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16. Aegean Bronze Age seascapes – a case study in maritime movement, contact and interaction

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Abstract

Recent approaches to landscapes, islandscapes, and seascapes have highlighted the multivocal, interactive, multi-sensorial, and, most of all, deeply social nature of human engagement with them. Unfortunately, due to a perceived or real lack of archaeological evidence, anthropological studies, oral histories and the more often than not land-based lifestyle of modern scholars, the maritime world of the Aegean has up to now experienced a certain neglect. It is thus the purpose of this work to draw out the potential of research into seascapes and to promote a new kind of survey that incorporates the maritime environment into its design. The final section reinvestigates common assumptions about mobility, directionality, navigation and interaction in the Bronze Age Aegean and offers a perspective more in keeping with ethnographic, archaeological and experimental data. It will be argued that mobility, movement and interaction were essential factors of island life, that seafaring technology was well developed, and that, therefore, an isolationist tendency should be considered as socially constructed, rather than an inevitable consequence of island living.

Landscapes, islandscapes, seascapes…

Over recent decades, archaeologists, anthropologists and geographers have made great strides in understanding landscapes (Bender 1993; Cosgrove 1998; Ingold 1993; Tilley 1994, 1999). We have now moved a long way away from merely perceiving landscapes as exclusively formed by

environmental processes or as unambiguous reflections of past human activities. Instead, scholars have emphasised the interactive and multivocal nature of our engagement. For those living in it, the landscape *is* a story and a testimony to those who have lived in it before them (Ingold 1993:152). These stories (and myths and rituals) are embedded in places which have become associated with individual or collective emotions and memories, and, as a result, create physical and metaphorical arenas for social reaffirmation as well as conflict and renegotiation. Because any landscape constitutes an interactive discourse in which meaning is 'continually being woven into the fabric of social life, and anchored to the lived topographies of the landscape' (Tilley 1999: 177), it should thus be regarded as 'both object and subject' (Cosgrove 1998: 17).

Seascapes, not dissimilar to landscapes, hold more information than a casual observer might gleam at first glance. What some might perceive as undifferentiated sea is in fact an intimately familiar environment with known places which encapsulate a myriad of histories, experiences, skills, and relationships of importance for those who traverse it and live on or near it (Feinberg 1995: 7; *cf.* McNiven 2003; Rainbird 2004: 5). In some instances, defined areas of the sea – close to the coast or out of sight of land – may actually represent a family's or kin group's territorial holdings. As on land, such areas frequently serve as ancestral memorials and as markers of ownership and are thus an essential dimension of a group's social and mythical history (Barber 2003; Hviding 1995; McNiven 2003; Thompson 1995: 62). Furthermore, interviews with fishermen and sailors have made it clear that their experience of the sea is not limited to a two-dimensional understanding of the sea's surface, but rather they experience the sea as a three-dimensional space where they can also 'see' the fish, and the composition and layout of the sea bottom (Palsson 1994: 910; Nicholson 1983: 105; *cf.* Thompson 1995: 62). Adding the variable of time, it becomes apparent that people's engagement with the sea is as complex and multi-faceted as that with land.

Unfortunately, understanding of seascapes globally, and in particular in the Aegean, is still in its early stages. Traditional approaches to maritime archaeology, with their focus on the practical and physical aspects of seafaring, have proven to be of limited value for a more sophisticated understanding of seascapes. This is not to deny the importance of research into shipwrecks, ship technology, experimental navigation,

port facilities, fishing installations, fishing methods, fishbones, mollusc remains and items of trade, but such approaches do not go far enough in their awareness of the sea as a real and spiritual living space.

Research into seascapes has been further hampered by the sea's physical nature, scholarly attitudes towards it, and a lack of knowledge of its potential for archaeological exploration (Parker 2001). Unlike the land, which can transform human activities into a permanent record, the sea does not have traces of past human activities inscribed into its waves; instead we have to look for indirect (zoo)archaeological evidence. An exception is the shore which, as a physical and metaphorical meeting point between land and sea, often provides evidence of structures, such as port/beaching facilities, navigational landmarks, fishing installations, and ceremonial structures (e.g. Blackman 1982a, 1982b; O'Sullivan 2003; Phillips 1993; Wachsmuth 1967). In addition, natural processes such as tectonic or seismic activity, sea-level changes, erosion and alluviation are continuing to transform the maritime and coastal environment significantly. While no different in principle from land, access to its depths involves higher financial costs and thus acts as a barrier. Unlike the land which most of us scholars consider home, 'the sea is seen as a foreign and threatening medium dividing one piece of land from another, which people cross at their peril, grateful to make land again' (Gosden and Pavlides 1994: 162). Almost a caricature, this statement nevertheless captures the underlying fear of the sea bred from unfamiliarity and ignorance. And despite a strong push by Broodbank (2000), in particular, to incorporate the sea into the analytical framework of islandscapes, the use of the sea remains poorly conceptualised outside the Pacific. Part of the problem is the expense perceived to be associated with marine archaeology, such as specialist marine geophysical equipment and underwater surveys by divers. Contrary to this notion, a recent project off the East African coast has demonstrated that many aspects of seascapes can be investigated with standard archaeological or anthropological methods without incurring additional costs (Breen and Lane 2003).

