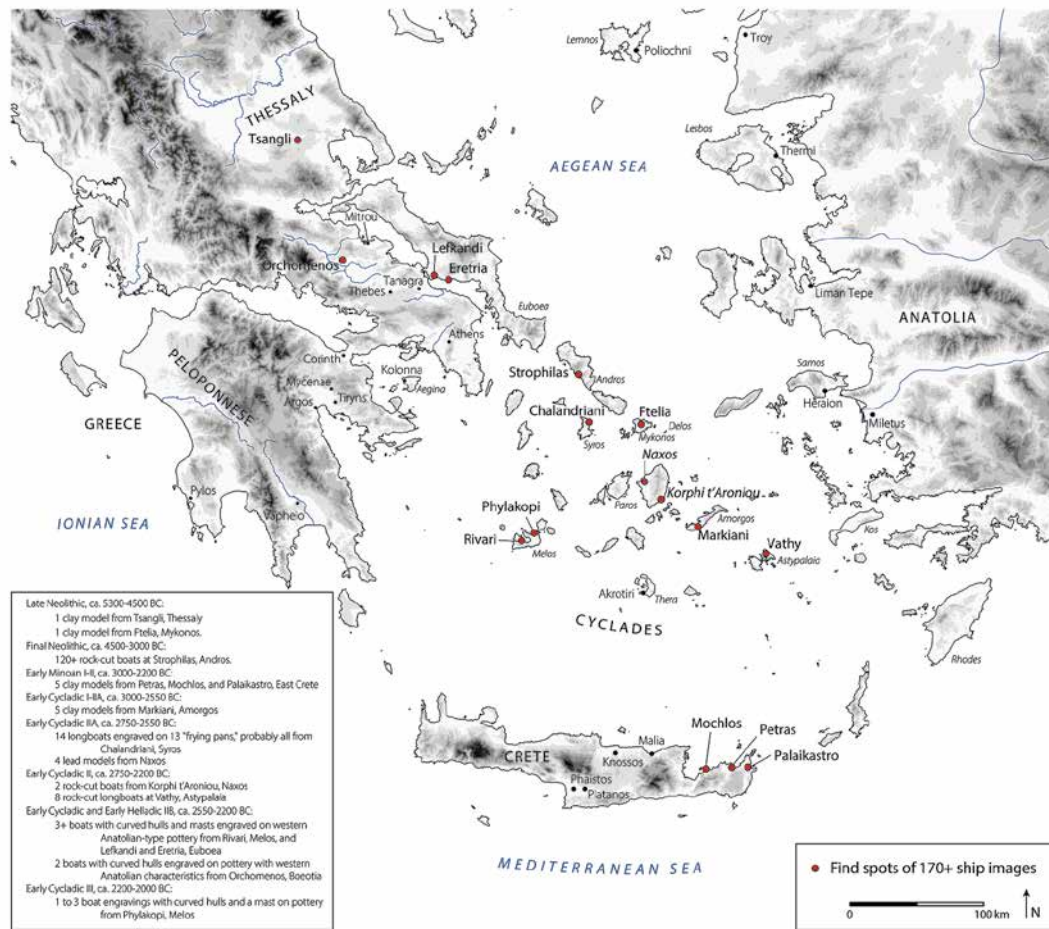


Fig. 1 Map of the Aegean with the geographical distribution of 170+ Late Neolithic and Early Bronze Age boat images with known provenance, ca. 5300-2000 BC (drawing: T. Ross)

