

# NAVIGATION IN THE ANCIENT EASTERN MEDITERRANEAN

A Thesis

by

DANNY LEE DAVIS

Submitted to the Office of Graduate Studies of  
Texas A&M University  
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

May 2001

Major Subject: Anthropology

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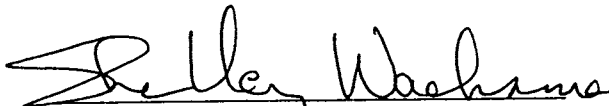
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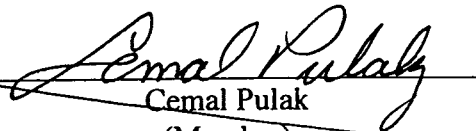
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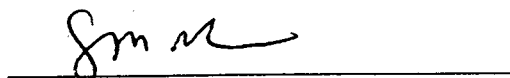
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## ABSTRACT

Navigation in the Ancient Eastern Mediterranean. (May 2001)

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Studies on ancient navigation have traditionally derived their information from ancient geographers and the authors of various *periploi* ("sailings around"), a type of coast-pilot written in and after the fifth century B.C. The resultant paradigm portrays a scene in which ships voyage from headland to headland, never traversing the open sea, and rarely, if ever, sail intentionally past sunset. The investigation presented here, however, offers a different scenario, one which characterizes ancient seafarers as both naturalists and pragmatists, devoted to accurate wayfinding not only on coasting voyages, but also on the open sea. To this end they became students of their maritime environment, making a science of winds (dividing and subdividing them into a wind "compass") and wind prediction, and compiling a body of weather lore that still rings true today. At times, contrary to ancient conventions and modern interpretation of the sailing season, their confidence emboldened them to extend their activity into the winter months. They acquired wayfinding clues by observing the behavior of shore-sighting birds and birds in their natural environment. They also invented aids to navigation: the crow's nest, a Late Bronze Age innovation, extended the viewer's horizon by several miles and helped ships avoid dangerous reefs on approaches to land; the sounding lead indicated depth and type

of bottom; man-made seamarks and landmarks (temples, shrines, funeral mounds, towers, and lighthouses) offered invaluable position-finding information. Sailing past sunset, a very-well documented practice in antiquity, presented a host of additional challenges and hazards. Their response, quite logically, was to make sense of the night sky. Systems of celestial navigation eventually evolved, facilitated by the Mediterranean's clear summer skies: the circumpolar constellations offered a convenient orientation; their height above the horizon provided rough positions north or south of predetermined reference points; and evidence suggests that ancient seafarers utilized guide-stars and "star paths" (a Polynesian practice) to point them in the direction of their destination. In addition to presenting the subject, there is also a case to be made that ancient seafarers invented wayfinding instruments and practices that allowed them to sail safely upon the open sea, day or night.

*To M.R.D. and M.R.D.*

*Uxori bellae filiaeque*

## NOMENCLATURE

I have attempted to be consistent with Greek and Latin transliteration, preferring to use anglicized forms when common convention dictates, and preferring to retain Hellenic endings in the geography of the Aegean and in Greek settlements abroad. Even here, however, the reader will encounter some inconsistencies: Cnidus for Knidos,

Halicarnassus for Halikarnassos, for instance. When in doubt I consulted the *Oxford Classical Dictionary* (3rd ed.) for guidance and clarification. All Greek and Latin translations are my own, and their respective citations follow the numbering system of the Loeb Classical Library. I have had to rely on others for translations of Akkadian, Aramaic, Hebrew, and various other ancient Near-Eastern languages.

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focus our energies toward an investigation of the widely-scattered literary references. Most of these, during the Graeco-Roman period at least, were the product of landlubberly authors making casual observations and offhand comments about their voyage. As this study will try to demonstrate, more is to be learned on the topic of wayfinding in the fertile pages of Homer, Aratus, and Lucian, among others, than in all the *periploi* and geographies combined.

For this study I have chosen to concentrate solely on the Eastern Mediterranean basin, for here, in addition to being the birthplace of seafaring, we find the most evidence of ancient wayfinding practices. From Palaeolithic and Mesolithic Aegean seafarers trading island obsidian, to ships of the Late Bronze Age carrying metals, to a vanquished Roman general fleeing Greece for Egypt across the open sea, the Eastern Mediterranean's literary, archaeological, and iconographic record is significantly more complete than that of its western neighbor. In the eastern basin we have access to Egypt and its rich heritage, and to the abundant archaeological evidence of the Bronze Age Syro-Canaanites and their Iron Age successors, the Phoenicians. And of course we have ample evidence from Greece, with its well-documented past and intellectual tradition, as well as from Rome, Greece's successor not only in the eastern basin, but also in the western.

Central to the theme of this study is my desire to bring ancient wayfinding practices within the scope of seaborne trade and communication. For without widespread knowledge and experience of open-sea navigation, intercourse between and among the Aegean, Egypt and the Levant (i.e. the Syro-Palestinian littoral) would never have occurred at the level it did in any period.

This study begins with a treatment of the Eastern Mediterranean's maritime environment (Chapter II), the physical contexts into which we must place the ancient navigator and the various wayfinding methods mentioned in ancient sources. Here the reader will find a discussion and examination of winds, currents, visibility, and how one should define "open sea." Familiar assumptions regarding the ancient sailing season also require further refinement. This is followed by a survey of documented sea routes in antiquity (Chapter III), starting in the Neolithic and proceeding down to the Roman era. Chapter IV is designed to bridge Chapters II and III by outlining the various "instruments" and man-made aids employed by seafarers along these routes. Chapter V opens with a survey of each region's astronomical traditions, then addresses the practice and methods of night-time sailing and celestial navigation. Finally, Chapter VI is an attempt to synthesize the preceding chapters into practical, age-by-age navigational systems.

On some questions (due to evidential constraints) one can only guess and bring to bear appropriate parallels. I make heavy use of Polynesian seafaring practices, for instance, especially as regards wayfinding at night. Their navigational systems, which are wholly environmental in nature, have been well-documented by David Lewis and many other anthropologists.<sup>10</sup> And their system of star-path sailing appears to dovetail nicely with ancient Mediterranean practices. While it is true that Oceania comprises a vast area of open sea, it was within its distinct island archipelagos—whose inter-island distances mirror those of the Eastern Mediterranean—that Polynesians practiced their

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<sup>10</sup> See Lewis 1994; Ellsworth 1987; Halpern 1985; Finney 1976; Gladwin 1970.

ghly-accurate and yet non-literate navigational systems. These methods often find counterparts in the eastern basin.

This study is merely a preliminary step in approaching traditional problems anew, while simultaneously examining certain aspects of ancient wayfinding heretofore silent to the intellectual tradition. In addition to presenting the subject, there is also a case to be made that ancient navigators were more capable than is generally allowed. Omissions are inevitable, errors unavoidable, but it is hoped that this study will arouse wider discussion on a subject that has received only summary treatments.

## CHAPTER II

### THE ANCIENT MARITIME ENVIRONMENT

#### INTRODUCTION

Before the invention of the compass, a basic understanding of winds and weather comprised the most important instrument in the navigator's kit. The importance of winds to early seafarers is confirmed by Linear B tablets discovered at Knossos, which mention an *a-ne-mo i-je-re-ja*, or "Priestess of the Winds" at the location of *u-ta-no*.<sup>1</sup> Similarly, New-Kingdom Egypt boasted both a "Lady of the Winds" and a "Lord of the Winds."<sup>2</sup> According to Herodotus, the priests at Delphi erected an "Altar of the Winds" in order to pray for those allies fighting at sea against Xerxes's invasion force in 480 B.C.<sup>3</sup> Two centuries prior to Herodotus, Homer could comment on the four winds recognized in his time, and in the fourth and third centuries B.C. studies of winds and weather and their relation to seafaring were penned by Aristotle, Theophrastus, and Aratus.<sup>4</sup> The ability to sail effectively and safely, even short distances, depended to a certain degree on the navigator's ability to predict and gauge currents, wind speed and wind direction. In the absence of reliable forecasting instruments, he relied totally on his

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<sup>1</sup> This is most likely the site of Itanus on the eastern coast of Crete. This city was one of the gateways to the Aegean from points east (Deshayes 1951). A list of offerings to an *a-ne-mo/i-je-re-ja* is listed at Fp1 and Fp13, the latter of which lists offerings sent to one of the priestesses in *u-ta-no* (see Ventris and Chadwick 1973, 127, 304-8; Hampe 1967; cf. Wilson 1977, 76-7, 106).

<sup>2</sup> Budge 1960, 632.

<sup>3</sup> Hdt. 7.177-9. Pausanias (2.12.1) mentions an altar of the wind at Titane, just west of Corinth, and also a shrine to Athena of Winds at Mothone (4.35.8).

<sup>4</sup> Arist. *Mete.*; Theophr. *De Ventis* and *De Signis*; Aratus *Phaen.*

own knowledge and intuition forged in the fire of experience, without which his career would be cut very short. To be sure, the Mediterranean, both then and today, is not as forgiving a sea as is generally credited. Stories of shipwrecks and faulty navigation are littered throughout ancient, medieval, and modern literature. They are validated by the multitude of shipwrecks found on the bottom of the Mediterranean and along her shores.<sup>5</sup>

In this chapter I set forth the environmental parameters under which the navigators of antiquity operated, *at the very spot where atmosphere encounters the surface*. We begin with tides and currents, then proceed to a discussion of wind regimes among the various regions. Unfamiliar to this discussion is the question of visibility and its role, if any, regarding the maritime space of the ancient Eastern Mediterranean. The chapter then concludes with a treatment of the ancient sailing season(s). Modern meteorological data supplement the often silent ancient sources, thereby giving us a grasp of the maritime environment as it relates to wayfinding. Perhaps only then can we arrive at an understanding of the conditions under which the ancient mariner operated, solved wayfinding problems, and sailed safely from port to port.

## **METEOROLOGICAL CONDITIONS**

### **The Surface of the Mediterranean: Tides, Currents, Winds, and Visibility**

To the ancient seafarer, the sea was more than just some meaningless and unpredictable mass: it contained a variety of directional and meteorological information. While the horizon was the object of his gaze often enough, so too was the surface of the sea. An

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<sup>5</sup> On estimates on the number of ancient shipwrecks in the Mediterranean and Black Seas, along with the likely reasons for their demise, see Bascom 1976, 65–8, 71–84.

understanding of the behavior of the liquid/air interface on which their vessels operated was essential for safe voyaging. Currents, swells, and wave-patterns served as simple, yet accurate, wayfinding tools: the set and speed of a current, if correctly read, could reveal direction in relation to familiar winds or nearby landmasses. When winds died down and no longer served as a point of reference, the waves and currents they generated continued for some time afterwards, thus leaving a directional clue.<sup>6</sup> Contrary currents, with prior knowledge at least, could be avoided in times of calm. Today we describe sea-surface phenomena in terms of tides, currents, winds, and visibility.

## Tides and Currents

Paradoxically, in the Mediterranean, tides—that is the vertical rise and fall of sea-level—and their result, currents, are a product more of nontidal forces than of direct lunar influence; indeed lunar-generated tides are negligible, particularly in the eastern basin.<sup>7</sup>

Evaporation is one such nontidal force that produces surface currents.<sup>8</sup> Since there are few rivers that empty into the Mediterranean, evaporation greatly exceeds replenishment.<sup>9</sup> To maintain equilibrium, Atlantic waters flow into the western basin via the Straights of Gibraltar (fig. 2.1). During summer, this general current maintains a

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<sup>6</sup> This technique was employed extensively by Polynesian navigators in the Pacific; see, e.g., Lewis 1994, 148–50; cf. Theophr. *De Ventis* 35.

<sup>7</sup> Heikell 1994, 24; Le Gras 1870, 184; the *Sailing Directions (Planning Guide) for the Mediterranean*, published by the Defense Mapping Agency Hydrographic/Topographic Center (1991, 134 and fig. 15), states that the “[tidal] range decreases farther east....Elsewhere the range is less than 1 ft....The tidal range in the Tyrrhenian and Ionian Seas is only a few inches.”

<sup>8</sup> Hecht et al. 1988, 1320.

<sup>9</sup> Rivers compensate for only about one-third of the Mediterranean’s water loss through evaporation.