Exploration of the historical, cultural, symbolic and cosmological dimensions of the Aegean Sea (Figure 1), I would argue, needs to begin with the appreciation that islands and the sea form one interconnected unit which cannot be studied fruitfully in isolation. Thus, surveys of individual islands (or parts thereof) are missing vital dimensions of past lives

Figure 1. *The Aegean.*

and need to be complemented by studies of the surrounding marine environment. My own anticipated project will therefore incorporate a survey of the maritime environment as well as observations of and interviews with local sailors into the more standard survey design. The increasing availability of commercial 3D maps may help us understand the relationship between subsurface features and human activities at sea. Admittedly, establishing a time-depth in relation to the utilisation of the sea will be difficult due to its physical nature. However, investigations of the shoreline, field survey and excavation can fill the knowledge gap to some extent as they can provide information on how a community's interaction with the surrounding sea (and hence attitudes towards it) changed

throughout time (for a good example of such a holistic survey design, see Breen and Lane 2003).

However, before we can embark on such a project, we must first re-investigate commonly held, constraining assumptions about movement, directionality and distance of maritime travel in the southern Aegean that have contributed to a perception of Aegean people as sedentary and wedded to familiar environments.

The sea and seafaring in the Aegean during the Middle and Late Bronze Age

Before embarking on such a discussion, however, two subject matters need to be stated here explicitly. First, there exists one major stumbling block to any investigation of past sailing patterns, namely our assumption that modern current or wind patterns are representative of past configurations. Unfortunately, with evidence of prolonged climatic change towards dryer conditions leading to a reduced winter rainfall and erratic, torrential rainfalls throughout the year in the eastern Mediterranean towards the end of the third millennium BC becoming more and more prominent (Dalfes *et al.* 1997; Peltenburg 2000**;** Weiss and Bradley 2001; see also Moody (2000) who, based on ice-core evidence from Greenland and extensive flood deposits on Crete, has argued for the existence of a 'Little Ice Age' on Crete between MM I and LM III coinciding with the Löbben phase of glacial advance in Europe), we might have to acknowledge that such climate change would potentially have had an impact on sea levels, wind and current patterns. Neither should we forget changes through seismic activity. The study of past climate and seabed changes is a complex and time-consuming collaborative effort between, among others, climate modellers and marine geologists, and it will be some time yet before we can hope for conclusive answers. Until such time, however, our arguments have to remain based upon the explicit assumption of fundamental climatic similarities between the Bronze Age and modern day.

Second, having based my argument on modern sailing charts and pilot books as well as on accounts by contemporary sailors, I feel confident that I am not misrepresenting the relative (un)importance of tides, currents and winds as the basis of sailors' decision-making processes. The

only experimentally and theoretically sound way to investigate the issues touched upon below is by sailing experiments with replicas of ancient boats. Until such time, secondary literature, I fear, remains our best guide to past sailing behaviour.

From the end of the EBA onwards, large sailing ships characterised by greater speed of travel, greater day's travel range and greater cargo capacity came into widespread use and have been depicted on Minoan seals and sealings (Figure 2), on two sherds from Phylakopi as well as on Theran wall paintings (Casson 1995; Morgan 1988; Wachsmann 1998). Despite acknowledging some advantages, it is puzzling that the introduction of sailing ships has, in modern scholarly perception, actually led to a *decrease* in mobility as sailing ships are perceived to be governed by the currents and winds to the same extent as earlier sea crafts, have only a moderate directionality due to poor tacking abilities and are limited in their movements due to their need for protected anchorages (Broodbank 2000: 345). While the first two assumptions will be discussed at length below, the third one is easily undermined by modern pilot and sailing books which stress the ample availability of suitable harbours in the Aegean **(**Heikell 2001; Heikell 2004; Mediterranean Pilot 2000**).** Thus, in the following sections it will be argued – that while sea-wide contacts may expand or contract – these patterns, as discussed above, should be