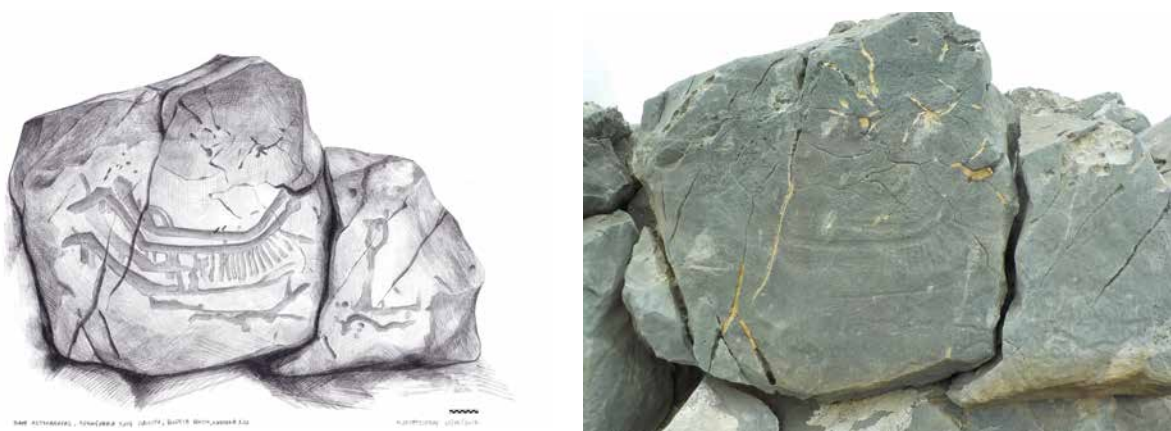


Fig. 2 2a) Three rock-cut flat-bottomed longboats at the EC II settlement of Vathy, Astypalaia, ca. 2750–2200 BC; the second boat has a triangular steering oar at its lower, righthand extremity, demonstrating without a doubt that the high extremity on these longboats was the bow. Fig. 2a (drawing: N. Sepetzoglou; Vlachopoulos 2021: 128, Fig. 27; courtesy of A. Vlachopoulos, Vathy Astypalaia Archaeological Project); Fig. 2b (photo: A. Van de Moortel)

The long-standing idea that the sail was adopted in Crete in the EM III phase, ca. 2200–2000 BC, was based on the presence of ship images with masts engraved on two Minoan seal stones that had no secure provenance. One seal was found at the East Cretan settlement of Palaikastro, embedded in wall plaster in a Late Minoan (LM) I context (Platon *et al.* 1977: 369, 377, No. 261b). The other seal did not come from an archaeological excavation, but was bought at the locality of Andromyloi, in East Crete (Van de Moortel 2017: 266, Fig. 2A; Platon *et al.* 1977: 369, 387, 410–411, No. 276b). Both seal stones have the shape of three-sided prisms, and were dated by Sir Arthur Evans to the EM III phase for several reasons: they were made of soft stones, they lacked hieroglyphic writing of the Middle Minoan (MM) I–II period, and they were of fine quality. To Evans, seals with such characteristics were associated with EM III pottery in the tholos tombs of southern Crete (Evans 1921: 117–118, 123–124, 195–196, Fig. 87; Anastasiadou 2011: 3). However, these tombs were in use for many centuries in the Early and Middle Minoan periods, and their material was notoriously mixed, with contexts not well documented. In 1956 and the 1960s–1970s, a workshop producing such three-sided soft-stone prism seals, mostly made of steatite, was excavated at the palatial settlement of Malia, in northeastern Crete, and its destruction dated to the MM IIB phase, roughly the early 18th century BC. This has prompted a number of scholars to question Evans' dating of those two ship seals. In 2000, Jean-Claude Poursat and Elsa Papatsaroucha redated both seals to the MM II phase, roughly 1850–1750 BC, because of their similarities in material, style, and imagery with seals from the workshop at Malia (Poursat, Papatsaroucha 2000: 265, Fig. 3a–c). Their dating is supported by Maria Anastasiadou in her 2011 comprehensive study of all three-sided soft-stone prism seals from Crete. She assigns those two ship seals to her Malia/Eastern Crete Steatite Group (Anastasiadou 2011: 101, 513–514, Fig. 47, Nos 87b, 90b).

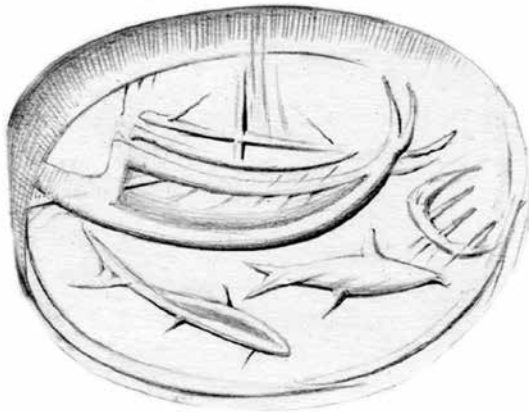


Fig. 3 Drawing of MM IA Late/IB seal from tholos tomb B at Platanos, Southern Crete, which provides the earliest secure evidence for a sail in Minoan Crete, ca. 1900 BC. L = 1.8 cm (drawing: courtesy of the Corpus der Minoischen und Mykenischen Siegel)

Some other seals with sailing ships were previously dated to the EM III/MM I transition, ca. 2000 BC (Kenna 1960; Wedde 2000: 332–333, Nos 703–801), but these have also been redated to the MM II phase by Poursat, Papatsaroucha, and Anastasiadou, including two with an unknown provenance in the Ashmolean and the Brooklyn Museum, which are assigned by Anastasiadou to the Malia workshop (Anastasiadou 2011: Pls 58–60, esp. Pl. 59, Nos 509b, 570a). With the downdating of all these seals to the MM II phase, the earliest well-dated evidence for the sail in Minoan Crete is a three-sided bone seal from tholos tomb B at Platanos, in southern Crete (Fig. 3), which has been dated by Christos Sbonias on the basis of its style to the transition from MM IA Late to MM IB, ca. 1900 BC – just before or at the time when the first palaces were built on Crete (Sbonias 1995: 101; Platon 1969: 330–331, No. 287; Wedde 2000: 333, No. 802). Many early Minoan sailing ships have rather bulky hulls, and it is reasonable to interpret them as specialized cargo vessels.