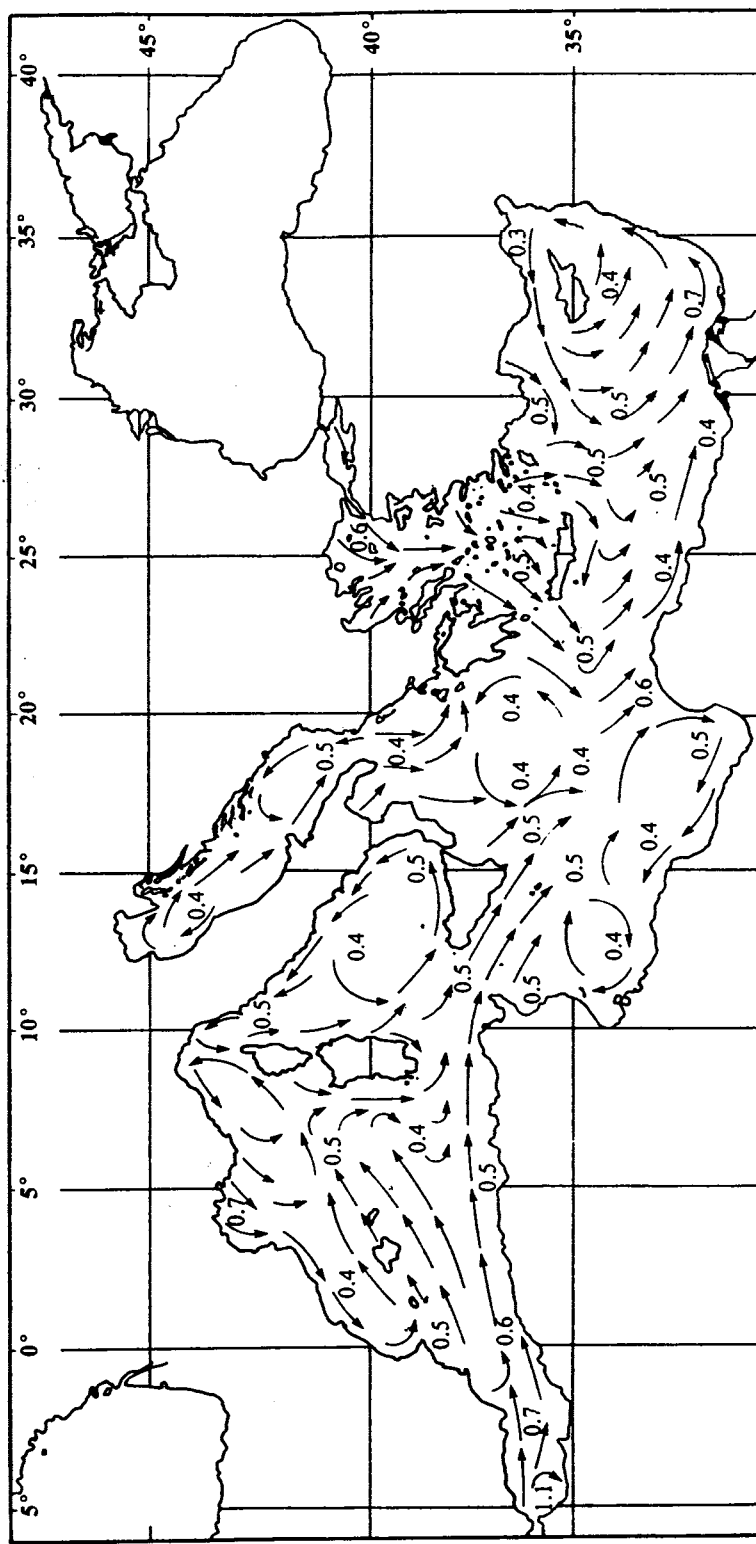


Fig. 2.1. Surface currents in the Mediterranean. (Data derived from Defense Mapping Agency Hydrographic/Topographic Center 1991, fig. 18; British Hydrographic Department 1961, 5:11-16, figs. 3-4)

steady, eastward flow until it reaches the Strait of Sicily, at which point it begins to meander along the Libyan coast toward Egypt. While it continues eastward, a part of the stream breaks off to the south to produce a clockwise current in the Gulf of Sidra (ancient *Syrtis*). Upon reaching the Egyptian coast, the general current received a boost from Nile floods during spring and early summer; prior to the construction of the Aswan High Dam, north-northeast currents reached speeds of up to 3.2 knots before encountering the general current.<sup>10</sup> (Today, however, surface currents along the Delta's shoreline rarely exceed 0.5 knots.<sup>11</sup>) From here the general stream flows northward toward Cyprus in a massive, but slow-moving surface gyre, rotating in a counter-clockwise direction along the Levantine coast and under Asia Minor. Upon reaching the north coast of Crete, the current splits in two: one branch continues on into the Ionian Sea past Malea, some of which turns south and back into the general flow heading eastward toward Egypt. The other branch flows into the southern Aegean where the general current is deflected by a profusion of islands and projecting headlands between Crete and Asia Minor. Here this branch encounters the current that issues from the Dardanelles, the result of the Black Sea's higher sea level (fig. 2.2). This current meanders from the northern Aegean basin to the southern, its course diverted here and there by islands and parts of either mainland; eddies result and often run counter to the southern course of the general stream. The incessant *Etesians*, which blow consistently out of the north and produce surface currents, render the current's path more irregular.<sup>12</sup>

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<sup>10</sup> Defense Mapping Agency Hydrographic/Topographic Center 1991, 50 (see *supra* n. 7).

<sup>11</sup> *Ibid.*

<sup>12</sup> Reports conflict with regard to a north-flowing current along the eastern Aegean coastline. Degas (1995, 78 and pl. 17), citing vague French and Dutch sources, maintains that Aegean currents travel predominantly southward or westward during the sailing season; only between November and January do

There are some consistent patterns during the summer months, however. According to the Hydrographic Service of the Greek Navy, minor gyres exist between Crete and Thera and in the northern Aegean basin. Several independent currents course eastward from the central Greek mainland, through the northern Cyclades, to the east Greek islands.<sup>13</sup>

While the general Mediterranean current is steady and predictable, it is also relatively weak, often traveling during summer at the rate of between 8 and 12 miles *per day*.<sup>14</sup> Certainly they facilitated the voyages of Neolithic and Early Bronze Age vessels. However, with the widespread use of sail after the Early Bronze Age, the exploitation of these weak currents became secondary to that of winds.

As already noted, steady winds can also generate tides and currents. Certain winds have been known to generate tidal ranges of up to one meter, particularly in the northern parts of the Mediterranean where they funnel between proximate landmasses.<sup>15</sup> The *Mediterranean Pilot* states: "The currents, at any time, are largely affected by the wind, and local drift currents of a temporary nature, but of sufficient strength to mask the general circulation, are set up when the wind has been strong and continuous from any one quarter...the wind effect may be such as to enhance the strength of the normal circulation."<sup>16</sup>

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surface currents travel northward along the eastern Aegean coast. The *Mediterranean Pilot* (5: 12 and figs. 2–3), however, describes the existence of a north-flowing current from early spring to late summer. The Hydrographic Service of the Greek Navy is perhaps our most reliable source. It documents the complicated, intra-island currents in the Dodecanese and northern Aegean basin (Agouridis 1997, 6, fig. 3).

<sup>13</sup> See Hydrographic Service of the Greek Navy 1971; 1976; Agouridis 1997, 3–6, figs. 1–3.

<sup>14</sup> British Hydrographic Department 1961, 5:13, fig. 3.

<sup>15</sup> See, for example, Le Gras 1870, 184; Weld-Blundell (1895–6, 115), however, reports that on the western coast of the Syrtis, "the rise sometimes amounts to over 5 feet...due to a northerly wind piling the water up on these shoal coasts;" see also Pliny *HN* 5.4; Theophr. *De Signis* 29; Scylax 109.

<sup>16</sup> British Hydrographic Department 1961, 5:12.

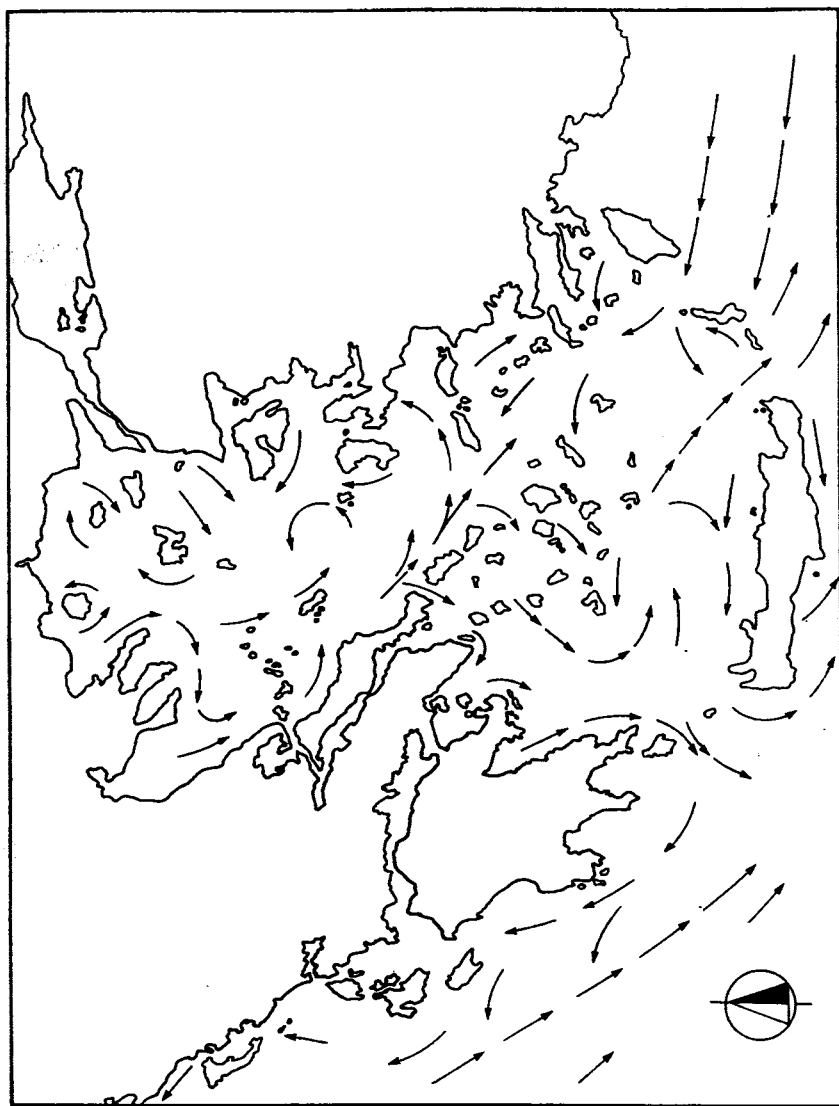


Fig. 2.2. Surface currents in the Aegean. (Data derived from Hydrographic Service of the Greek Navy 1976; Defense Mapping Agency Hydrographic/Topographic Center 1991, fig. 18; and British Hydrographic Department 1961, 5:11-16, figs. 3-4)

While currents of either type in the Mediterranean rarely exceed one knot, it is not rare to find faster-flowing currents in channels or straights aligned with the direction of prevailing winds, such as the narrows between Euboea and the Greek mainland (7 knots),<sup>17</sup> or the channel between Samos and the Turkish mainland (3 knots +).<sup>18</sup> The variegated topography of the Aegean, both above the sea and below it, ensures that any surface current (general or wind-generated) is diverted, deflected, reversed, sometimes intensified or, conversely, nullified. In the open sea, on the other hand, where winds flow unchecked by land masses, wind-driven currents generally travel in the direction of the wind; they are influenced only by the general current and, to a much lesser extent, the Coriolis force.<sup>19</sup>

## Winds

Throughout the history of sailing ships, winds have played an essential role in the determination of sea routes. In desiring to reach one's destination, the direction of the wind or winds is of paramount importance, for sailing is, essentially, the management of winds. Thus it required not only strategy, but also an understanding of a ship's sailing limitations.<sup>20</sup> For the inter-regional voyager, a knowledge of local wind conditions was required for each leg of the trip: Aegean winds, for example, do not behave the same as

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<sup>17</sup> Heikell 1994, 24; the tide in the Euboean channel changes up to seven times in a twenty-four hour period (see Strab. 9.2.8 and Pl. *Phd.* 90c).

<sup>18</sup> Defense Mapping Agency 1995, 212.

<sup>19</sup> The Coriolis force is an apparent force generated by the rotation of the earth. In the Northern Hemisphere, it deflects currents to the right, and in the Southern Hemisphere, to the left; in the upper layers of the Mediterranean, it may alter the direction of a wind-driven current by up to 15° (see Bowditch 1984, 815–16, 905).

<sup>20</sup> On ancient sailing strategy, see Conlin 1998; on sailing limitations of Bronze-Age ships, see Roberts 1991; 1995; Georgiou 1991; Wachsmann 1998, 216–17, 241–3, 245–6, 248–51, 371 n. 35; on Iron-Age ships and brailed sails, see Cariolou 1997.

winds off Egypt's Delta or those north of Cyprus.<sup>21</sup> In an age of sail, prevailing winds were the primary driving force on these routes. A knowledge of local peculiarities and the behavior of offshore and onshore breezes was necessary when putting to sea or seeking a harbor or anchorage.<sup>22</sup>

Beyond the sight of land, seafarers relied primarily on their ability to read the winds' signatures to obtain their bearings: telltale signs included strength, moisture, temperature, accompanying haze, cloud-cover, or clear sky.<sup>23</sup> Indeed the concept of "direction" became inexorably connected with winds. To face north was to face *Boreas*, the North Wind. While Homer knew only of the four winds that correspond to our cardinal directions—*Boreas*, *Notos* (south), *Apeliotes* (east), and *Zephyros* (west)—Aristotle identified no less than eleven, which he arranged into a convenient "wind rose."<sup>24</sup> To the Eastern Mediterranean seafarer, however, the *Etesians* were the most influential in determining the general pattern of routes (fig. 2.3).

*Etesians*. Perhaps the most pervasive, and most notorious, of all wind regimes in the Eastern Mediterranean are the *Etesians* (Turkish *meltem*)—northerlies that originate in the upper Balkan peninsula. Their name, taken from Greek ἐτήσιος, means annual or periodic,<sup>25</sup> and they blow with exceptional regularity from March to November.<sup>26</sup> Their

<sup>21</sup> On the equation of ancient winds with modern winds, see Murray 1987, 1995.

<sup>22</sup> Xenophon (*Hell.* 2.3.31) has Critias say to Theramenes: "It is necessary to persevere as sailor's do (at the oar) until they encounter favorable breezes;" see also Morrison and Williams 1968, 310–11, n. 26.

<sup>23</sup> Theophrastus (*De Ventis* 37–43) lists the peculiarities of each wind.

<sup>24</sup> Arist. *Mete.* 2.6.

<sup>25</sup> The term οἱ ἐτήσιαι came to be used later by the Romans to denote the periodic monsoons of the Arabian Sea (see for example Pliny *HN* 6.21).

<sup>26</sup> The so-called "Bird Winds" (οἱ ὀρνιθίαι), which blow out of the north after the winter solstice, were considered by Aristotle (*Mete.* 2.5.22) to be a weaker species of the *Etesians*.