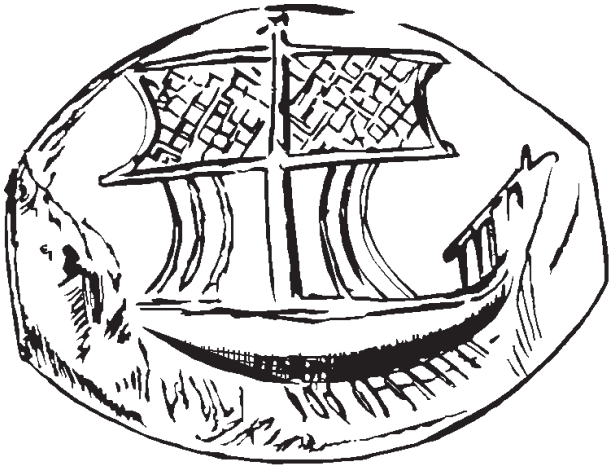

Figure 2. *Late Minoan seal depicting a vessel under sail. The hatches below the boat probably indicate oars (after Casson 1995: fig. 39).*

regarded as a product of social, not technical or environmentally-determined, change.

Ship technology

It is generally recognised that floats, rafts and boats were limited in their manoeuvrability by sea-surface currents and winds. Theoretically, the introduction of the sail should have allowed for greater flexibility, but scholars have been slow in acknowledging any improvement in seafaring technology and regard Middle and Late Bronze Age sailing boats as

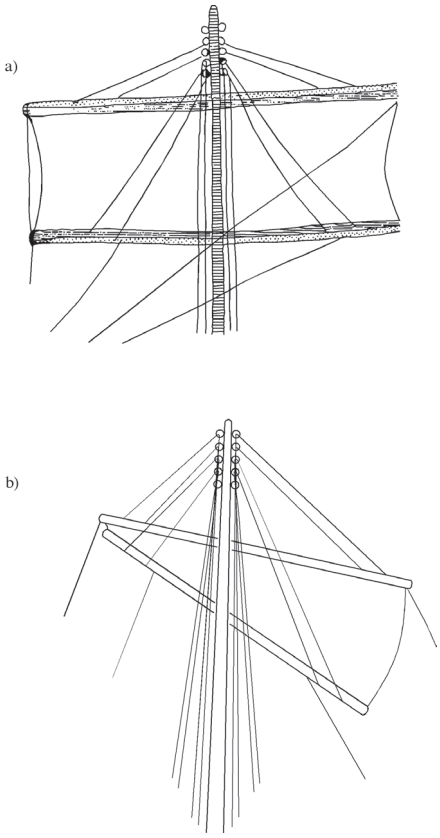

Figure 3. *Prehistoric rigging: a) Reconstruction of the rigging of the Thera sailing ship (after Morgan 1988: fig. 71); b) Rigging reconstruction of a triangulated sail (after Georgiou 1991: plate 23).*

equally controlled by currents and winds. Most of the argument hinges on the capabilities of ships with square-rigged sails supported by an upper yard and boom (Figure 3a). Both Morgan (1988) and Wachsmann (1998: 106, 2000) believe that this type of sail would have allowed sailors exclusively to run directly before the wind, but was incapable of tacking against it. As a consequence, boats could have sailed directly southwards from the Aegean to Egypt but would have been incapable of a return journey against predominant north-westerly winds, necessitating a counter-clockwise circuit around the eastern Mediterranean. Other scholars disagree with this assessment on several counts. First, running directly before strong winds would have been extremely dangerous for square-rigged boats as 'the ends of the low boom would be liable to catch the waves at each roll' resulting in broaching and swamping. The slight upward curve of the two yards, seen on many seal depictions, may have been an attempt at overcoming this disadvantage (Georgiou 1991: 63; Roberts 1991: 56). A reach is the safer and faster way to travel. Second, while many scholars assume that a boomed square-rigged sail cannot be reefed and can thus only be rotated to a position before the wind (Roberts 1991: 55), Georgiou has reconstructed a rigging of the Theran ship (Figure 3b) which allows a reduction of the sail area, highlighting the boat's ability to sail at a closer angle to the wind than previously acknowledged and, consequently, enable tacking manoeuvres rather than merely running before the wind and jibing (1991: 66-67). Indeed, most sailing experiments with replicas and close study of ancient sailing schedules have demonstrated their ability to sail closer to the wind than previously expected (Georgiou 1991, 1993: 360; White 1984: 143-145). Third, the forward position of the mast and the small size of Aegean sails (compared with Egyptian ones) indicate a deliberate adjustment to enhance stability and manoeuvrability of the boat (Georgiou 1991: 66). Fourth, experimental voyages with a brailed sail clearly demonstrate that this innovation *did not* allow for much greater manoeuvrability than a boom-footed sail (Severin 1987).