The construction of specialized sailed merchantmen at this time appears to reflect an increase in maritime trade and a shift from high value/low bulk cargoes to low value/high bulk cargoes. All this supports the thesis that an increase in maritime trade was an important economic driver that made Minoan elites wealthy and contributed to the rise of a hierarchical, palatial society. These early representations on Minoan seals are very small (1–2 cm as a rule) and do not show much detail of rigging, but the Late Cycladic I Miniature Ship Fresco from Akrotiri, on the island of Thera, includes much more detail, making it clear that the rigging of the depicted ships closely resembles that of Egypt (Doumas 1992, 69, Fig. 35; Casson 1975; Basch 1988; Wachsmann 1998, 96–99). Because of these close similarities, Basch's interpretation that Crete had adopted the sail from Egypt has been widely accepted, as Crete and Egypt had increasing trade contacts at that time (Basch 1988: 8–10; cf. Broodbank 2013: 341–347; Tartaron 2013: 53; see Wedde 2000: 76–80, 90–92 for a more complex borrowing route).

However, recently iconographic evidence has come to light that links the first appearance of the sail in the Aegean not to Crete but to the East Aegean. It shows beyond a doubt that the sail was known in the Aegean already in the Early Bronze Age, and this roughly in the third quarter of the third millennium BC. In 2008, Christina Televantou published images of potter's marks found on EC IIB (ca. 2550–2200 BC) shallow bowls from the cemetery of Rivari, on the Cycladic island of Melos. One of these potmarks is a schematic ship image with a mast (Fig. 4a; Televantou 2008b: 213–214, Fig. 21.14; Sampson, Fotiadi 2008: 218–219). In 2018, Sylvie Müller Celka reported the discovery

of similar potmarks on a wheel-finished shallow bowl from Lefkandi and a semi-coarse pottery fragment from Eretria, both located on the island of Euboea, and dating to the contemporary Early Helladic (EH) IIB phase (Fig. 4b-c; Müller Celka *et al.* 2018: 202–203, Fig. 10). All these potmarks are about 4 cm long and represent boats with curved hulls. It is important to note that all these boat engravings with masts occur on vases of the so-called Kastri and Lefkandi I groups, which have western Anatolian characteristics. Many of the bowls are wheelmade and their surfaces are plain or have been red to brown or black slipped and burnished. Their shape and surface finish is western Anatolian, as is the fact that they were wheelmade. They represent the earliest products of the potter's wheel in the Aegean (Choleva 2020: 15–20), and are part of an elite Anatolian eating and drinking set that was introduced into the Aegean presumably together with new elite commensal practices (Mellink 1989; Kouka 2013: 577).



Fig. 4 Potter's marks in the form of boats with asymmetrically curved hulls and masts on EC IIB and EH IIB shallow bowls and a vase with western Anatolian characteristics from (a) Rivari, Melos; (b) Eretria, Euboea; and (c) Lefkandi, Euboea (after Müller Celka 2018: 203, Fig. 10; courtesy of S. Müller Celka). These provide the earliest evidence for the use of the sail in the Aegean, ca. 2550–2200 BC.

The sail and the potter's wheel were not the only technical innovations coming from the East Aegean around 2550 BC. Tin bronze, or bronze made from an alloy of copper and tin, also was introduced into the Central and West Aegean at this time, whereas previously only arsenic bronze was known (Stos-Gale *et al.* 1984: 23). I have argued that also a new shipbuilding technology based on the principle of the expanded logboat was introduced at this time (Van de Moortel 2017). My hypothesis was based on the fact that these boat representations on Anatolian-type pottery are the first ones in the Bronze Age Aegean to show curved hulls, and their curvature is asymmetrical, which is a characteristic of the expanded logboat (Van de Moortel 2012: 24–25). One could rightly object that the potmarks are too rudimentary to provide certainty, but a much more detailed engraving on an EH IIB hybrid jug from Orchomenos, in Central Greece, which has a local shape but an Anatolian surface finish, shows a boat that resembles an Early Cycladic longboat, but with a bottom that is curving in a decidedly asymmetrical fashion, rising less towards the (high) bow than towards the stern (Fig. 5). Hulls with similarly asymmetrical curvatures are seen in later Aegean ship images such as the Miniature Ship Fresco from Akrotiri and MM and LM depictions from Crete (Van de Moortel 2012: 24–25, Fig. 3.8; 2017).