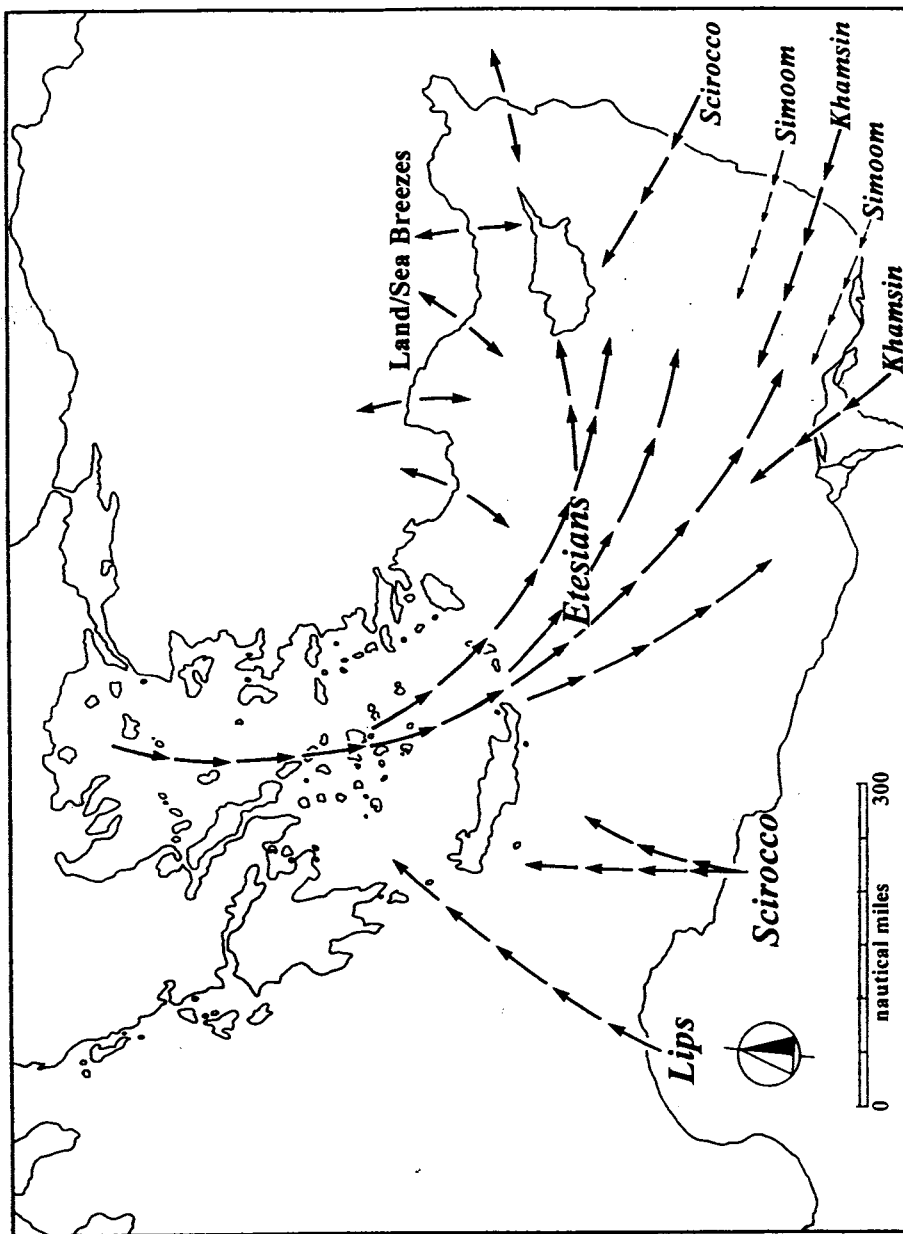


Fig. 2.3. Summer winds in the Eastern Mediterranean. (Data derived from Defense Mapping Agency Hydrographic/Topographic Center 1991, 74; Air Ministry/Meteorological Office 1962, 100, fig. 1.20)

maintenance is dependant on the presence of a stable high-pressure system over southern Europe and the Mediterranean, and a corresponding low-pressure system over south-west Asia. In the Aegean, the *Etesians* are predominantly northerly, accounting for some 90% of all winds recorded during the month of July.<sup>27</sup> Upon reaching the latitude of Crete they begin to veer more westerly, such that by the time they arrive in the Central Levantine Basin they are predominantly northwesterly, with a significant portion being westerly. They maintain their force and consistency until they encounter and mix with other wind regimes.

Funneling into the narrows between landmasses, such as between Samos or Euboea and their adjacent mainland, these winds can reach dangerous velocities and at times can blow with gale force. Sailing vessels were often forced to anchor or beach in the lee of islands or headlands until they abated.<sup>28</sup> It was the north wind *Boreas*, for example, that smashed King Darius's fleet while attempting to round Mt. Athos in 490 B.C.<sup>29</sup> And it was this wind that carried Odysseus, among countless others, from the Aegean to North Africa on both planned and unplanned voyages.<sup>30</sup> Because the effects of the *Etesians* influenced nearly the entire Eastern Mediterranean basin, they were perhaps most responsible for the determination of sea routes throughout antiquity. Other winds, however, were utilized in antiquity.

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<sup>27</sup> Defense Mapping Agency Hydrographic/Topographic Center 1991, A51; British Hydrographic Department 1961, 5:29–30 and fig. 4.

<sup>28</sup> As Le Gras (1870, 185–6) observed, these “winds from the N. blow sometimes with great violence, even in summer...they are generally strong and often blow a gale;” see also the description by Philippon (1907, 94; pace Semple 1931, 580).

<sup>29</sup> Hdt. 6.44.

<sup>30</sup> Hom. *Od.* 3.299–300; Hdt. 4.152; Thuc. 7.50; Alciphron *Letters to Fishermen* 10.3; see below, pp. 58–66.



*The Lips*. For ships of the Iron Age destined for the Aegean from points south, such as Cyrenaica and ports along the adjacent shoreline, there was an alternative to pounding upwind against the *Etesians*, or to the laborious, counter-clockwise route utilized by ships of the Late Bronze Age.<sup>31</sup> To the Greeks this southwesterly was known as the *Lips* (Λίψ), whereas the Romans knew it later as the *Africus*.<sup>32</sup> It originates in north-central Africa, reaches the Mediterranean coast roughly at Cyrene, then flows northeastward to the western Aegean midway between Cape Malea and Crete; eventually it reaches the Saronic Gulf and is deflected by the Attic peninsula.<sup>33</sup>

The relationship of the *Lips* to seafaring is symbolized in Athens on the *Horologion* of Andronikos, known today as the Tower of the Winds, an octagonal building of marble erected by its namesake in the middle of the first century B.C. (fig. 2.4).<sup>34</sup> Personifications of eight winds, complete with names carved in Greek, were cut in relief along the top of each exterior face. Their respective “signatures” are thus represented: *Boreas*, the north wind represented by a winged man carrying a triton shell; *Kaikias* of the northeast bearing hailstones; *Apeliotes* from the east carrying a sash of grains and fruits; *Euros*, a south-east wind covering his face from the cold wind; the southern wind *Notos* holding a water jar upside-down; *Lips* holding an *aphlaston*, or an ornamented stern-post, of a galley (fig. 2.5); *Zephyros*, a west wind bearing flowers; and finally the *Sciron*, a northwesterly carrying an inverted brazier. The attire and

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<sup>31</sup> For the sailing limitations of Bronze Age ships, see pp. 195–200.

<sup>32</sup> Pliny *HN* 18.77; in Aristotle’s eleven-point wind rose (*Mete.* 2.6), the *Lips* is labeled a west-southwest wind, with no wind occupying south-southwest.

<sup>33</sup> However, Theophrastus (*De Ventis* 51) states that the *Lips* is used “mostly about Crete and Rhodes.” Apparently the Greeks did not distinguish between the *Lips* and its counterpart on the other side of Crete, today’s *Sirocco*.

<sup>34</sup> Traulos 1980, 281–8.



Fig. 2.4. The *Horologion* of Andronikos, or Tower of the Winds, erected in Athens in the third century B.C. Note the Lips bearing on aphlaston on the left. (Courtesy of S. Wachsmann)

attributes of nearly all personifications lend themselves to uncomplicated interpretation. *Boreas*, for example, is heavily dressed and thus personifies the cold or cool element of the *Etesians*. The triton shell was a common icon for seafaring. *Notos*'s inverted water jar signifies rain or wet weather. The inverted brazier of Sciron probably signifies oppressive heat.

The portrayal of the *Lips*, the only wind on the *Horologion* with a direct nautical association, has engendered two possible interpretations. The name is no doubt derived from the Greek verb *leibo* (λείβω), meaning to pour, pour forth, or let flow; and thus its appellation indicates an original association with wet weather. Based on this Stuart and Revett suggested that the personification symbolizes foul weather for seafarers attempting to enter the Piraeus.<sup>35</sup> After all, Herodotus states that these winds are “the most rainy.”<sup>36</sup> And Pausanias reflected on the destructive nature of this wind on crops along the southern coasts of the Saronic Gulf.<sup>37</sup> These mentions, however, likely referred to winter months, when indeed this wind was cold, wet, and blustery—an enemy of agriculture. But as all the winds are represented by these eight personifications, we need not assume that the *Lips* was undesirable for seafarers. Rather, we should consider the depiction of the *aphlaston* a symbol of a very useful wind. For during the months of May and October, an extension of the *Lips* acts as a steady sea-breeze in the Saronic Gulf, at the north end of which lies the Piraeus, the bustling port of Athens. And similar effects are also seen between Cyrene and the eastern Peloponnese. In these areas the

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<sup>35</sup> Stuart and Revett 1825, 45; LeGras (1870, 186) states that these southwesterly winds occur sometimes in summer, “but they are disagreeable for navigation, owing to the sudden variations to which they are subject.”

<sup>36</sup> Hdt. 2.25.

<sup>37</sup> Paus. 2.34.2.

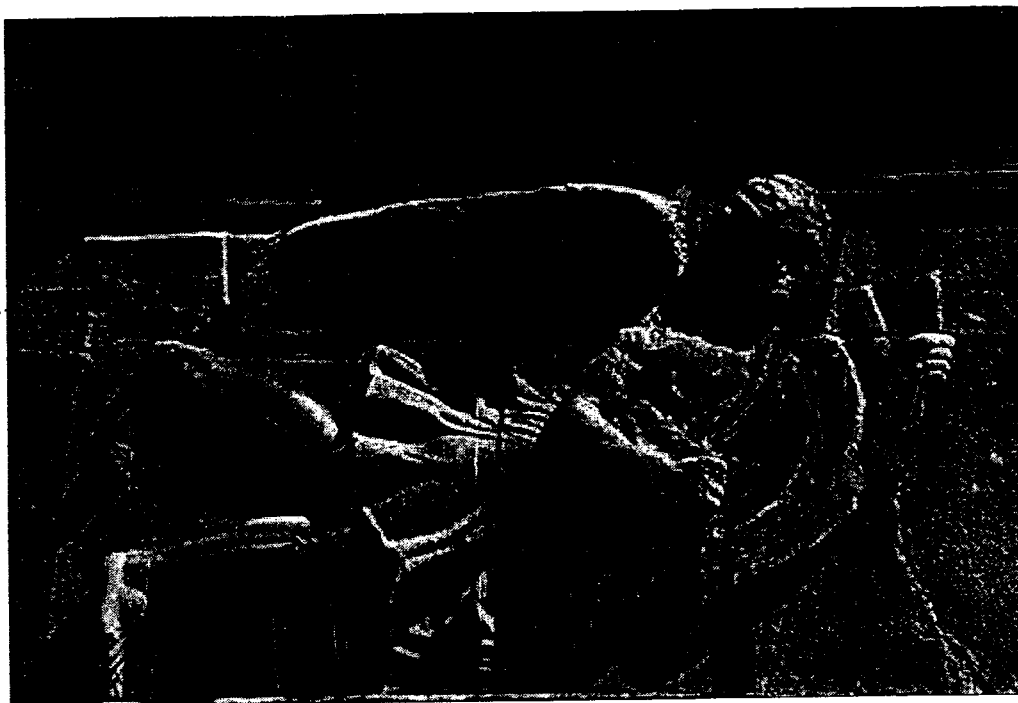


Fig. 2.5. Detail of the personification of the Lips, holding an aphlaston, or sternpost of a ship.

*Lips*, and to a much lesser extent the *Sirocco* (Gr. *Notos*), counteracts the weak *Etesians* for up to ten days at a time.<sup>38</sup> Theophrastus refers to the sailor's proverb: "Tis well to sail when the South winds begin to blow, and when the North winds fail."<sup>39</sup> Aratus, a third-century B.C. source, mentions a south wind and its kindness to seafarers: "For often Night herself prepares this sign (the constellation Altar) for the South Wind (*notos*) in her kindness to toiling sailors."<sup>40</sup> And Synesius observed that a south wind, likely the *Lips*, carried his ship out to sea when he was sailing from Alexandria to Cyrene.<sup>41</sup>

Despite their brevity, these must have been welcome winds for seafarers trekking to the Aegean from Cyrene and points east, or to the upper Aegean from Crete.<sup>42</sup> Thus, the depiction of the personification of *Lips* holding an *aphlaston*, here symbolizing a following wind, makes sense. Another alternative, as we shall see, was to travel with this wind when it became wet and stormy, such as in early spring or late fall/early winter.<sup>43</sup>

*Levantine Winds.* By the time the *Etesians* arrive in the Levant, they are predominantly from the western quadrant and somewhat weaker than in the Aegean. Therefore, Bronze Age and Iron Age ships treading north and south between Egypt and ports along the Levantine coast were able to veer and tack in either direction with little difficulty, though

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<sup>38</sup> Air Ministry/Meteorological Office 1962, 92–4; Defense Mapping Agency Hydrographic/Topographic Center 1991, 74, 76–7.

<sup>39</sup> Wood 1894, 23, n. 5.

<sup>40</sup> Aratus *Phaen.* 413–19.

<sup>41</sup> Synesius *Epist.* 4

<sup>42</sup> Voyages between North Africa and the Aegean appear to have become routine in the Early Iron Age—likely as a result of the invention of the loose-footed, shapable sail that allowed ships to sail closer to the wind (see pp. 195–200); Athens, for example, received large shipments of grain annually from Cyrene (*SEG* 9.2; below, p. 59, notes 57 and 59). LeGras (1870, 187) describes a southern wind predominating near the Gulf of Smyrna, now modern-day Izmir, during the month of September and into October.

<sup>43</sup> On the ancient sailing season, see below, pp. 31–9.