Unlike merchant vessels which were exclusively propelled by the sail, galleys could also be rowed. The importance of rowing as an alternative means of propulsion even during the Late Bronze Age is visible in the hull, which had originally been developed for rowing rather than sailing boats (Roberts 1991). Experiments have demonstrated the suc-

cessful use of oars against wind, current and tide, making sailors relatively independent of the weather and allowing for mobility at all times. However, man-powered boats required a large crew to reach 3-4 knots in calm sea; under sail the same boat could forge along at 5-6 knots while under stormy conditions the speed could reach up to 12 knots. Astonishingly, rowing counter-current is perfectly feasible if extremely exhausting (Mantzourani and Theodorou 1991: 42; Severin 1985). While being capable of great flexibility and distances, Bronze Age boats must also have been influenced by currents, tides and prevailing winds as is indicated by a slower upwind speed (almost twice as long as for downwind journeys) for recorded early medieval voyages (Pryor 1988). However, their advantages over Early Bronze Age longboats lay in the use the sail to propel vessels over large distances, including their ability to sail close to the wind, and being able to switch between modes of propulsion in an attempt overcome disadvantageous currents and winds (*cf.* Severin 1985).

Navigation

The Mediterranean Sea is comparatively easy to sail and navigate for many months of the year. In contrast to the Atlantic or even North Sea it offers virtually no tides, moderate winds and frequently clear skies, thus permitting navigation by sight with the help of landmarks (Agouridis 1997: 15-16; McGrail 1987, 1991; Wachsmann 1998: 300; *cf.* Severin 1985 for an experimental application). Knowledge of routes and landmarks was presumably passed down from generation to generation and may even have included instructions to destinations beyond the realm habitually travelled. Both natural and man-made landmarks served as orientation markers (Ballard *et al.* 2003: 388; Parker 2001:35; Phillips 1993). While seafarers from the Middle Ages onwards were able to rely on drawn sketches of the coastline as seen from the sea (Parker 2001: 35), Greek and Roman seafarers had access to *periploi*, written travel guides. All *periploi* included distances between stop-overs, names of these places and some navigation instructions (Güngrich 1950). Several, however, such as Arrian's Periplus Ponti Euxini (Liddle 2003) and the Periplus Maris Erythraei (Casson 1989), also include information on wind seasonality, direction and strength; current direction and strength; quality

and type of anchorage; availability of water and food; type and quality of merchandise on offer; and an assessment of the character of the inhabitants (*cf.* also Pliny *Nat. Hist.* IV.11.51-12.74). This tradition has continued into modern day in the form of pilot books which cover all of the world's oceans and seas, and provide information on weather, currents, tides, waves, winds, water depths, anchorages, harbour facilities, sailing regulations, etc. (e.g. Mediterranean Pilot 2000; Heikell 2001). Neither drawn nor written instructions were available to prehistoric sailors, but, as implied by Circe's sailing instructions to Odysseus (*Od.* XII.38-148; *cf.* also V.388-457, X.87-90), detailed verbal sailing and navigating advice must have existed in the form of 'mental maps' (Finney 1998; Gell 1985; Gladwin 1970: 34; *cf.* also Parker 2001: 33).

The fact that islands were intervisible and that sailors did not normally have to cross more than *c.* 20 km of open sea should not lead to the assumption that seamen were unwilling or even incapable of crossing greater distances. Unfortunately, few scholars have contemplated the implications of the existence of advanced navigational skills for the flexibility, mobility and travelling distance of ancient sailors. Long-distance navigation methods have been successfully employed by Pacific sailors, and there is little doubt that the principles are transferable to the Mediterranean (Finney 1994; Lewis 1972; *cf.* McGrail 1987: 275-285 for the capabilities of European sailors prior to AD 1500). Steering by star path and sun orientation were the two major navigation techniques utilised (Lewis 1972: 45, 79-83). During rain and in overcast weather when neither stars nor sun are visible, current sets, water temperature and winds could be drawn upon to stay on course but need to be checked frequently against more reliable data (Agouridis 1997: 17; Lewis 1972: 78; McGrail 1991: 86-87). At other times, navigators may have to rely on suitable land-nesting birds which can indicate the direction of the nearest island up to 32 km out at sea (Lewis 1972: 137, 163-4; Wachsmann 1998: 300). Other scholars have suggested the use of caged land birds (doves, swallows etc.) (Wachsmann 1998: 300). Experimental voyages with experienced native navigators in the Pacific indicate that accurate landfall can be achieved with only a small margin of error (Lewis 1972). Once we acknowledge that Aegean sailors might not have been limited in their movements by their reliance on visible targets and, hence, day travel, but were potentially able to find their path at any time, night or day, then we