In view of the close similarities of the Late Bronze Age Aegean rigging with Egyptian rigging, I would hypothesize that the sail was not invented in the East Aegean but introduced via the Levant from Egypt, where the sail was first attested (Fagan 2004: 14; Van de Moortel forthcoming: note 62). Recent research has demonstrated that ca. 2600 BC a number of small regional trade networks in Anatolia coalesced into what Vasif Şahoğlu has called the Anatolian Trade Network (Şahoğlu 2005; 2019). This terrestrial and maritime network linked the Aegean coast through Anatolia to Mesopotamia overland, and to the Levant via a maritime route that ran along the south coast of Anatolia (Mellink 1989; 1993; Choleva 2020: 7, 8). This Anatolian Trade Network

brought new goods and knowledge from those eastern regions to the East Aegean, including the potter's wheel, which was invented in North Syria in the 4th millennium BC, and arrived in Cilicia and Troy by the early 3rd millennium BC. I would propose that also the knowledge of the sail, possibly together with the expanded logboat technology, was brought to the East Aegean from the Levant via the southern Anatolian maritime route.



Fig. 5 Paddled or oared longboat with an asymmetrically curved hull (max. pres. W = 7.5 cm) engraved on the handle of an EH IIB Boeotian askos from Orchomenos, Boeotia, ca. 2550–2200 BC; the two slanted lines above the hull do not belong to the ship but are part of the handle decoration (photo: A. Van de Moortel; courtesy of Chaironeia Museum).

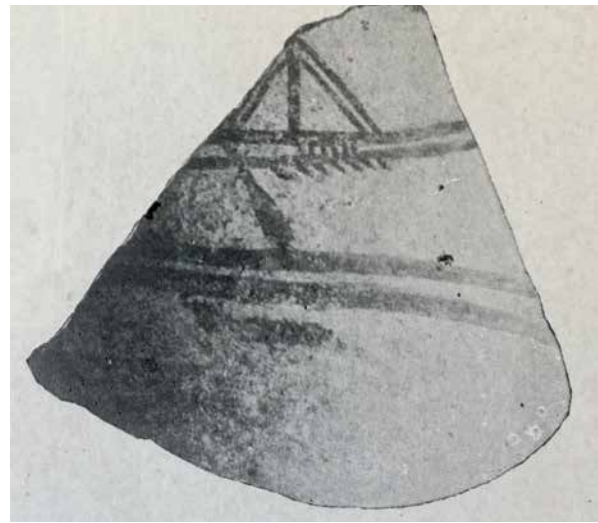


Fig. 6 Fragment of a two-handled jar (max. pres. L = 9.7 cm) from Phylakopi I or II with painting of a sailing ship with curved hull, EC III-Middle Cycladic, ca. 2100–1700 BC (after Edgar 1904: pl. XII.23; courtesy of Society for the Promotion of Hellenic Studies, London)

Current scholarship on the transfer of complex technologies emphasizes the need for prolonged and intense contact between teacher and apprentice (cf. Choleva 2020: 2–6). Where and how the adoption of the potter's wheel and tin bronzes happened in the Early Bronze Age Central and West Aegean has been a matter of debate. Some scholars (Davis 2001: 74; Kouka 2013: 577) have described these processes as local adaptations resulting from increased trade contacts between the East Aegean and the rest of the Aegean. Others (Rutter 2012: 73–79, Şahoğlu 2005: 352; 2019) have proposed that East Aegean migrants moved west and settled in other parts of the Aegean, bringing with them the new technologies. Şahoğlu has argued most forcefully for this hypothesis, and sees these movements as a westward extension of the Anatolian Trade Network. This migration hypothesis is supported by a recent study by Maria Choleva (2020) of the adoption of the potter's wheel, which provides strong evidence for mobility of East Aegean or Anatolian potters to the west. Much of the Anatolian-type pottery found in the Central and West Aegean has been made in local fabrics, including wheelmade vases. This observation had led scholars to conclude that these vessels had been made by local potters who had traveled east and learned to use the potter's wheel there. However, Choleva was able to demonstrate that this was not the case. She found that the potter's wheel was used exclusively for a small number of high-quality Anatolian-type drinking, eating, and serving vessels in the Central and West Aegean, and especially for shallow bowls, whereas local pottery shapes as well as many Anatolian-type vessels continued to be made by hand. What is more, the large majority of wheelmade Anatolian-type vases show a consistent *chaîne opératoire*, or production-step sequence, which includes using the wheel for joining coils, thinning the vessel walls, and shaping the roughout (Valentine Roux' Method 3: Roux, Courty 1998), whereas fewer vases display various *chaînes opératoires* using the wheel only for thinning and shaping (Roux' Method 2). These *chaînes opératoires* are mostly found at Lefkandi and Palamari (on the island of Skyros) and have links with the northeast Aegean and northwestern Anatolia. Given the difficulties involved in building and using the wheel, and the intense prolonged cooperation required for apprentices to learn the required cognitive and motor skills of a technique and *chaînes opératoires* that then were used only for a small subset of vases, Choleva argues, convincingly in my opinion, that the potter's wheel was introduced into the Central and West Aegean by mobile groups of northwestern Anatolian potters, most probably located at Lefkandi and Palamari, who eventually taught the new technology to local apprentices, possibly resulting in its spread to other Aegean settlements.