...y had to beware that they were sailing along a lee shore notorious for producing  
 ...pwrecks.<sup>44</sup> When heading westward from the Levantine coast toward Cyprus or the  
 ...gean, ships waited for the *Etesians* to weaken, thereby taking advantage of evening  
 ...d nightly land breezes to bring them out to sea.<sup>45</sup> In addition, ships could occasionally  
 ...lize a number of regional winds that arise mostly out of the east and southeast during  
 ...e sailing season, though sometimes with ill results. The generic name for these winds  
 ...*Scirocco*, a label derived from the Arabic word for east, *sharq*.<sup>46</sup> One variety of  
 ...*irocco* is the *Khamsin*, whose name is derived from the Arabic word for fifty. This  
 ...try southeaster blows intermittently onto the Mediterranean from Egypt and Gaza for  
 ...proximately 50 days after the Coptic Easter, around mid-March.<sup>47</sup> Grain ships headed  
 ...Rome no doubt used this wind to begin the leg to Cyprus, Crete, or the Aegean.<sup>48</sup>  
 ...imilarly, the *Simoom*, a very hot, sand-laden wind that blows off the Egyptian and  
 ...lestinian coast, may have been used to exit Levantine harbors and anchorages,

<sup>44</sup> Wachsmann and Davis (in press).

<sup>45</sup> On Levantine land and sea breezes, see British Hydrographic Department 1961, 5:xlix-l and 40. On his departure from Byblos in 1175 B.C., Wenamun waited for night to fall in order to utilize convenient land breezes (Simpson 1972, 145-6). Perhaps it was an easterly that inspired a third-century poet's song: "I used to captain the Rhodian winds ('Ροδίῳι ἀνέμοι) and parts of the high sea, when I wanted to sail, when I wanted to stay there, I used to say to those parts of the sea, "Let the seas not be bitten! Subject the sea to seafarers! The wind is rising in full strength! Shut out the storm-winds, Night, I make the seas smooth for running'" (*Lit. Pap.* [anon.] *Sailor's Song* 98).

<sup>46</sup> The *Scirocco*, in the modern sense, has come to mean any wind running counter to the dominant winds in the Eastern Mediterranean.

<sup>47</sup> The *Mediterranean Pilot* (5:34-5) says of the *Khamsin*: "This wind is a variety of *Scirocco*"...[and it] occasionally reaches gale force, but is usually moderate to strong...violent dust storms occur...In the period 1907 to 1942, the number of "khamsins" recorded averaged about three per month, in March and April, and slightly less in May...conditions usually do not usually last for more than one day in February, but as the season advances the duration increases to three or four days. Spells of five days or more are uncommon. A wind speed of 54 kt has been recorded." Wachsmann (1998, 300-1, and n. 70) makes the connection between an east wind that apparently drove Wenamun's ship upon Alashia's shore and the fact that this Egyptian priest was traveling up and down the Levantine coast during the month of April—the season of the *Khamsin*; see also Egberts 1991, 62-7.

<sup>48</sup> Achilles Tatius 5.15.1; Casson 1995, 299 n. 9; Aristotle (*Mete.* 2.6.18) identifies this wind as *Phoenicias* (φοινικίας).

although it is avoided today.<sup>49</sup> These winds sometimes turned violent. The Psalmist and Ezekial tell of a malevolent east wind capable of wrecking ships “on the high seas,” a statement given substance by the discovery of two eighth-century B.C. Phoenician shipwrecks in the open sea 48 km off Ashkelon, Israel.<sup>50</sup>

### Visibility at Sea

There is no doubt that Mediterranean seafarers depended to some degree on landmarks for safe navigation during daylight hours.<sup>51</sup> Whether making short trips or long, multi-day voyages, their reliance on prominent or conspicuous mountains, capes, and islands necessitated not only that they be able to recognize those landmarks, *but also that the landmarks be visible*. However, in studies of ancient navigational parameters, very little consideration has been given to the topic of visibility and to what degree its regional variations affected navigation. The question is relevant, for if a majority of scholars insist that ancient seafaring was limited to coasting, then it must be the case that land was always visible on each documented route. Conversely, if we accept that certain routes took ships out of sight of land, which was certainly the case as we shall see, then how long did they navigate without landmarks? Put another way, just how open is the “open sea” in the Eastern Mediterranean?

M. Aubet, in her book *The Phoenicians and the West*, states:

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<sup>49</sup> On the *Simoom*, see Defense Mapping Agency Hydrographic/Topographic Center 1991, 77; British Hydrographic Department 1961, 5:43.

<sup>50</sup> Psalms 48: 7; Ezekial 27:26; and perhaps Jonah 1:4; on the two Phoenician shipwrecks, see *Biblical Archaeology Review* 1999, 16.

<sup>51</sup> Semple 1927 is a discussion of seafaring and landmarks during the Greek and Roman periods; see below pp. 126–34.

in favourable weather conditions, with very few exceptions, the coast or the mainland is visible from any point in the Mediterranean. From a map of theoretical visibility, taking in all the coasts of the Mediterranean, it is clear that there are very few parts of the sea from which at least a mountain or a high coastal range cannot be seen. This is especially true along the whole northern coastline of the Mediterranean and along the African coast in the west.<sup>52</sup>

Aubet computed the height of each major mountain or mountain range and the curvature of the earth to arrive at a range of "theoretical visibility" (known in nautical parlance as "geographic range") during "favourable weather."<sup>53</sup> Thus, owing to the high elevations of mountains along the northern Mediterranean littoral (Sicily, the Peloponnese, Crete, southern Asia Minor), Aubet's map displays only a very narrow corridor of open sea (i.e. in which land is not visible) between Crete and North Africa; all the islands of the Aegean archipelago lie within sight of one another; and Cyprus is visible from the mainland coasts to the north and east (fig. 2.6).

Geographic range, however, is only half of the equation. To determine the *actual* range of visibility, atmospheric conditions must be taken into account. Data obtained from U.S. Naval Weather Service publications are revealing, for they indicate that sea-

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<sup>52</sup> Aubet 1993, 142. The notion that seafarers could see long distances because one peak was visible from atop another—*despite the premise that ships operate at sea level*—is the theme in McCaslin 1980, 106 and throughout Semple 1927.

<sup>53</sup> Aubet's information is taken from Schüle 1968, 449–62. For these numbers to make sense, we need to know first that the higher the elevation of the observer or the observed, the more distant the visibility, according to a mathematical formula. If we assume a masthead lookout of 7 meters above sea level, then the horizon lies 5.6 nautical miles away. If the observer's height is doubled to 14 meters, then the horizon retreats to 7.9 nautical miles, and so on. It follows, then, that if the observed object, such as an island or a mountain, has any elevation, it can be seen from further away *if visibility is unlimited*. Aubet, like Semple fifty years earlier, uses this convenient formula to compute her map of theoretical visibility, but makes the mistake of excluding meteorological factors. McGrail (1987, 278 and table 14.1) qualifies his mention of theoretical visibility by adding "in good weather," so too does Agouridis (1997, 16–17). For tables computing distance to the horizon and geographic range, see Bowditch 1981, tables 8 and 40.



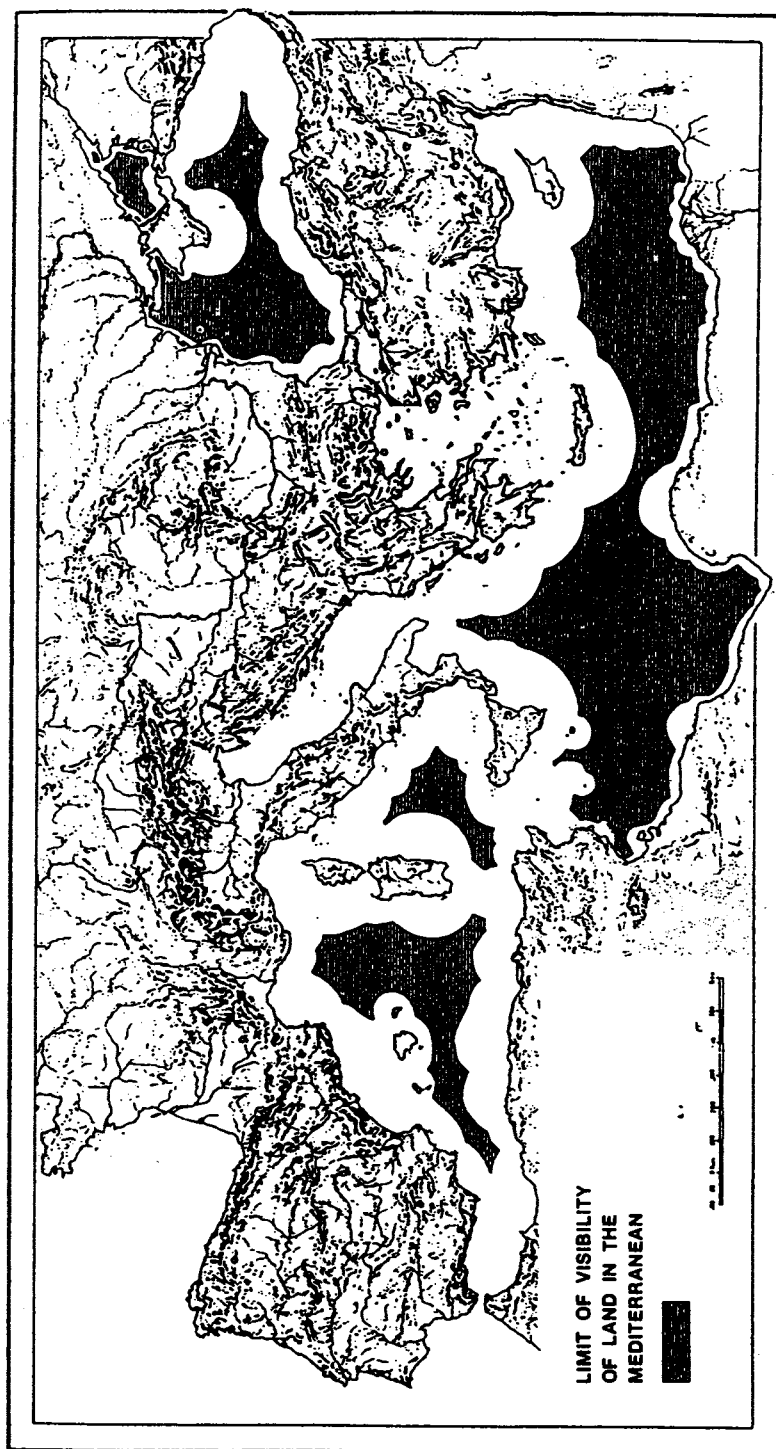


Fig. 2.6. M. Aubet's map of geographic range in the Mediterranean.  
(Aubet 1993, fig. 23).

haze is a constant limiting factor in determining visibility during the summer in the Eastern Mediterranean.<sup>54</sup> The haze, for the most part, is natural—the product of three factors: predominant winds, dust, and static pressure. From May to September (the period of heaviest ship traffic in antiquity), the *Etesians*, the *Lips*, the *Khamsin*, and other periodic winds blow with enough force to inject a considerable amount of dust and sand into the atmosphere.<sup>55</sup> This dust is held down at the lowest stratum of the atmosphere—the one where ships do their business—by a moderate high-pressure system whose isobars remain relatively unchanged throughout summer. Roving weather fronts are rare during summer, and therefore there is little air circulation.

Table 2.1 indicates the frequency (expressed as a percentage) of varying visibilities in twelve regions of the Eastern Mediterranean observed from May 1 to September 30, 1854–1969. The regions are divided as follows: North Aegean (Region 24), South Aegean (25), Crete (26), Benghazi (27), Rhodes (28), Central Levantine Basin (29), Alexandria (30), North Cyprus (31), South Cyprus (32), Nile Delta (33), Beirut (34), and Port Said (35). Regional visibility is computed in nautical miles and is split into three categories: visibility more than 2 but less than 5 nautical miles; more than 5 but

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<sup>54</sup> Georgiou (1993, 361–2) briefly discusses visibility in the Aegean during summer months.

<sup>55</sup> Le Gras (1870, 185): “The Etesian wind, or *metlem* (*sic*) of the Turks, is the most frequent in the fine season; it blows from N.E. to N.W., and is sometimes fresh, with a clear sky, *but a misty horizon; with this wind the land cannot be seen at a long distance, except, perhaps, about sunset*” (my italics). A more serious culprit, however, is the *Scirocco*, described by the *Mediterranean Pilot* (s.v. “Scirocco”): “When these winds are strongly developed, visibility may be reduced to less than half a mile by reason of the dust in suspension. This dust may be carried hundreds of miles seaward and there are reports of serious deterioration of visibility at Malta, from this cause...The more violent dust storms associated with winds between south and east are known in Arabic as “simoom” or “samun”. Over the land, “dust devils”, although a very localised phenomena, may raise sufficient dust to cause a local and temporary reduction of visibility to less than half a mile.”

Table 2.1. Frequency (expressed as a percentage) of varying visibilities in twelve regions of the Eastern Mediterranean. Averages contrasting the Aegean with the rest of the Mediterranean are presented in the three right-hand columns.