can begin to envisage movement without daily stop-overs, during less than perfect weather conditions and stretching over longer distances.

Mobility

The limitations placed upon prehistoric sailors by our modern minds coupled with a desire to make sense of the distribution of prehistoric sites has led to a misplaced emphasis on sea routes – be it within the Aegean or within the wider eastern Mediterranean. Studies of sea routes can be divided into two, sometimes overlapping, categories: those that place modern wind and current patterns at the heart of their argument (Agouridis 1997; Lambrou-Phillipson 1991; Mantzourani and Theodorou 1991; McGeehan Liritzis 1988; Papageorgiou 2004) and those that wish to explain distribution of roughly contemporary sites (Papageorgiou 2004; and the 'Western String' and its derivations: Cherry and Davis 1982; Davis 1979; Davis *et al*. 1983; Graziadio 1998: 33-41; Mountjoy and Ponting 2000; Niemeier 1984). While delineating sea routes may enhance our understanding of the Neolithic and Early Bronze Age when boats were controlled by currents and winds, both sets of scholars invariably, albeit implicitly, regard those routes as environmentally determined and thus relatively unchanging even in the later Bronze Age. Without doubt, prehistoric sailors took geographical conditions, predominant current and seasonal wind patterns into consideration in order to sail under the best possible conditions – we should not expect anything else – but available ship technology and navigation skills meant that sailors could be much more flexible if they wished to; ultimately, wind and current could be used to the sailor's advantage but neither their route nor their destination was predetermined by these environmental factors.

This view is strongly supported by modern pilot books which provide general and area specific information on tides, currents and winds: 1) 'As in most parts of the Mediterranean, the sea level in the Aegean is influenced more by wind than by tide' (Mediterranean Pilot 2000: no. 1.110); 2) Broadly speaking, the surface current of the Aegean conforms to the anti-clockwise circulation of the eastern Mediterranean current (i.e. running north-south) but is easily diverted due to the many islands and channels (Heikell 2001: 23). As a consequence direction may not always be easy to establish. As strong winds can decrease, increase, halt or

even reverse currents (e.g. Paros-Naxos Strait and south-east of Naxos, Skiathos Channel, Poros Channel), modern navigation charts therefore give the advice to ignore currents unless specifically marked in the chart (e.g. Imray Chart 31: Northern Cyclades). Up to 79% of all currents reported did not exceed 1/2 kn and only few reached rates of 2 kn or above (Mediterranean Pilot 2000: no. 1.105-107). Areas where currents need to be taken into consideration are the channels between Euboea and the mainland, as well as at Andros, Tinos, Kea, and in the Samos Strait (Denham 1983: xxvi; Mediterranean Pilot 2000). 3) Broadly speaking, winds vary in strength and direction according to season: in May and June winds are light (averaging Beaufort 3), increase in strength between July and September (averaging Beaufort 4 to 5) before becoming weaker again in the autumn. From December to February winds are strong again, averaging Beaufort 4 to 5. Wind strengths are considerably increased as boats approach the coast. Due to the mountainous character of the land and wind funnels, winds can gust with speeds of up to Beaufort 8 (Heikell 2001: 222; Mediterranean Pilot 2000: no. 1.124-125). While considerable variation exists, prevailing winds are, generally speaking, from the North during the summer (*meltemi*) – except for the irregularly occurring southern Sirocco. In winter, although North and South winds predominate, West and East winds also occur regularly (Heikell 2001: 21-22, 221-222; Mediterranean Pilot 2000: no. 1.124). The direction of any wind may be modified by the mountainous relief of the Greek coastline and may provide boats with an opportunity to sail windwards. A northwards destination can be reached even during *meltemi* season by sailing late in the day or during the night when the winds tend to abate (Denham 1983: xxvi; Mediterranean Pilot 2000: no. 1.3). The Greek Waters Pilot suggests several routes for going northwards during the summer months during the *meltemi* season by going via Kos, Astypalaia, Anaphi, Thera, Ios, Folegandros, Kimolos and Milos, or via the Peloponnese or indeed, via the eastern Cyclades or the Dodecanese and then heading West through the northern Cyclades (Heikell 2001: 222). Either way, a northwards journey is perfectly possible even with prevailing North winds. Especially the 'route' through the Cyclades was in reality 'an almost infinite diverse series of routes amongst the various islands' depending on weather, starting point and destination as medieval navigation books so clearly reveal (Pryor 1988: 97).