It is proposed here that the transfer of the new shipbuilding technology and the sail may have happened in much the same way. Given the very different boatbuilding principles and understanding of the properties of wood involved in the construction of expanded logboats and their multi-part descendants as compared to boats descended from ordinary logboats, I think it is likely that also this technology as well as the sail were introduced to the Central and West Aegean by traveling East Aegean boatbuilders. However, it is unlikely that there were large waves of East Aegean migrants into the Central and West Aegean, because there is too much continuity in local material culture and practices in those regions. Rather, we should envision small groups of people seeking their luck in the Central and West Aegean. Sometimes they traded or merged with the local population, and sometimes they created their own short-lived settlements, as I have argued for Kastri on the Cycladic island of Syros and for Panormos on Naxos (Van de Moortel forthcoming; cf. Bossert 1967; Angelopoulou 2014). The superiority of the expanded logboat design and the use of the sail would have made those East Aegean seafarers more mobile than the Central or West Aegean people using their traditional paddled or oared craft consisting of unexpanded logboats and their descendants, and this may have made the East Aegeans very successful also at raiding local settlements. One could compare their technological advantage to that of the Vikings in medieval northern Europe, who used the expanded logboat principle to build superior seagoing vessels that allowed them to be more mobile and carry out far-flung voyages of colonization as well as surprise raids in western Europe (Crumlin-Pedersen 1972; 2010: 49–51, 65–117).

By the Early Bronze 3b phase, starting ca. 2100 BC, the Anatolian Trade Network had collapsed, and so had much of maritime trade in the Central and West Aegean, breaking apart into smaller networks (Alberti 2012). Only three ship images are known from the EC III phase and Middle Cycladic period, and all come from Phylakopi on Melos (Fig. 6; Edgar 1904: 91, 104, 179, No. I 4, pls. V.8c, XII.23; Wedde 2000: 314, 316, Nos 416, 509; Van de Moortel forthcoming). Since they occur on local Cycladic-style vases, they suggest that curved hulls and the sail were now at home in the archipelago.

Two regions survived this collapse relatively unscathed, and in the vacuum thus created, they developed their own maritime trade networks. One was the small island of Aegina, near Athens, where the urban settlement of Kolonna in the course of the Middle Bronze Age (ca. 2000–1700 BC) established a maritime trade network reaching from the Saronic Gulf down to the East-Central Peloponnese and up to Thessaly through the Euboean Gulf, to judge by the distribution of its pottery (Gauss, Knodell 2020). Its ever-growing massive fortification walls as well as the presence of weapons and a helmet on two of its ship representations, painted on Middle Helladic II barrel jars from Stratum IX, dating ca. 1800 BC, indicate that Kolonna had the military and naval power to support its trade network (Gauss 2019: 66; Siedentopf 1991: 6b, 24–25, 45–46, 62, Pls 14, 35–38, Nos 75, 158, 162; Van de Moortel 2020: 323–325, Fig. 18.3). These painted Aeginetan ships have similarly asymmetrically curved hulls as the East Aegean and Cycladic ships, and thus would arguably have descended from expanded logboats.

The other region that took advantage of the Anatolian collapse was Minoan Crete, which from ca. 1900 BC onwards developed highly complex palatial societies that, to judge by the distribution of pottery and other cultural characteristics, were increasingly involved in maritime trade with the Greek mainland, the Cyclades, the southeastern Aegean, the Levant, and Egypt. This long-distance trade by the Minoans was made possible by their adoption of the sail and their construction of specialized cargo ships with rounded bottoms. Co-incidentally, Minoans also adopted the potter's wheel about the same time, ca. 1900 BC (Van de Moortel 2006: 328–329; Berg 2015: 19–23).

At the beginning of the Late Bronze Age, ca. 1700 BC, the rising power of Mycenae in mainland Greece arguably took over the Aeginetan trade network. Around 1450 BC, after the destruction of most Minoan palaces and settlements on Crete, Mycenaean elites also established control over Crete and the Minoan maritime trade network. The few ship depictions that we have from the Mycenaean palatial period, ca. 1370–1200 BC, including reassembled fresco fragments and a graffito from the palace of Pylos (Brecoulaki *et al.* 2015; Egan, Brecoulaki 2015), as well as a Linear B sign from Knossos, display mostly asymmetrically curved hulls comparable to Minoan and Cycladic hulls, which likewise must have descended from expanded logboats. These ships also have Minoan-type masts and rigging. However, some Mycenaean representations from the 13th century BC, such as small clay boat models with curved hulls from Tiryns and Tanagra, and an unpublished fragmentary fresco from Orchomenos (Aravantinos, Fappas 2015: 324; <https://www.mthv.gr/en/permanent-exhibition/mycenaean-period/#image-40>), testify to the existence of asymmetrical ships with a vertical stem and a curved stern comparable to the many well-known representations of Sea Peoples' ships from the 12th century BC Aegean (Van de Moortel 2017: 267–268, Fig. 4b; 2020). In spite of the relative scarcity of ship images, it is clear from the wide geographic distribution of Mycenaean pottery and the dispersion of Mycenaean cultural practices that with the aid of well-built ships descended from expanded logboats, and with the sail, Mycenaeans were able to develop the most intensive maritime trade network of the Late Bronze Age Aegean.