Area	Region	2 < 5	5 < 10	10 +	2 < 5	5 < 10	10 +
North Aegean Sea	24	2.26	46.8	49.4	Avg. = 2.56	Avg. = 42.0	Avg. = <u>54.35</u>
South Aegean Sea	25	3.86	52.78	42.2			
Crete	26	1.58	26.42	71.48			
Benghazi	27	0.98	12.84	85.96	Avg. = 0.9	Avg. = 17.92	Avg. = <u>80.84</u>
Rhodes	28	0.82	31.0	67.76			
Central Lev. Basin	29	0.94	12.88	85.78			
Alexandria	30	0.68	8.12	90.94			
North Cyprus	31	0.54	17.82	81.3			
South Cyprus	32	1.0	21.04	77.64			
Nile Delta	33	0.68	9.2	89.7			
Beirut	34	1.44	35.64	62.72			
Port Said	35	1.02	12.72	85.74			
Averages		1.31	23.9	<u>74.2</u>			

(Data obtained from U.S. Naval Weather Service Command 1970, 7-9: table 11)

less than 10 nautical miles; and 10 nautical miles or more.<sup>56</sup>

According to the above table, visibility in every region of the Eastern Mediterranean is diminished to varying degrees.<sup>57</sup> The average occurrence of 10 + nautical miles visibility in the Mediterranean during the sailing season is 74.2%, otherwise expressed as three days out of four. The only exceptions are the areas around Rhodes (28) and Beirut (34), where, owing perhaps to the dust-laden *Simoom* blowing off the Syrian desert, visibility falls well below the Mediterranean average. Despite these agreeable conditions, the very low relief of the eastern basin's shoreline and adjacent hinterlands, especially in eastern Libya, Egypt, and along stretches of the Levantine coast (but excepting western and southern Asia Minor), ensures that the coast comes into view only six to eight nautical miles out, thereby offsetting the advantages gained by clear skies. Visibility in the Aegean (areas 24–26), on the other hand, where we would assume the easiest navigation,<sup>58</sup> does not match the rest of the Eastern Mediterranean: here there is only a 54.35% occurrence of 10 + nautical miles of visibility. This means that land of *any elevation* which lies 10 nautical miles distant

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<sup>56</sup> U.S. Naval Weather Service Command 1970, 7–9: table 11. The numbers of regional observations varied between 200 and 2,000 each month from May to September over a 115 year period, 1854–1969. The resultant numbers agree well with my own personal experience acquired at sea in the Aegean 1995–1999. I found that haze often limited visibility to three or four nautical miles for a week at a time. The averages taken from *Synoptic* Table 11 were derived as follows: each observation was broken down by hour (0000 & 0300; 0600 & 0900; 1200 & 1500; 1800 & 2100) and divided into six stages of visibility. These lower three stages (<1/2 nm, 1/2<1 nm, and 1<2 nm) I discarded because of their rare frequencies, which rarely amount to 0.3 %. Next, I averaged each region's daily percentage for each of the three visibility categories and placed these figure on Table 1. Variations in visibility can sometimes be seen over the course of a day, but these hour-to-hour variations are minute by comparison with those that occur day to day.

<sup>57</sup> As described by Alciphron (*Letters to Fishermen* 10.1). Theophrastus (*De Signis* 31) explains that "if headlands far out at sea become discernible, or several islands appear instead of one, it there will be a change [of the wind] to the southward;" Xenophon (*Hell.* 1.1.16) states that Alcibiades was able to catch Mindarus's fleet exercising a distance offshore in very poor visibility.

<sup>58</sup> Cary and Warmington 1963, 21.

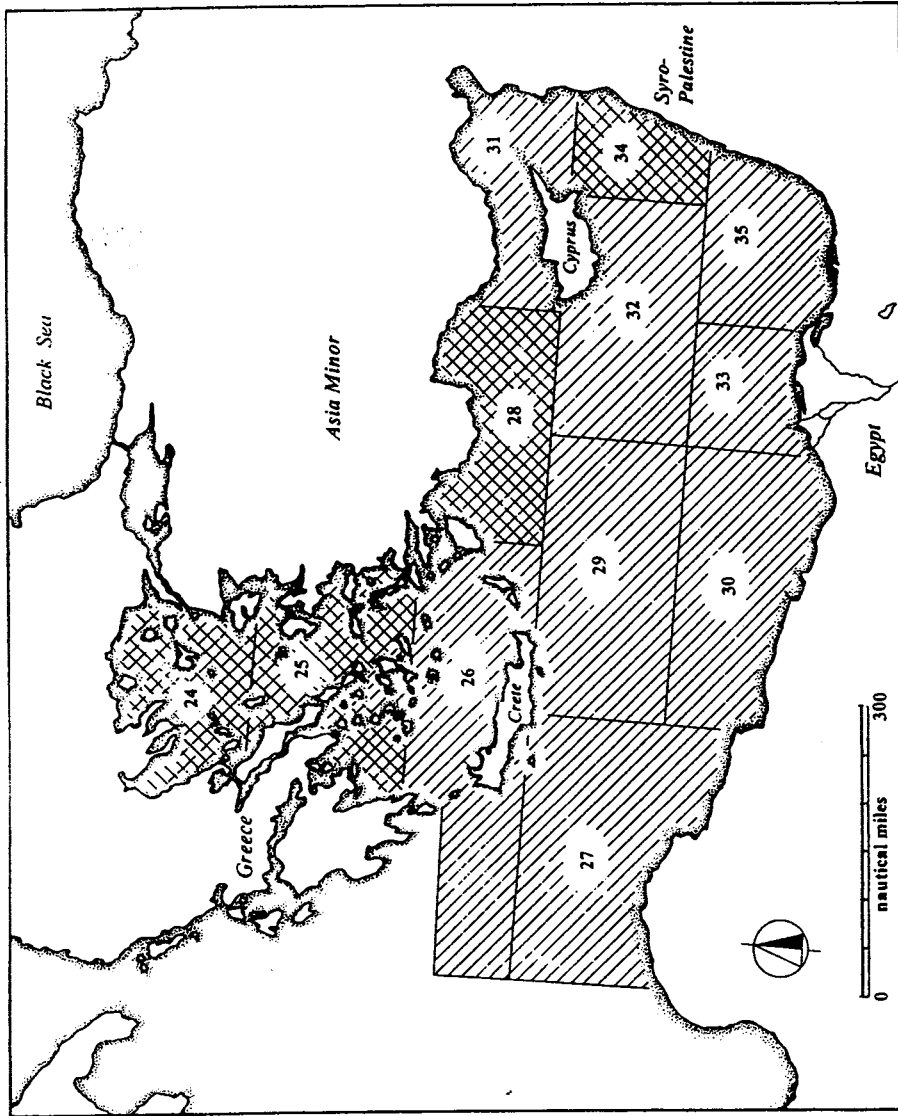


Fig. 2.7. Geographic range in the Eastern Mediterranean employing meteorological data presented in table 2.1. Areas 24, 25, 28, and 34 (diamond-hatched areas) experience less than 10 nautical miles of visibility one day out of two throughout the summer. Compare Aubet's map in fig. 2.3.

*cannot be sighted one day out of two* during the summer. The upshot is that this island-rich archipelago houses large areas of sea within which land is out of sight for significant periods, especially in the central and southern Aegean, the crossroads of ancient trade routes. Voyages between islands and coasts often placed ships in waters devoid of landmarks, even in cases of relatively short crossings, such as between the mainland and Rhodes, or between Lesbos and Euboea.<sup>59</sup> Consequently, as a general rule, the complexity of local navigation practices emulated that of interregional, open sea navigation practices, such as those exercised on longer passages between Crete and North Africa, or between Egypt and Cyprus.

How open, then, is the “open sea” in the Eastern Mediterranean? And what areas should be considered as such? Figure 2.7, a revised version of Aubet’s map, employs the meteorological data presented in table 2.1. It becomes apparent that there are much larger areas of blue water in the Eastern Mediterranean than we have been led to believe. Thus, we should consider much of the Eastern Mediterranean, including significant areas of the Aegean, “open sea.”

## **WEATHER LORE AND *LA BELLE-SAISON***

It is generally agreed that the ancient sailing season lasted, approximately, from March to November. The qualification is necessary, for there are nearly as many exceptions to the rule than statements of the rule itself.<sup>60</sup> Hesiod, our earliest source, may have been too

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<sup>59</sup> For example, Menalaus deliberated whether to cross the “open” Aegean or take the coastal route (Hom. *Od.* 3.165–75).

<sup>60</sup> Two studies on winter sailing in the Roman era are de Saint-Denis 1947 and Rougé 1952.

cautious when he stated that the sailing season lasted for fifty days after the summer solstice, during the months of July and August.<sup>61</sup> Still, his is a lonely voice, for as far as literary mentions are concerned, there appears to have been no hard and fast rule, no hard dates, nor evidence of an enforced span of “down time” during winter.<sup>62</sup> It is probably safe to presume that ancient seafaring activity slowed with the onset of stormy weather, erratic winds, and heavy seas.<sup>63</sup> To some extent seaborne commerce was regulated by underwriters, who protected their interests against shipwreck by insuring ships and cargoes during the fairer months only.<sup>64</sup> Nevertheless, we read in Thucydides that Athenian and Spartan galleys engaged in the usual fleet activities—warfare, tribute collection, commerce raiding, merchant-ship protection—throughout the Aegean and Ionian Seas during the winter months.<sup>65</sup> The Attic statesmen Andocides, a contemporary of Thucydides, said to a jury: “For what is more dangerous to men than sailing the sea during winter?...Furthermore, there was a war going on (i.e. that winter)

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<sup>61</sup> Hes. *Op.* 663–5. Hesiod’s advice may have been but an echo of an earlier, oral tradition dating back to the Late Bronze Age. For the Linear B Fr and Tn series (1221/1232 and 316 respectively) list a *po-ro-wi-to* and a *po-ro-wi-to-jo*, both of which have been interpreted as “sailing month,” probably around March or April. Presumably this was when sailing began anew each year (see Palmer 1955, 10–12; 1963, 248, 254, 265; Ventris and Chadwick 1973, 90).

Wallinga (1993, 2) suggests that Hesiod’s short sailing season was germane only to the areas around Boeotia, and that its brevity may be explained in terms of agricultural restrictions, with voyages made only during “slack periods – immediately before and after the grain harvest.”

<sup>62</sup> An “enforced” sailing season does not occur until the late fourth century, when the emperor Gratian decreed that navigation of Alexander-Rome ships be suspended between November and April, at which point cargo could be accepted (see *Cod. Theod.* 13.5.26, 13.5.27, 13.9.3).

<sup>63</sup> Casson (1995, 272 n. 5) cites the fourth-century author Vegetius (*re mil.* 4.39), who lists among the undesirables of winter sailing: scant daylight (*lux minima*), long nights (*noxque prolixa*), dense cloud cover (*nubium densitas*), poor visibility (*aëris obscuritas*), and violence of the winds doubled by the addition of rain or snow (*ventorum imbri vel nivibus geminata saevitia*).

<sup>64</sup> Dem. *Against Lacritus* 10–13; *Against Dionysodorus* 56.3, 56.27, 56.30; Suet. *Claud.* 18–19.

<sup>65</sup> Thuc. 2.69; 3.88; 8.30; 8.34–44; 8.60; Thucydides draws no unusual attention to ships, even galleys, sailing during the winter, though certainly there was a larger degree of risk involved, both to ships and to the large numbers of men required to row them; cf. Casson 1995, 270–1.

and *triremes and pirates were always at sea.*"<sup>66</sup>

An Aramaic papyrus from Elephantine sheds light on winter sailing. Dated to 475 B.C., the *Ahiqar* scroll records the arrivals, departures, and customs accounts of forty-two merchant ships from Ionia and Phoenicia (apparently Sidon).<sup>67</sup> Ionian ships, according to the dates listed beside each customs account, made round-trips continually from late February (*Athyr*) to November/December (*Mesore*). Sidonian ships arrived and departed during the fall, from late September to mid-December. No ships are recorded during the months of January (*Thoth*) and February (*Paophi*).<sup>68</sup> Biblical accounts suggest that these ships may have ported in the Nile Delta towns of Migdol (upriver from Pelusium), Tahpanhes (Daphnae), or Memphis, all of which had significant Jewish populations at this time.<sup>69</sup> Their sailing times are listed in table 2.2.

That these ships sailed on the route between Egypt and Ionia in winter is further confirmed by Thucydides, who recounts events that took place in the winter of 430/29 B.C. According to him, the Athenians sent Melesander with six ships to Caria and Lycia

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<sup>66</sup> Andoc. *On the Mysteries* 137–8 (my italics).

<sup>67</sup> Porten and Yardeni 1993, xx–xxi, 82–193, 284–95; Yardeni 1994, 67–78; cf. *P. Cairo Zen.* 59029 and *P. Mich. Zen.* 10, both of which treat winter-sailing in the Hellenistic period.

If we accept that the Tale of Wenamun (1076 B.C.) is without emendation, then it appears that the Egyptian priest set out from the Nile delta for Byblos in early January on a Syro-Canaanite ship (see Egberts 1991, 60).

<sup>68</sup> Lucian (*Syr.D.* 2) vividly describes the “Voyage of the Isis,” an annual procession which terminates in Isis’s ornamented and unmanned ship being “let go” (*ploiaphesia*) from shore. This act symbolized the opening of the sailing season and the godly protection sought by seafarers. We find its first recorded instance on inscriptions from first-century B.C. Euboea (Vidman 1969, §80), although it was likely an already ancient custom by that time. According to John of Lydia (*De Mens.* 4.45), a sixth-century writer, the *ploiaphesia* continued into his day and was held on March 5. If historically consistent, the date appears to coincide with renewed spring sailings recorded on the *Ahiqar* scroll. However, instead of inaugurating the “official” beginning of spring sailing, the date of the procession roughly coincided with a visible increase in maritime activity, especially with regard to the grain-carriers that regularly plied between Egypt and Italy during the Roman era. For a discussion of Isis and her maritime role(s), see Witt 1997, 165–84.

<sup>69</sup> Jer. 43:9, 44:1, 46:14; Ezek. 29:10, 30:6; see also Porten and Yardeni 1993, xx.



Table 2.2. Sailing schedules of Ionian and Phoenician ships as reflected in the Ahiqar scroll of 475 B.C. The port of call was likely one in Egypt's Delta region or slightly south at Memphis.