Acknowledging the great skill and experience sailors possessed allows us to envisage a great variety of sailing patterns in the Aegean. Instead of devising routes with stop-over points one day's sail apart, we are now able to consider journeys ranging from a short local trip to uninterrupted long-distance voyages stretching over several days and nights. Leaving aside the sailors' dependence on winds which cannot be regulated to blow only at times convenient for daytime travel, or winds too strong to travel with during the daytime (e.g. *meltemi*), the need of landfall during daylight and distances too great to be traversed within one day, there is no reason to assume that daytime travel would have been preferred over night-sailing. Especially when undertaking longer journeys beyond eye contact with land, star-path navigation would have been more accurate than sun orientation. This should come as no surprise, as already in the *Odyssey* night voyages were regularly undertaken (e.g. IX. 79-86, 137-138), and in medieval times Ibn Jubayr travelled 26 days without sight of land (Georgiou 1993: 361; Pryor 1988: 5; *cf.* Severin 1985). While many scholars have emphasised the predominance of coastal voyages (Cherry and Davis 1982; Davis 1979; Furumark 1950), others have rightly highlighted the dangers that await sailors there (Wachsmann 2000). The Palestinian coast and the eastern part of the south Anatolian coast, for example, were difficult to navigate – and it may not be surprising to find that two well-known shipwrecks are located in those dangerous areas (Horden and Purcell 2000: 139; Pryor 1988: 21). The same is valid for the Cyclades and much of the Greek coastline. Due to reefs, rocks, shallows, changing winds and contrary currents these areas are particularly dangerous to any sailor who, during night and storms, would have preferred the open sea. Modern pilot books frequently draw attention to strong wind gusts near coasts due to the mountainous terrain (Mediterranean Pilot 2000: no. 1.124-125; Heikell 2001: 222). Siding with Georgiou (1993: 361), I imagine that open sea voyages were much more common in the Bronze Age than we customarily assume; after all, scholars have reconstructed possible sea-routes between Crete and Cyprus without the possibility of finding shelter at a nearby island (Mantzourani and Theodorou 1991: 51 fig. 9; also Sherratt and Sherratt 1991: 357-358). The same applies to our assumption of a direct long-distance route of roughly four days between Crete and Egypt (e.g Lambrou-Philippson 1991). Furthermore, as scholars have reconstructed a trading route by-passing Thera

after its destruction (Mountjoy 1993: 168) there is no reason to assume that this was impossible before.

The actual sailing season in the Mediterranean has often been considered as comparatively short (early April to late October) because the adverse winter weather was hazardous to sailing (Barber 1987: 17; Lambrou-Phillipson 1991: 12; Mantzourani and Theodorou 1991: 49; Pryor 1988: 87). At first glance, the wind-rose for Melos (Figure 4) supports the assertion of more dangerous sailing conditions in winter by the relatively greater proportion of strong winds (above 5 Beaufort) between October and March. At the same time, however, it also shows the *overall* predominance of comparatively calm conditions throughout the same period – between 50 and 75% of all winds could be classified as Beaufort 1-5 and were thus excellent for sailing or rowing (Wagstaff and Gamble 1982: fig. 9.3). A similar picture emerges from Naxos (Figure 5) where the months of November through to March see a higher proportion of gales, and winter winds are on average 2 knots stronger than summer winds. Still, even in the winter season there exist plenty of calmer days as indicated by the overall averages for *both* seasons which are categorised as 'moderate breeze' or Beaufort 4. While acknowledging a higher