References

- Alberti, M. E. 2012. Aegean Trade Systems: Overview and Observations on the Middle Bronze Age. In M. E. Alberti, S. Sabatini (eds), *Exchange Networks and Local Transformations. Interaction and Local Change in Europe and the Mediterranean from the Bronze Age to the Iron Age*. Oxford, Oxbow: 22–43.
- Anastasiadou, M. 2011. *The Middle Minoan Three-sided Soft Stone Prism. A Study of Style and Iconography*, [CMS Beiheft 9]. Mainz, von Zabern.
- Angelopoulou, A. 2014. *Κορφάρι των Αμυγδαλιών (Πάνορμος) Νάξου: μια οχρωμένη πρωτοκυκλαδική ακρόπολη*. Athens, Greek Ministry of Culture and Athletics.
- Aravantinos, V., Fappas, I. 2015. The Mycenaean Wall Paintings of Thebes: From Excavation to Restoration. In H. Brecoulaki, J. L. Davis, S. R. Stocker (eds), *Mycenaean Wall Painting in Context*, [Meletemata 72]. Athens, National Hellenic Research Foundation: 316–353.
- Basch, Athens, L. 1987. *Le musée imaginaire de la marine antique*. Athens, Hellenic Institute for the Preservation of Nautical Tradition.
- Basch, L. 1988. Naissance de la voile carrée. *Neptunia* 171: 2–10.
- Berg, I. 2015. Potting Skill and Learning Networks in Bronze Age Crete. In W. Gauss, G. Klebinder-Gauss, C. von Rüden (eds), *The Transmission of Technical Knowledge in the Production of Ancient Mediterranean Pottery*. Vienna, Österreichisches Archäologisches Institut: 17–34.
- Bossert E. M. 1967. Kastri auf Syros. Vorbericht über eine Untersuchung der prähistorischen Siedlung. *Archαιολογικόν Δελτίον* 22.1: 53–76.
- Brecoulaki, H., Stocker, S. R., Davis, J. L., Egan, E. C. 2015. An Unprecedented Naval Scene from Pylos: First Considerations. In H. Brecoulaki, J. L. Davis, S. R. Stocker (eds), *Mycenaean Wall Painting in Context*, [Meletemata 72]. Athens, National Hellenic Research Foundation: 260–291.
- Broodbank, C. 2013. *The Making of the Middle Sea: a History of the Mediterranean from the Beginning to the Emergence of the Classical World*. Oxford, Oxford University Press.
- Casson, L. 1971. *Ships and Seamanship in the Ancient World*. Princeton, Princeton University Press.
- Casson, L. 1975. Bronze Age Ships. The Evidence of the Thera Wall Paintings. *The International Journal of Nautical Archaeology* 4.1: 3–10.
- Choleva, M. 2020. Travelling with the Potter's Wheel in the Early Bronze Age Aegean. *Annual of the British School at Athens* 115: 1–46. Doi:10.1017/S0068245420000064.
- Crumlin-Pedersen, O. 1972. Skin or Wood? A Study of the Origin of the Scandinavian Plank-Boat, in O. Hasslöf, H. Henningsen, and A. E. Christensen (eds), *Ships and Shipyards, Sailors and Fishermen*. Copenhagen, Copenhagen University Press: 208–234.
- Crumlin-Pedersen, O. 2010. *Archaeology and the Sea in Scandinavia and Britain*, [Maritime Culture of the North 3]. Roskilde, Viking Ship Museum.
- Davis, J. L. 2001. Review of Aegean Prehistory I: The Islands of the Aegean. In T. Cullen (ed.), *Aegean Prehistory. A Review*, [AJA Suppl. 1]. Boston, American School of Classical Studies: 19–94.
- Doumas, C. 1965. Κορφή τ' Ἀρωνίου. *Archαιολογικόν Δελτίον* 20.1: 41–64.
- Doumas, C. 1992. *The Wall Paintings of Thera*. Athens, Thera Foundation.
- Edgar C. C. 1904, Chapter IV: The Pottery; Chapter V: The Pottery Marks. In T. D. Atkinson, R.C. Bosanquet, C.C. Edgar, A.J. Evans, D.G. Hogarth, D. Mackenzie, C. Smith, F.B. Welch, *Excavations at Phylakopi in Melos*, [Journal of Hellenic Studies Suppl. 4]. London, Macmillan: 80–180.
- Egan, E. C., Brecoulaki, H. 2015. Marine Iconography at the Palace of Nestor and the Emblematic Use of the Argonaut. In H. Brecoulaki, J. L. Davis, S. R. Stocker (eds), *Mycenaean Wall Painting in Context*, [Meletemata 72]. Athens, National Hellenic Research Foundation: 292–313.
- Evans, A. 1921. *Palace of Minos*, Vol. 1. London, Macmillan.
- Fagan, B.M. (ed.) 2004. *The Seventy Great Inventions of the Ancient World*. London, Thames and Hudson.
- Gauss, W. 2019. Considerations on Aegean Bronze Age Fortifications. In S. Hansen, R. Krause (eds), *Bronze Age Fortresses in Europe. Proceedings of the Second International LOEWE Conference, 9-13 October 2017 in Alba Julia*. Bonn, Habelt: 53–80.
- Gauss, W., Knodell, A. R. 2020. Aeginetan Pottery in the Aegean World: Mapping Distributions Around an Island Hub. In S. W. E. Blum, T. Efe, T. L. Kienlin, E. Pernicka (eds), *From Past to Present. Studies in Memory of Manfred O. Korfmann*, [Studia Troica Monographien 11]. Bonn, Habelt: 245–262.
- Kenna, V. E. G. 1960. *Cretan Seals*. Oxford, Oxford University Press.
- Kouka, O. 2013. 'Minding the Gap': Against the Gaps. The Early Bronze Age and the Transition to the Middle Bronze Age in the Northern and Eastern Aegean/Western Anatolia. *American Journal of Archaeology* 117.4: 569–580.
- Kouka, E., Menelaou, S. 2018. Settlement and Society in Early Bronze Age Heraion: Exploring Stratigraphy, Architecture and Ceramic Innovation After Mid-3rd Millennium BC. In E. Alram-Stern, B. Horejs (eds), *Pottery Technologies and Sociocultural Connections Between the Aegean and Anatolia During the 3rd Millennium BC*, [Oriental and European Archaeology 10]. Vienna, Austrian Academy of Sciences: 119–142.
- Marangou, C. 1991. Maquettes d'embarcations: les débuts. In R. Laffineur, L. Basch (eds), *Thalassa. L'Egée préhistorique et la mer. Actes de la 3e rencontre Egéenne internationale de l'Université de Liège, Calvi, Corse, 23-25 avril 1990*, [Aegaeum 7]. Liège, Université de Liège: 21–42.
- Marinatos, S. 1933. La marine créto-mycénienne. *Bulletin de Correspondance Hellénique* 57: 170–235.