Egyptian Months	Ionian Ships		Phoenician Ships		Total Sailings
	Arrivals	Departures	Arrivals	Departures	
<i>Athyr</i> Feb. 18 – Mar. 19	3	2	–	–	5
<i>Choiak</i> Mar. 20 – Apr. 18	3	3	–	–	6
<i>Tybi</i> Apr. 19 – May 18	3	3	–	–	6
<i>Mehir</i> May 19 – Jun. 17	3	3	–	–	6
<i>Phamenoth</i> Jun. 18 – Jul. 17	4	4	–	–	8
<i>Pharmuthi</i> Jul. 18 – Aug. 16	4	5	–	–	9
<i>Pahons</i> Aug. 17 – Sep. 15	5	5	–	–	10
<i>Payni</i> Sep. 16 – Oct. 15	4	4	1	1	10
<i>Epiph</i> Oct. 16 – Nov. 14	3	3	3	3	12
<i>Mesore</i> Nov. 15 – Dec. 14	4	4	2	2	12

(Data obtained from Porten and Yardeni 1993, xx–xxi, 82–193, 284–95)

to prevent Peloponnesian pirates from harassing merchantmen sailing from Phaselis and Phoenicia.<sup>70</sup> Later, in the winter of 412/11 B.C., the Spartans attempted to “capture all the merchant ships arriving from Egypt.”<sup>71</sup> Demosthenes remarked that the Rhodes-to-Alexandria run was “never-ceasing” (ἀκέρατος), although those in Athens had to await the “proper season” (ὥραίαν).<sup>72</sup> The route to the Aegean from Egypt most likely began by paralleling the Levantine coast to Phoenicia, thence to Cyprus, and finally to Lycia, much as Paul’s voyage to Rome, in late fall, was to do over four-hundred years later.<sup>73</sup>

Aratus’s aforementioned *Phaenomena*, which is essentially a metrical version of Eudoxus’s fourth-century B.C. treatise on astronomy, appears to mark the transition from a loosely-specified sailing season into one more strictly defined:

Then the fields of corn appear empty, and the Sun first  
comes together with the Lion (in late July). At that time the  
roaring *Etesians* fall freely upon the sea, and voyaging is no  
longer seasonable for oars. Then let broad-beamed ships be  
my preference, and let helmsmen hold the steering oars into  
the wind.<sup>74</sup>

Although these lines ring of poetic latitude, their portent is reinforced further in his warning to seafarers: “And even in the previous month (November), having suffered much at sea...put to shore in the evening and trust no longer in the night.”<sup>75</sup> The meaning

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<sup>70</sup> Thuc. 2.69.

<sup>71</sup> Thuc. 8.35.

<sup>72</sup> Dem. 56.30.

<sup>73</sup> Acts 27:1–6, 9.

<sup>74</sup> Aratus *Phaen.* 150–5.

<sup>75</sup> Aratus *Phaen.* 299–302.

is clear: in Aratus's time, sail-driven merchantmen could and did sail year-round as they did in the fifth and fourth centuries B.C. but sailed only by day during the extreme winter months. Galleys, presumably, sailed only during the safer summer months. In addition to the usual hazards of sailing in winter, overnight voyages would have been made under a rather unfamiliar sky, for many of the familiar stars and constellations employed during summer (*Pleiades*, *Orion*, *inter alia*) would have been obscured by daylight.<sup>76</sup>

By the end of the third century B.C. a more precisely defined "sailing season" began to take effect. The rising and setting of certain constellations were used to demarcate a period of time within which shipping was safe, and outside of which was avoided if at all possible.<sup>77</sup> This is evidenced by Callimachus, a third-century B.C. Alexandrian scholar who lamented a sailor's death by shipwreck. He warned seafarers to "flee the solace of the sea when the Kids (Hyades) begin to set," which they do in early November.<sup>78</sup> Polybius, the second-century B.C. Greek historian of Rome, recalls the conventional wisdom of his day: "[The] captains had warned the commanders...that the [hazardous astral] period had not yet ended and another one was coming, for they were making their voyage between the risings of *Orion* and the dog-star, *Sirius*," that is, between mid-July and December.<sup>79</sup> It seems reasonable to conclude that Aratus,

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<sup>76</sup> On night-time sailing and constellations, see below pp. 167–80.

<sup>77</sup> A century earlier, however, Demosthenes (*Against Lacritus* 10) describes an increase in interest charged if a captain "embarked from Pontus to Hieron after the rising of *Arcturus* (early October)."

<sup>78</sup> Callim. *Epigr.* 20; by "setting" Callimachus was referring to their cosmical setting—on the western horizon just before sunrise; similarly, Manilius (*Astron.* 1.365) poetically writes: "Him follow the Kids whose constellations close the seas."

<sup>79</sup> Polyb. 1.37: "διαμαρτυραμένων...ἅμα δὲ καὶ τὴν μὲν οὐδέπω καταλήγειν ἐπισημασίαν, τὴν δ' ἐπιφέρεισθαι· μεταξύ γὰρ ἐποιοῦντο τὸν πλοῦν τῆς Ὠρίωνος καὶ κυνὸς ἐπιτολῆς." If by "rising" (ἐπιτολῆς) Polybius meant heliacal rising (i.e. during morning twilight), then a late-July date would apply to both *Orion* and *Sirius*, since both are seen to rise on the morning horizon in that order during this month. July, however, is an unlikely time to be fearful of sailing in the Mediterranean. Polybius was

Callimachus, and other third- and second-century B.C. writers were quoting a body of weather and sea lore common among mariners of their day. This leads one to wonder if the huge losses of fleets at the hands of warfare and storms sustained during the fifth and fourth centuries B.C. translated into a more rigidly-defined sailing season in the succeeding Hellenistic period.

To the west, the Romans were quickly growing their sea legs, having suffered severe fleet losses during the First and Second Punic Wars (264–241 and 218–201 B.C. respectively), in spite of victory. With the final defeat of Carthage in the Third Punic War (149–146 B.C.), Roman merchantmen began to fill the vacuum left by Punic merchants. By the first century B.C., Rome's reach, both military and economic, extended to the entire Mediterranean basin. Not surprisingly, the majority of references to the sailing season are written by Roman hands. The first-century B.C. writer Varro asserted that sailing was safe between the rising of the *Pleiades* and the rising of *Arcturus* (in the constellation *Bootes*), that is between mid-May and the beginning of October;<sup>80</sup> thereafter, until November 11, it was considered unsafe. And from then until March 10 the seas were closed (*mare clausum*): the emperor Titus would not cross with his troops from the port of Caesarea to Italy at that time of year,<sup>81</sup> nor would Herod even journey to Ionia from that same port.<sup>82</sup> In the fourth century, Vegetius echoed Varro's

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more likely referring to *Orion*'s ascension at sunset, which occurs in December, and the heliacal rising of *Sirius* in July. The order in the text—*Orion*, then *Sirius*—leaves some confusion, but it may be explained if Polybius or his sources thought in terms of their ascension order, rather than their calendrical significance.

<sup>80</sup> Varro *Libri Navales Veget.* 4.39; cf. Patai (1998, 65), who erroneously computes the rising of *Arcturus* as July 14; clearly this is too early a date to mark the end of the sailing season (see Davis 1999, 167–8).

<sup>81</sup> Joseph. *BJ* 7.1.3.

<sup>82</sup> Joseph. *AJ* 16.2.1.

ating by defined a sailing season lasting from May 27 to September 14, the outermost limits being March 10 to November 10.<sup>83</sup>

Still, as in the fifth and fourth centuries B.C., there were many exceptions to the rule. The Augustan poet Ovid began his storm-tossed journey into exile from Rome to the Black Sea in December and apparently encountered few problems finding a different ship for each leg of the journey;<sup>84</sup> Paul's centurion located a freighter bound for Italy in late fall, realizing full well that the journey would extend into December;<sup>85</sup> the emperor Claudius, due to a shortage of grain in Rome and in an attempt to quell riots in Rome, assured shipowners against financial loss if they transported grain from Alexandria out of season.<sup>86</sup>

Clearly seafaring activity slowed down during the winter months. Yet, given the incomplete nature of the literary evidence, these exceptions are remarkable for their unremarkability: Athenians and Spartans did not plan to make war at sea in winter—they waged it business as usual; if pirates roamed the seas in winter, they presumably did so with the intent of boarding merchant vessels at sea; Ovid had no trouble finding a ship bound for the Black Sea; the onset of winter did not force Paul to await the arrival of spring in Caesarea or Myra; nor did winter prevent Caesar from crossing with his troops

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<sup>83</sup> Veget. *re mil.* 4.39; Casson 1995, 270 and n. 2. Vegetius's dates vary little until the thirteenth century, when the compass and hulls of higher freeboard, such as the cog and carrack, extended the limits of the season even further. As in antiquity, however, a number of exceptions marked the intervening years (see Pryor 1988, 87; Braudel 1972, 186–8).

<sup>84</sup> Again, as in Callimachus (see supra n. 78), seasons and inclement weather were described in terms of the rising and setting of constellations. Ovid (*Trist.* 1.11.1–20) states: "Often I was tossed about dangerously by the stormy *Kids* (*Hyades*), and often the sea was threatened by the constellation *Steropes*, or the guardian of the Atlantian bear (*Bootes*) darkened the day" (cf. Ov. *Ars Am.* 1.399–400).

<sup>85</sup> *Acts* 27:1–44; Paul (in *Acts* 27:12, 21), however, admonished the crew of the fated ship for setting out from Crete in such unpredictable weather; see also Patai 1998, 65.

<sup>86</sup> Suet. *Claud.* 18–19.

from Italy to the Balkan peninsula during the Civil War.<sup>87</sup> These instances serve to illustrate that the ancient sailing season, as defined by Hesiod or Vegetius, was more abstract than previously thought. Seafarers hedged their bets in winter not out of military or dire necessity, but from a practical knowledge of the Mediterranean's churlish weather<sup>88</sup> and an ambition for higher profits. Organized, large-scale commerce, at times sponsored or regulated by governments, evidently preferred to take no chances: the captains of the large Rome-Alexandria grain ships deemed the risk of catastrophe too great to sail in mid-winter. They, among others, generally remained faithful to Varro's sailing schedule.<sup>89</sup>

The development of navigation and wayfinding techniques of the ancient Eastern Mediterranean was inexorably tied to the meteorological conditions and geographic configuration of the basin; any attempt to theorize on the topic of ancient navigation should not and cannot ignore the physical setting. While tides and currents had negligible effect on this development, prevailing and diurnal winds were the principal determinant of the patterns of sea routes in every period of antiquity. Indeed winds and their effects on seafaring were recognized by the ancient writers themselves. The prevailing notion that very few areas of the Mediterranean exist within which land cannot be sighted was compared against comprehensive and modern meteorological data and was found to be, for the most part, false: in fact, a large area of the eastern basin

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<sup>87</sup> Caes. *BCiv.* 3.25.

<sup>88</sup> Ptol. *Tetrabiblos* 1.2.5.

<sup>89</sup> Casson 1995, 297–9.

qualifies as “open sea.” Similarly, prevailing notions of the limits and actual adherence to rigidly-defined sailing seasons languish under scrutiny. Exceptions to the rule do not appear to prove the rule in this case, although it must certainly be allowed that traffic slowed dramatically during the “off” season.

## CHAPTER III

### ANCIENT SEA ROUTES

#### INTRODUCTION

This chapter explores and indexes the various sea routes that existed between the Aegean, Egypt, and the Levant from the Mesolithic period up to the Roman era.<sup>1</sup> Although the Mediterranean Sea fostered isolation at times, particularly in insular regions, it also acted as a conduit that permitted communication and trade, facilitated the flow of ideas and knowledge of the “other.” The ships and the routes these ancient seafarers sailed became as important to the ancient Eastern Mediterranean as the Silk Route was for China and Western Asia, or as vital as galleons were for the maintenance of Spain’s overseas empire during the sixteenth and seventeenth centuries. As G.F. Bass notes, “it was only with watercraft that ancient peoples could discover, explore, colonize, and supply the once uninhabited islands of the eastern Mediterranean.”<sup>2</sup>

The criterion for determining the historical reality of ancient sea routes, especially before the Classical period, has often been based on archaeological evidence

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<sup>1</sup> The periods covered in this study are as follows: Mesolithic = 12000–6800 B.C.; Neolithic = 6800–3300 B.C.; Early Bronze Age = 3300–1900 B.C.; Middle Bronze Age = 1900–1600 B.C.; Late Bronze Age = 1600–1050 B.C.; Aegean Iron Age = 1050–480 B.C. (following traditional internal divisions of Protogeometric [1050–900 B.C.], Geometric [900–700 B.C.], Orientalizing [700–620 B.C.], and Archaic [620–480 B.C.]); Classical = 480–323 B.C.; Hellenistic = 323–31 B.C.; Roman = 31 B.C.–A.D. fourth century. The Neolithic chronology follows Demoule and Perlès 1993, 355–416, esp. 366; the Bronze Age chronology is taken from Dickinson 1994, 12–21, esp. 19.

<sup>2</sup> Bass 1998b, ix; to these I might add the demands of fishing, which, besides its dietary importance, certainly played an essential role in the development of open-sea navigation (e.g. McGeehan Liritzis 1988, 243).



(or lack of archaeological evidence), a line of reasoning rather dependant on arguments *ex silentio*.<sup>3</sup> Foreign finds *per se*, unfortunately, can only signify that some sort of intercourse occurred: they cannot answer how, why, by whom, how often, or even for whom, trade was practiced. Even in the case of islands it is difficult to determine an accurate vector of external trade, or to rule out the existence of secondary or tertiary exchanges.<sup>4</sup> For instance, how can we be certain that the presence of an Egyptian scarab in a Minoan context is proof of an Egyptian embassy,<sup>5</sup> or visits by Egyptian trading ships, when there are other possible explanations for its final deposition? Other studies of late strive to identify sea routes predetermined by patterns of winds and currents—a refreshing approach warranting more research, but one which also should not ignore the material evidence or sailing characteristics of ancient ships.<sup>6</sup>

Our criteria for indexing these routes, then, should consist of a graduated scale of evidence, with the first criterion being assigned the highest degree of confidence, and the last the lowest degree:

1. Literary and epigraphical mentions of foreign trade or contact with specific regions, including to a lesser extent foreign names and objects listed in bureaucratic inventories.

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<sup>3</sup> Pulak (1997, 242–3) demonstrates the temerity of basing direct foreign connections on foreign finds. He observes, for example, that Cline's index (1994, 60–3) of Late Bronze Age Cypriot wares found in Aegean contexts nearly triples when the cargo of the Uluburun shipwreck is included; cf. Gill 1994, 105–6.