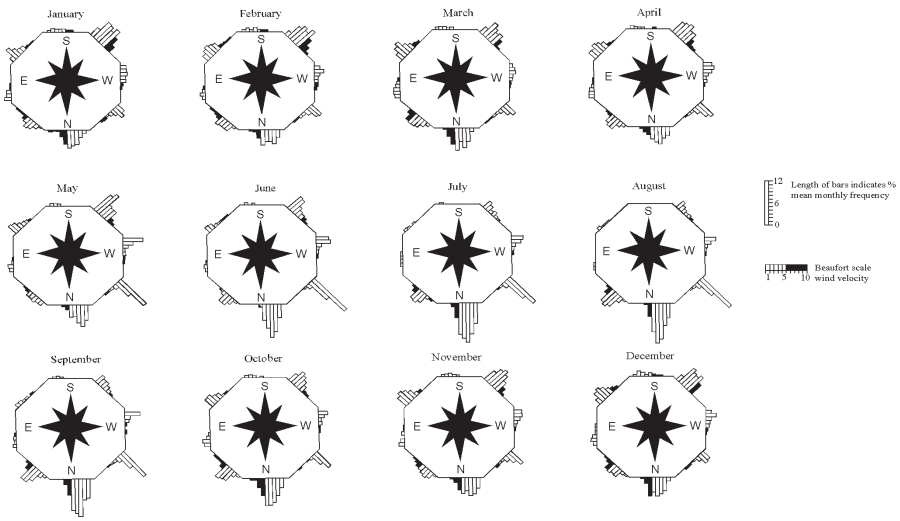

Figure 4. *Windrose data from Melos (after Wagstaff and Gamble 1982: fig. 9.3)*

		JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	MEAN
Average cloud cover (oktas)		5	5	4	3	3	1	<1	<1	1	3	4	5	3
Wind distribution in % (8am)														
	North	44	42	44	34	43	54	78	74	62	58	38	40	51
	North-east	5	6	5	5	6	7	9	10	7	8	7	6	7
	East	2	2	1	1	0	0	0	0	0	R	2	1	1
	South-east	13	13	13	6	2	R	R	1	1	4	8	16	15
	South	14	11	14	17	14	12	3	4	7	6	17	14	11
	South-west	7	8	4	4	2	4	R	0	1	1	3	5	3
	West	1	2	2	2	2	1	1	R	R	R	1	2	1
	North-west	2	3	2	3	3	3	1	2	1	2	R	2	2
	Calm	12	13	16	29	28	19	9	11	17	18	15	15	17
Wind distribution in % (2pm)														
	North	52	52	58	51	61	69	86	84	74	70	51	50	60
	North-east	4	4	4	4	5	6	8	9	7	7	6	6	6
	East	0	0	R	R	R	0	0	0	0	0	R	R	R
	South-east	2	2	3	3	1	1	R	R	R	1	3	3	1
	South	20	21	17	19	15	9	2	3	10	12	24	23	15
	South-west	13	11	10	11	7	7	1	1	5	3	8	8	7
	West	2	2	2	2	1	1	0	R	0	R	2	1	1
	North-west	3	4	4	6	5	4	2	1	4	4	3	3	4
	Calm	3	3	2	5	5	3	1	1	1	3	4	5	3
Mean wind speed (knots) (8am)		15	15	14	9	9	9	14	13	13	13	12	14	12
Mean wind speed (knots) (2pm)		16	17	16	13	12	12	17	16	15	15	15	16	15
Days with gale		5	6	4	1	1	1	1	1	1	2	3	5	-

Figure 5. *Wind data from Naxos weather station. Data compiled over 17 years. Conversion of the Beaufort scale into knots: 0 = 0-1 knot ('calm'); 1 = 1-3 knots ('light air'); 2 = 4-6 knots ('light breeze'); 3 = 7-10 knots ('gentle breeze'); 4 = 11-16 knots ('moderate breeze'); 5 = 17-21 knots ('fresh breeze') (after www.sailingissues.com/climate.html).*

frequency of strong winds and gales (between November and February, up to 30% of ships' observations refer to winds of Force 6 to 8), modern pilot books seem to emphasise more the changeability of wind direction and speed of weather changes with serious consequences for sailing and anchoring (Mediterranean pilot 2000: no. 1.2, 1.124, 1.133; Heikell 2001: 22). In fact, cruising manuals for the Mediterranean almost seem to be concerned more with the uncomfortably low temperatures in winter than the vagaries of the weather (Heikell 2004: 8, 26, 96; James 2003: 161). More importantly, Horden and Purcell rightly point out that we have to distinguish between the *preferred* and *actual* sailing season (2000: 142-3). As the registers of ships to the capital of Majorca in the early fourteenth century AD show, 'almost any month could rate as a busy one' (Abulafia 1991: 46 quoted in Horden and Purcell 2000). Similarly, *all* of the Venetian boat journeys to Palestine collated by Ashtor took place either in autumn or spring (1986: 115). Genoese commercial shipping did also sail in winter (if less regularly) and important military and diplomatic voyages were undertaken at any time of the year (Pryor 1988: 87-89). Neither should we forget the strong *meltemi* which are at their strongest between July and September (up to Force 7), and can interrupt summer sailing completely; anecdotal evidence is provided by the Roths who encountered heavy winds on their way from Samothrace to Delos in June 1996 forcing them to seek shelter for seven out of their ten travelling days (Roth 1999). With visibility actually much better in the Aegean during the winter months due to the lack of summer haze and sea mist which may reduce visibility to three miles or less, winter-sailing is likely to have been common also in the Bronze Age (Heikell 1988: 76-77; Mediterranean Pilot 2000: no. 1.141-2; Georgiou 1993: 362).