- Mellink, M. 1989. Anatolia and Foreign Relations of Tarsus in the Early Bronze Age. In K. Emre, M. Mellink, B. Hrudá, N. Özgüç (eds), *Anatolia and the Near East: Studies in Honor of Tahsin Özgüç*. Ankara, Türk Tarih Kurumu Başimevi: 319–332.
- Mellink, M. 1993. The Anatolian South Coast in the Early Bronze Age: the Cilician Perspective. In M. Frangipane, H. Hauptmann, M. Liverani, P. Matthiae, M. Mellink (eds), *Between the Rivers and Over the Mountains: archaeologica anatolica et mesopotamica Alba Palmieri dedicate*. Rome, Università di Roma “La Sapienza”: 495–508.
- Müller Celka, S., Kiriázi, E., Charalambidou, X., Müller, N. S. 2018. Early Helladic II-III Pottery Groups from Eretria (Euboea). In E. Alram-Stern, B. Horejs (eds), *Pottery Technologies and Sociocultural Connections Between the Aegean and Anatolia During the 3rd Millennium BC*, [Oriental and European Archaeology 10]. Vienna, Austrian Academy of Sciences: 197–213.
- Platon, N. 1969. *Iraklion. Archäologisches Museum. 2. Die Siegel der Vorpalastzeit*, [Corpus der minoischen und mykenischen Siegel II.1]. Berlin, Mann.
- Platon, N., Pini, I., Salies, G. 1977. *Iraklion. Archäologisches Museum. 2. Die Siegel der Altpalastzeit*, [Corpus der minoischen und mykenischen Siegel II.2]. Berlin, Mann.
- Poursat, J. C., Papatsaroucha, E. 2000. Les sceaux de l’Atelier de Malia : questions de style. In I. Pini (ed.), *Minoisch-mykenische Glyptik. Stil, Ikonographie, Funktion*, [CMS Beiheft 6]. Berlin, Mann: 257–268.
- Roux, V., Courty, M. A. 1998. Identification of Wheel-fashioning: Technological Analysis of 4th-3rd Millennium BC Oriental Ceramics. *Journal of Archaeological Science* 25: 747–763.
- Rutter, J. B. 2012. Migrant Drinking Assemblages in Aegean Bronze Age Settings. In J. Maran, P. W. Stockhammer (eds), *Materiality and Social Practice*. Oxford, Oxbow: 73–88.
- Sampson, A., Fotiadi, P. 2008. Early Cycladic II-III Finds from Rivari, Melos. In N. Brodie, J. Doole, G. Gavalas, C. Renfrew (eds), *Horizon. Opiçov. A Colloquium on the Prehistory of the Cyclades, Cambridge 2004*. Cambridge, McDonald Institute for Archaeological Research: 217–223.
- Sbonias, C. 1995. *Frühkretische Siegel. Ansätze für eine Interpretation der sozial politischen Entwicklung auf Kreta während der Frühbronzezeit*, [B.A.R. International Series 620]. Oxford, Tempus Reparatum.
- Şahoğlu, V. 2005. The Anatolian Trade Network and the Izmir Region During the Early Bronze Age. *Oxford Journal of Archaeology* 24.4: 339–361.
- Şahoğlu, V. 2019. The Early Bronze Age Anatolian Trade Network and its Role on the Transformation of the Anatolian and Aegean Communities. In V. Şahoğlu, M. Şevketoğlu, Y. H. Erbil (eds), *Connecting Cultures. Trade and Interconnections in the Ancient Near East from the Beginning until the End of the Roman Period*, [Anatolia Suppl. I.4]. Ankara, Ankara University: 115–131.
- Siedentopf H. B. 1991. *Mattbemalte Keramik der mittleren Bronzezeit*, [Alt-Ägina 4.2]. Mainz, von Zabern.