<sup>4</sup> McGeehan Liritzis (1988, 238–47, 251) attempts to validate specific routes in the Aegean during the third-millennium B.C. without taking alternative means of exchange into account; Melas (1988, 49–64) tries to ameliorate this shortcoming.

<sup>5</sup> Cline 1994, 39.

<sup>6</sup> See for example Agouridis 1997, 6–20; Georgiou 1991; 1997; on sailing characteristics of ancient ships, see below pp. 195–200.

2. Iconography of the sort that clearly demonstrates the usage of seagoing ships and/or the presence of foreign peoples and ships.
3. The presence of foreign finds in terrestrial sites, but also the locations of shipwrecks and the provenance of their cargoes.

By necessity, only the latter two are applicable to the question of sea routes during the Early and Middle Bronze Ages, and thus we should be hesitant to assign even a moderate degree of confidence, except in the case of islands and trade in ship timbers between Egypt and Syria. Hence the heavy application of material evidence towards a determination of sea routes during these early periods appears to be lopsided in comparison to later, more abundantly evidenced periods. During the Late Bronze Age, however, all three criteria come into effect, and our confidence in assigning specific routes to specific periods increases proportionally. While the evidence for sea routes takes a moderate dip during the Early Iron Age (1050–900 B.C.), we begin to see in the eighth and seventh centuries B.C. a rebirth in artistic representation of, and literary references to, nautical matters. Henceforth the evidential curve ascends again, peaking in the Roman period with an abundance of shipwrecks and literary references. Indeed the literature and epigraphy of the Graeco-Roman period bristles with allusions to trade-routes, ships, sea-battles, and naval policies in general. For these periods there is little ambiguity, and thus we do not need to be quite so meticulous in our appraisal of specific sea routes. The Mediterranean by this time had become a known and knowable sea, crisscrossed by ships of several nationalities.

The following is a catalog of sea routes based on a plurality of the available evidence. Most of it is critically derived from archaeology and supplemented with textual and iconographic evidence. Even so, only in general terms is it possible to reconstruct patterns of ancient sea routes. This chapter is not an attempt to gather together all evidence of foreign trade, nor is it an attempt to determine the ethnicity of seafarers.<sup>7</sup> Instead, it simply documents the existence of sea routes in an inter-regional, diachronic manner, in order to fit specific navigation practices into their proper contexts.

Four general routes are distinguished: (A) Inter-Aegean routes, (B) routes between the Aegean and North Africa, including Egypt, (C) routes between the Aegean and the Levant, including Cyprus, and (D) routes between Egypt and the Levant, again including Cyprus. When a route required particular or notable navigational practices, the reader is referred to the appropriate chapter where the topic is treated in more detail.

## CATALOG OF ANCIENT SEA ROUTES

### Aegean Routes

*Neolithic* (fig. 3.1). Obsidian from the island of Melos has been found in large quantities at Franchthi, a large cave in the eastern Peloponnese inhabited during the later Palaeolithic and Mesolithic.<sup>8</sup> These voyages were probably facilitated by the chain of islands that begins in the Saronic Gulf just to the north of Franchthi Cave, skirts the Attic coast to Sunium, then arcs eastward and southward to Melos. The maximum inter-island

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<sup>7</sup> On the ethnicity of Bronze Age seafarers, see Cline 1994, 91–3 and Wachsmann 1998, 211–12.

<sup>8</sup> Perlès 1987; 1990.

distance is approximately 8 nautical miles while the direct route stretches 70 nautical miles across open sea.<sup>9</sup> As these ships were most likely paddled, if not rowed, tides and currents certainly affected the choice of route and time of departure.<sup>10</sup>

Crete was colonized, probably from Anatolia, in the late eighth to early seventh millennium B.C.<sup>11</sup> The earliest human presence is recorded in Stratum X at Knossos, and predates a human presence in the rest of the Aegean islands by at least two millennia. Broodbank and Strasser have convincingly argued that this was the result of a seaborne migration, probably for the establishment of a farming community.<sup>12</sup> The distances involved are significant for paddled craft and certainly entailed the usage of stars for orientation at night.

*Bronze Age* (see fig. 3.1). Between two and three millennia after the initial colonization of Crete came the greatest expansion of permanent settlements in the islands. By the Early Bronze Age, ships of sufficient sophistication facilitated migration and settlement, and also acted as the sole vehicle of trade and external communication.<sup>13</sup> Boat models and images of boats on Early Cycladic II “frying pans” testify to the extent of seafaring technology at an early date.<sup>14</sup> Thus it is not surprising that seafaring, including navigation and its offshoot, astronomy, took root here very early.<sup>15</sup>

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<sup>9</sup> Mediterranean sea levels, however, were several meters lower as little as 4,000 years ago, thus making distances between landfalls somewhat shorter; see Agouridis 1997, 1–2; Tzalas 1995, 441–69; Cherry 1981.

<sup>10</sup> Tzalas 1995; McGeehan Liritzis 1988, 238–43.

<sup>11</sup> Broodbank and Strasser 1991, 233–34, 237.

<sup>12</sup> Ibid. 237–42.

<sup>13</sup> Davis 1992, 703.

<sup>14</sup> Coleman 1985; Wachsmann 1998, 69–82.

<sup>15</sup> See below p. 153, n. 18.

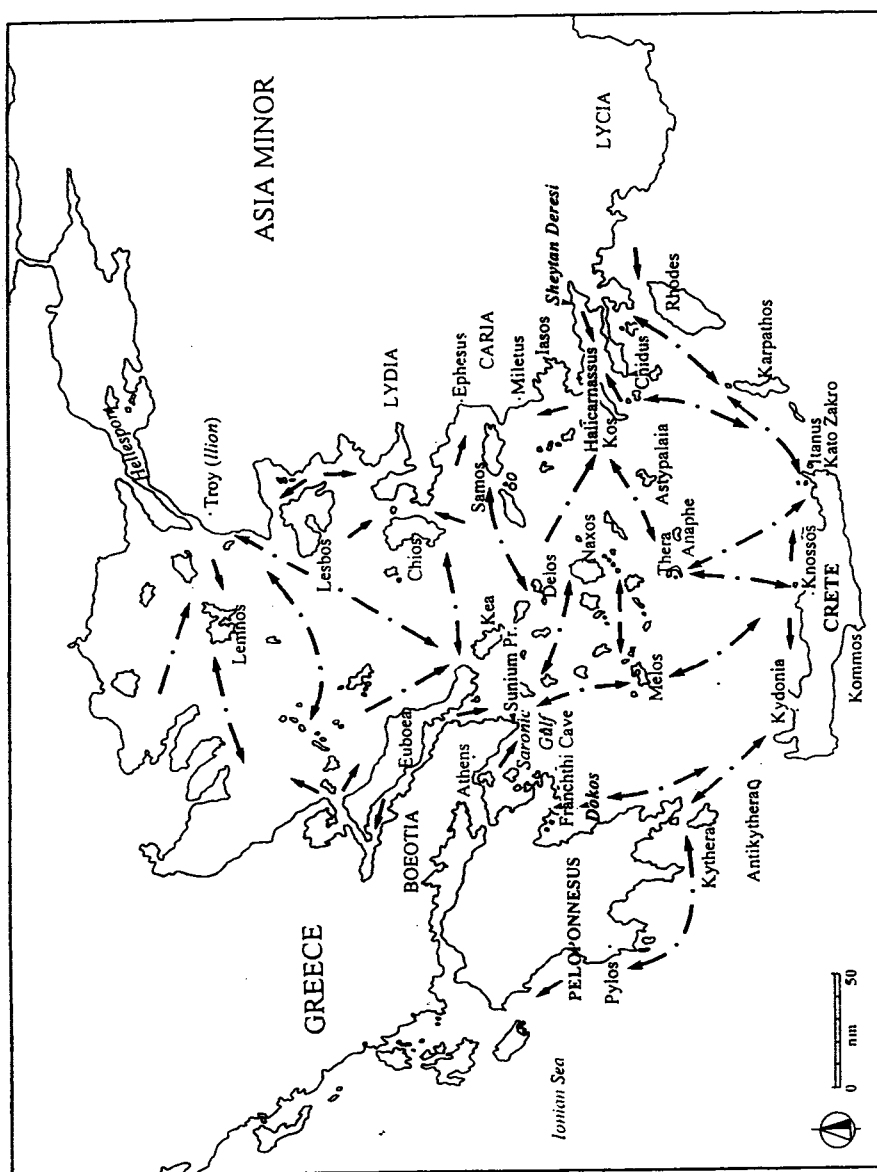


Fig. 3.1. Proposed sea routes in the Aegean Sea during the Neolithic period and Bronze Age.

To the west of Crete, an Early Bronze II settlement, apparently Minoan, was excavated on the island of Kythera. The site's ideal location served as a link in the trade chain between Crete and the Peloponnese. Minoan/Minoanizing influence reached the Greek mainland during the Middle Bronze Age, especially at Ayios Stephanos and Lerna.<sup>16</sup> A shipwreck cargo excavated at Dokos near Lerna in the Myrtoon Sea dates to the Early Helladic II period and may well be the earliest shipwreck material excavated to date. Its inter-Aegean manifest of pottery shapes indicates a vigorous seaborne trade network between the mainland and the Cycladic islands at a time when external relations were blossoming.<sup>17</sup> Unfortunately no hull remains survived to indicate the size of the vessel.

Besides Kythera, the islands of Aegina and Kea, where Minoan-style pottery was produced,<sup>18</sup> served as stopovers between Crete and the Balkan peninsula. Laurion, the metal-rich site in east Attica, was certainly a port of call in Middle and Late Minoan times.<sup>19</sup>

The Middle and early Late Bronze Age sees Aegean material culture painted in Minoan hues, whether as a result of the "Versailles effect" of a very prosperous Crete, or as a result of a Minoan thalassocracy, as cited by Thucydides.<sup>20</sup> The discovery of Minoan and Minoanizing artifacts all over the Aegean during these periods tells of a mesh of sea routes incorporating nearly every island of the Aegean. Looking eastward

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<sup>16</sup> Dickinson 1994, 108–9, 241–2; Simpson and Dickinson 1979, 107, 112, 27–8, 121–2; for the Minoan "settlement" at Kythera, see Coldstream and Huxley 1972; 1984.

<sup>17</sup> Papathanasopoulos et al. 1995, 17–29.

<sup>18</sup> Dickinson 1994, 108–9.

<sup>19</sup> See Watrous 1993, 81 and references there; Gale and Stos-Gale 1981, 188.

<sup>20</sup> Wiener 1984, 17; Thuc. 1.4.

from Crete, we find that Minoan artistic and architectural styles migrated to the Carian coast at Iasos, Miletus, and Didyma. Miletus may very well have been a Minoan colony, for excavators there discovered Minoan-style architecture, frescoes, and pottery.<sup>21</sup>

Pottery cargo from a wrecked ship dating to ca. 1600 B.C. was excavated by G. Bass at Sheytan Deresi along the south-west coast of Turkey.<sup>22</sup> No hull remains were found, despite an intensive search, and therefore Bass believes that it may have been made of skins; the vessel was probably transporting a cargo between villages.

Settlements on the islands of the eastern Aegean, such as those at Rhodes and Kos, also contain Middle and Late Minoan and Minoanizing artifacts.<sup>23</sup> Soon thereafter appears Mycenaean material on the major islands, thus indicating a possible expropriation of Minoan routes by Mycenaean seafarers following the ebb of Minoan civilization. By Late Helladic IIIA:1 we find Mycenaean pottery at Iasos, Miletus, and now Ephesus, although in markedly reduced quantities.<sup>24</sup> Mycenaeans probably settled Chios in Late Helladic IIIC, and we find their ceramics at Troy beginning in Late Helladic IIA and reaching their acme in Late Helladic IIIA:2.<sup>25</sup>

Further evidence of trans-Aegean traffic in the Late Bronze Age comes from Linear B documents found at Pylos in the south-west Peloponnese: tablets PY Aa 17+ and PY Aa 1180 mention *mi-ra-ti-ja*, translated as "women of Miletus."<sup>26</sup> Similarly, tablets PY Aa 61 and PY Ad 664 list *ze-pu<sub>2</sub>-ra<sub>3</sub>*, translated as "women of

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<sup>21</sup> Mee 1998, 137; on questions of Minoan colonialism, see Branigan 1981, 23–7; Melas 1988.

<sup>22</sup> Margariti 1998; Bass 1996, 54–9; 1976.

<sup>23</sup> Davis 1992, 748–50; Watrous 1993, 82.

<sup>24</sup> Mee 1998, 138–41; on Minoans and Mycenaeans at Miletus, see most recently Niemeier and Niemeier 1999.

<sup>25</sup> Davis 1992, 725–6.

<sup>26</sup> Ventris and Chadwick 1973, 148, 410, 561.

Halicarnassus.”<sup>27</sup> And several other tablets from Pylos speak of *ki-ni-di-ja*, or *Knidiai*, “women of Cnidus,” as well as variations on *A-<sup>\*</sup>64-ja*, or *Aswiai*, “women of Asia (Lydia).”<sup>28</sup> The occurrence of ethnics of Asian origin in texts from western Greece bespeaks an early and apparently common use of a cross-Aegean route.<sup>29</sup>

*Iron Age to the Classical Period* (fig. 3.2). Attempts to distinguish Aegean sea routes from archaeologies of the Early Iron Age are nearly non-existent.<sup>30</sup> In general we can say that Corinthian and Cycladic wares poured into Crete during the Proto-Geometric and early Geometric periods, and that there existed some level of traffic between the mainland and the islands.<sup>31</sup> Here Delos provides some additional information. This island was the legendary birth place of Apollo and Artemis, and would be the seat of the Delian League in the Classical period. Excavations on the small island indicate a more or less continuous occupation since the third millennium B.C. During the eighth century B.C. finds of foreign, though still Aegean, manufacture become more and more plentiful, thereby indicating the growing importance of the island as a religious center and central Aegean hub; ships involved in Aegean cross-traffic made this rocky island a frequent port of call.<sup>32</sup> Crete, too, maintained a moderate export trade in ceramics and precious

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<sup>27</sup> Chadwick 1988, 84.