Another common assumption, also based on the modern wind pattern, has been that predominant winds in the Aegean are southerly in winter and northerly in the summer – with obvious consequences for the direction and speed of travel (Agouridis 1997: 3-6; Barber 1987: 17-18; Morgan 1988: 162; Shaw 1990: 423). However, despite dominant wind directions both the Melian wind-rose and the data from Naxos (see Figures 4 and 5) demonstrate that '*all* winds can be expected at *all* seasons in the Aegean' – it merely is a question of waiting for a suitable wind (Georgiou 1993: 361 emphasis in original). If experimental archaeology (Severin 1985, 1987) and ancient literary sources (*Odyssey* XIX 199-202) are

given credence, then sailors would rarely have to wait longer than two weeks for a change in wind direction, even enabling a 190 mile journey from the North African coast to Crete against predominant north winds. We must also not forget that the mountainous coasts have a tendency to deflect winds from their predominant orientation, providing sailors with an opportunity to work their way against windward. Waiting was also required when the weather was too calm or too stormy, as, for example, during the summer *meltemi* season (*cf.* Tzala 1989). Like modern ferries, prehistoric sailors would also have waited for heavy winds to abate before leaving the harbour. In any case, voyages in any direction were possible throughout the whole year.

Conclusion and outlook

A re-assessment of prehistoric technology, navigators' capabilities and a better understanding of environmental parameters has resulted in a modified picture of Bronze Age seafaring. Instead of relatively fixed sea routes conditioned by day-time travel and dominated by the need to be close to the coast, we can now envisage sailors with great skills and capable of long journeys across the open sea which would have required night-time travel. With a sail capable of tacking and jibing, sailors were able to sail at an angle to the wind at any time in the year. It is likely that the majority of movements were on the local scale and involved coastal travel with stop-overs. The fact that the length of individual islands is often less than the distance to its closest neighbour draws attention to the intrinsic connectivity between communities from neighbouring islands (as opposed to those from the same island). More importantly, however, the above discussion highlights the relative ease and flexibility with which prehistoric travel could be undertaken. This is not to deny the risks inherent in sea travel, as clearly demonstrated by numerous shipwrecks. However, isolation was not an option available to communities as, leaving aside equally important social aspects of contact situations (Renfrew 1993), the unpredictable climate enforced mobility and contact simply in order to ensure survival. Like Broodbank (2000: 89), I visualise the Aegean as an ever-changing network of social, political and economic interaction spheres where exchange and mobility were essential to life.

Most importantly, however, with the technology available, contact or isolation was a choice, not a predetermined environmental fact.

To achieve a more balanced interpretation of past island life, we need to leave our focus on land behind and begin to include the sea in our project designs. While we will never know how the Aegean islanders (as a group and as individuals) perceived the sea, a wealth of ethnographic and historical data provides a collection of material to draw on for our interpretation. In addition, recent approaches can fruitfully contribute towards research into seascapes. These include contextual analyses of fishbones, mollusc remains, fishing methods, shipwrecks, and underwater or coastal reconnaissance. Much evidence has already been collected (e.g., Bass 1987; Pulak 1998; Powell 1996; Reese 1984, 1987, 1992, 1995; Karali 1999) but needs to be reinvestigated from the vantage point of informed landscape/seascape archaeology. Similarly, the time is ripe (and in the case of non-motorised sailing boats, time may already have passed) to gather information about contemporary Greek fishing methods, sailing activities, myths and stories to build up a mental map of the Aegean Sea, its uses and its economic, social, spiritual and symbolic meanings for those who live in it. Most importantly, however, we need to move away from archaeological field surveys that perceive the geological island as the natural boundary for our enquiries and incorporate the surrounding sea and islands into our research. The technology is commonly available to archaeologists – we simply have to use it!

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