- Soles, J. S. 2012. Mochlos Boats. In E. Mantzourani, P. P. Betancourt (eds), *Philistor: Studies in Honor of Costis Davaras*, [INSTAP Prehistory Monographs 36]. Philadelphia, Institute for Aegean Prehistory: 187–199.
- Stos-Gale, Z. A., Gale, N. H., Gilmore, G. R. 1984. Early Bronze Age Trojan Metal Sources and Anatolians in the Cyclades. *Oxford Journal of Archaeology* 3.3: 23–43.
- Televantou, C. A. 2008a. Strofilas: a Neolithic Settlement on Andros. In N. Brodie, J. Doole, G. Gavalas, C. Renfrew (eds), *Horizon. Opiçov. A Colloquium on the Prehistory of the Cyclades, Cambridge 2004*. Cambridge, McDonald Institute for Archaeological Research: 43–53.
- Televantou, C. A. 2008b. The Early Cycladic Cemetery at Rivari on Melos. In N. Brodie, J. Doole, G. Gavalas, C. Renfrew (eds), *Horizon. Opiçov. A Colloquium on the Prehistory of the Cyclades, Cambridge 2004*. Cambridge, McDonald Institute for Archaeological Research: 209–215.
- Tartaron, T. 2013. *Maritime Networks in the Mycenaean World*. Cambridge, Cambridge University Press.
- Van de Moortel, A. 2006. Minoan Pottery from the Southern Area, 2. Middle Minoan IA and Protopalatial Pottery. In J. W. and M. C. Shaw (eds), *The Civic Center [Kommos V]*. Princeton, Princeton University Press: 264–377.
- Van de Moortel, A. 2012. The Middle Bronze Age Boat of Mitrou, Central Greece. In N. Günsenin (ed.), *Between the Continents. Proceedings of the 12th International Symposium on Boat and Ship Archaeology*. Istanbul, Ege Yayınları: 17–26.
- Van de Moortel, A. 2017. A New Typology of Bronze Age Aegean Ships: Developments in Aegean Shipbuilding in Their Historical Context. In J. Litwin (ed.), *The Baltic and Beyond. Proceedings of the 14th International Symposium on Boat and Ship Archaeology, Gdańsk, September 21-25, 2015*. Gdańsk, National Maritime Museum: 263–268.
- Van de Moortel, A. 2020. Sea Peoples from the Aegean: Identity, Socio-Political Context, and Antecedents. In A. Gilboa, A. Yasur-Landau (eds), *Nomads of the Mediterranean: Trade and Contact in the Bronze and Iron Ages. Studies in Honor of Michal Artzy*. Leiden, Brill: 318–335.
- Van de Moortel, A. forthcoming. Shipbuilding and Seafaring in the Final Neolithic to Middle Bronze Age Aegean: the Role of the East Aegean Region. In: T. Marketou, S. Vitale (eds), *The Southeast Aegean/Southwest Coastal Anatolian Region (SASCAR): Material Evidence and Cultural Identity, I. The Early and Middle Bronze Age*. Athens, Scuola Archeologica Italiana di Atene.
- Vlachopoulos, A. G. 2021. Βαθύ Αστοπάλαιας: έρευνα και μελέτη σε ένα διαχρονικό παλίμψηστο της νησιωτικής αρχαιολογίας. *Δωδεκανησιακά Χρονικά* 27: 83–131.
- Wachsmann, S. 1998. *Seagoing Ships and Seamanship in the Bronze Age Levant*. College Station, Texas A&M University Press.
- Wedde, M. 2000. *Towards a Hermeneutics of Aegean Bronze Age Ship Imagery*, [Peles 6]. Mannheim and Möhnesee, Bibliopolis.