<sup>28</sup> On *ki-ni-di-ja*, see Ventris and Chadwick 1973, 159, 410, 554; Chadwick 1988, 80; and Cline 1994, 130; on *A-<sup>\*</sup>64-ja*, see Ventris and Chadwick 1973, 410, 417, 536; Cline 1994, 131.

<sup>29</sup> Note also that Pylos, Miletus, Cnidus, and Halicarnassus lie on or near the same latitude (37° North); on latitude sailing, see pp. 125, n. 85, 171–6.

<sup>30</sup> A study of sea routes during this period, unfortunately, is not even an ancillary subject in Snodgrass's exhaustive and ground-breaking archaeological study of Dark Age Greece (1971). Even so, he makes heavy use of Homer to fill in the gaps of his narrative; Wallinga (1993, 1–12) summarily covers trade routes in and around Euboea and Corinth during Hesiod's time.

<sup>31</sup> Snodgrass 1971, 60, 64.

<sup>32</sup> Thuc. 3.29; see also Gallet de Santerre 1958, 220.



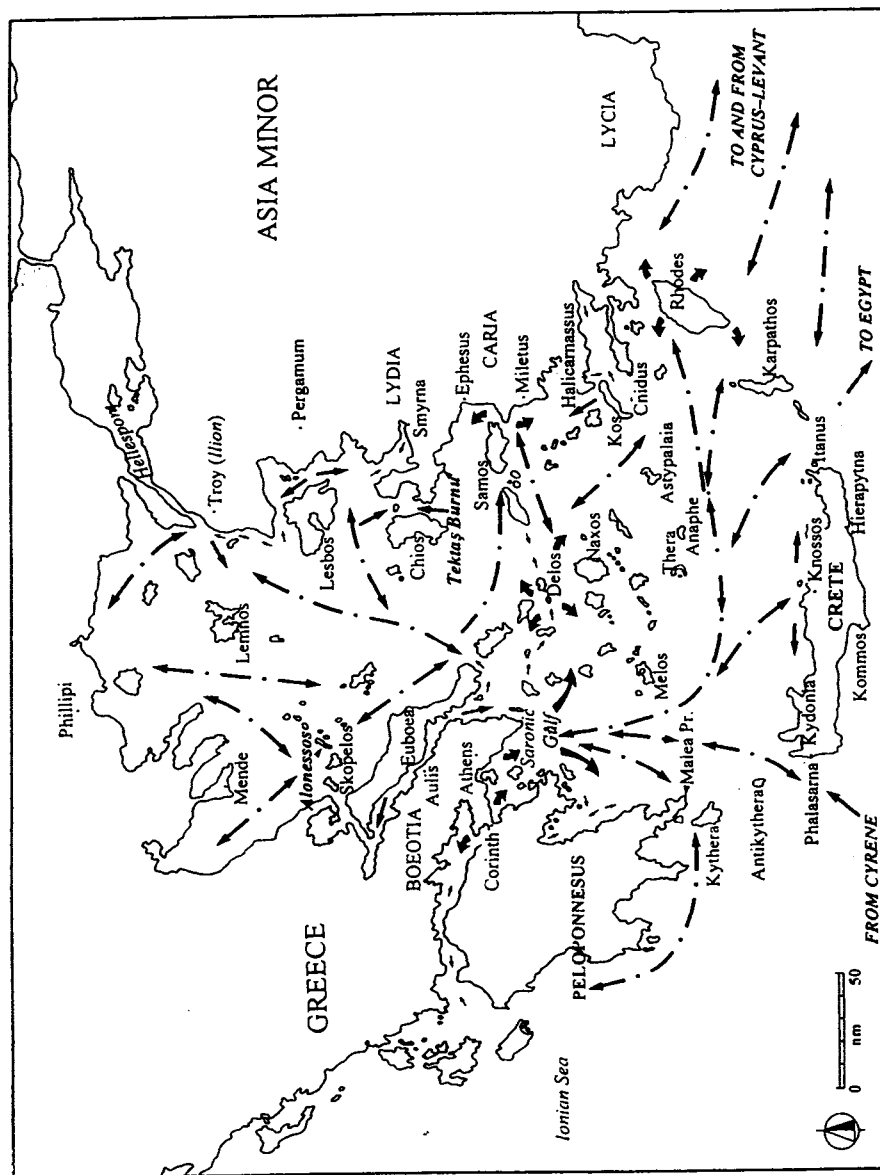


Fig. 3.2. Proposed sea routes in the Aegean from the Iron Age to the Roman era.

items with the Peloponnese, the Cyclades, and the Dodecanese, including Rhodes.

Indeed the process of orientalizing in Greek art began with Rhodes and Crete, the two major landfalls for ships headed to the Greek mainland from the east. Delos and Crete aside, the larger picture of trade between the islands in the Early Iron Age is one of shifting and evolving cultural material: while interaction was certainly taking place, the measurement of seaborne communication based on the material record is difficult to gauge.

Fortunately, however, we have literary evidence from the eighth century B.C. Homer described sea routes as ὕγρὰ κέλευθα, or “the watery paths,” a phrase which implies a specific, point-to-point journey, not one of random sailing and unplanned landfalls.<sup>33</sup> Accordingly, Homer has Menalaus choose between two routes which he describes in some detail, whether to take the direct route home from Troy (cutting across the mid-Aegean) or the southern route, island-hopping via Crete, as his brother Agamemnon chose to do.<sup>34</sup> In the *Iliad*’s Catalog of Ships, Homer paints a tableau of active seafaring throughout the Aegean. The Argonauts, whose legends predate the Homeric epics of the eighth century B.C., also realized the configuration of the Aegean while on their circuitous voyage home from Colchis in the eastern Black Sea. Other sources, however, call to question the verity of pan-Aegean routes during the period. One may wonder, for example, how pertinent is the passage in Hesiod’s *Works and Days*, in which that author states explicitly that he only sailed “once to Euboea from

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<sup>33</sup> Hom. *Il.* 1.312

<sup>34</sup> Hom. *Od.* 3.187–205, 4.573–86.

Aulis," a distance of only a few nautical miles.<sup>35</sup> Though Hesiod intimates that a low frequency of travel by sea was the norm at his time, it is probable that his purview did not extend beyond his Boeotian audience.<sup>36</sup> Thus he does not speak for the whole of the Aegean during this century. On the contrary, foreign finds from sites on Euboea, an island opposite Boeotia, as well as from many other Aegean sites, bespeak an active Iron Age maritime environment with eastern connections.<sup>37</sup> While inter-Aegean trade may not have reached the level it had in the Late Bronze Age in terms of volume, many of the routes remained in use.

By the Archaic and Classical Periods, several of the larger city-states commit to the maintenance of war fleets. Galleys from Corinth, Athens, Samos and several smaller cities roam the Aegean, their routes limited only by the degree of manpower at the oar.<sup>38</sup> One has only to read Thucydides to see the remarkable confidence of galley captains, with their ability to sail at will, day or night, and even in winter.<sup>39</sup> The route to Egypt from the port of Athens, apparently a common one in the fourth century B.C., took in many of the islands between there and Rhodes before setting out on the open sea.<sup>40</sup>

It was during this time also that Corinthian, then Proto-Attic and Attic, black-glaze pottery was shipped in large quantities all around the Aegean, indeed all around the Eastern Mediterranean and Black Seas. Merchantmen, to be sure, though somewhat more restricted in motive power than galleys, sailed to and fro throughout the Aegean.

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<sup>35</sup> Hes. *Op.* 651.

<sup>36</sup> Observe the very short sailing season Hesiod defines in *Op.* 663–8; cf. Wallinga 1993, 1–2; see also above pp. 31–9.

<sup>37</sup> Boardman 1999, 36–7, 54–84.

<sup>38</sup> Morrison 1996.

<sup>39</sup> See above pp. 31–9.

<sup>40</sup> See above p. 32.

The growth in both size and importance of the Piraeus after the fifth century B.C. is a strong indicator of the frequency of Aegean merchant traffic.

Maritime trade in wares other than Athenian are represented as well. Two recently-discovered Classical-period shipwrecks call attention to the existence of a network of both inter-island trade, as well as trade between major mainland and island cities. The first is the late fifth-century B.C. wreck at Alonnesos in the northern Sporades, which carried both mainland (Mendian) and island (Skopelian) wine amphorae, in addition to Athenian black-glaze symposium tableware; its cargo amounted to some 120 metric tons.<sup>41</sup> The second is a late fifth-century B.C. ship that met its end when it smashed into the rocks at Tektaş Burnu on the Aegean coast of western Turkey; its cargo comprised, *inter alia*, Mendian and Pseudo-Samian wine amphorae.<sup>42</sup>

*Hellenistic/Roman Era* (see fig. 3.2). Aegean merchants continued their inter-island trade into the Hellenistic and Roman eras. Rhodian merchantmen, at times protected by Rhodian galleys, carried Egyptian and Pontic grain to many Aegean destinations;<sup>43</sup> and stamped Rhodian amphora handles are found throughout the Mediterranean and Black Seas.<sup>44</sup> Turning to Delos again, we see this island becoming an important slave-trade center after 167 B.C., when the Romans exiled *en masse* the entire population of the island for supporting King Perseus of Macedon in his revolt against Rome.<sup>45</sup> The

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<sup>41</sup> Hadjidaki (1997, 125–32) believes that the ship may have “started out in Athens with a cargo of black-glazed ware, and found its way to Mende, where it acquired a cargo of wine, continued on to Peparethos, took on additional cargo, and then sank.”

<sup>42</sup> Carlson 1999, 3–8, figs. 1–2.

<sup>43</sup> Berthold 1984, 42–5, 50–2; Casson 1954, 168–87.

<sup>44</sup> Berthold 1984, 51, notes 45, 47, and 48.

<sup>45</sup> Strab. 10.5.4; see also Rauh 1993, 1–9.

Athenians attained Delos (with Roman oversight), under the condition that it would be a duty-free port. Subsequently, most trans-Aegean commerce shifted from Rhodian hulls to those of other nationalities. The new residents on the island set up shop in the *emporion* to facilitate trade with their respective homelands: from the east arrived merchants from Alexandria, Ashkelon and Tyre, while Italic merchants also made up a large part of the population.<sup>46</sup> In addition to Delos' infamous slave trade, a market for luxury goods developed, the demand for which emanated from a wealthy Roman aristocracy. Their rapacity for eastern goods, especially Hellenistic statuary and other luxury items, is well represented in the late first-century B.C. Antikythera shipwreck.<sup>47</sup> This large ship was carrying a dozen large bronze and marble statues, some dating to the fourth century B.C., as well as an Ephesian lamp, Pergamene coins, Koan and Rhodian amphoras, and a geared mechanism (possibly from Rhodes) created as a calendrical device, the so-called "Antikythera computer."<sup>48</sup> From an examination of its cargo, it has been suggested, correctly in my view, that the ship was headed to Rome from the Aegean via Cape Malea before it met its fate.<sup>49</sup>

Hereafter, Roman authors occasionally mention the Aegean in their travels, usually in reference to trips to and from the major cities ringing its shores. But Rome's persistent occupation of Greece after the second century B.C. effectively guaranteed a *Pax Aegeana*, with that sea eventually becoming part of Rome's *Mare Nostrum*. By

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<sup>46</sup> Rauh 1993, 28–9.

<sup>47</sup> Throckmorton 1970, 113–68; Weinberg 1965; cf. Cic. *Verr.* 1.46–8, 5.185.

<sup>48</sup> de Solla Price 1974; it was once believed that the mechanism was used as a celestial navigation instrument, somewhat akin to an astrolabe. De Solla Price, however, has shown it to be a sophisticated calendrical device.

<sup>49</sup> Throckmorton 1987, 20; on the renowned dangers of Cape Malea, see below p. 119.

Cicero's time, the majority of Aegean traffic involved mostly commercial and passenger travel.<sup>50</sup>

### The Aegean ↔ North Africa

*The Aegean ↔ Libya: Bronze Age* (fig. 3.3). Marsa Matruh, a small, isolated port located today on Egypt's west coast, offers the earliest evidence of an Aegean-to-Libya route. Its excavator, D. White, found what appears to be a Late Bronze Age trading depot on an island in the middle of a coastal lagoon.<sup>51</sup> Sherds of Libyan, Mycenaean, Egyptian, and Levantine vessels turn up in some quantity, with Cypriot wares dominating the pottery record.<sup>52</sup> Although the percentage of Aegean wares was low, their very presence is a strong indication of a direct route between the two regions. Despite thorough surveys, no other Bronze Age ports have been located along this coastline.<sup>53</sup>

*The Aegean ↔ Libya: Iron Age to the Classical Period* (fig. 3.4). In Homer's *Odyssey*, Menalaus tells Telemachus of his post-war voyages to Libya and Egypt, implying a

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<sup>50</sup> Strab. 10.5.1–19; in 51 B.C. Cicero (*Att.* 5.11.4, 5.12, 6.8.4, 6.9.1; Casson 1994, 151) traveled from Rome to Ephesus by way of the Aegean islands, stopping first at Athens, then proceeding to Kea, Gyaros, Syros, Delos, and Samos. His trip across the Aegean, which took two weeks when it could have taken three or four days, included a meal and a stable bed each night. An Ephesian captain transported the emperor Hadrian (ruled A.D. 117–138) on two occasions from Ephesus to Rhodes, and from Ephesus to Eleusis. Paul (*Acts* 18:18–19), it appears, sailed as a passenger from Cenchreae, Corinth's port on the Saronic Gulf, to Ephesus on his second missionary journey. Later, on his third missionary journey, he traveled from Philippi to Troas (20:6), and from there his party sailed to Assos, Mitylene on Lesbos, Chios, Samos, and finally to Miletus (20:13–15). A time later (21:1–2) he traveled from there to Cos, Rhodes, and finally to Patara in Lycia, where he caught a ship bound for Phoenicia.

<sup>51</sup> White 1999 is the latest summary; see also White 1986, 75–84 and White 1989, 87–114.

<sup>52</sup> Hulin 1989, 120–1. Ships with Cypriot ceramics likely came to Mersa Matruh via the Aegean. Though a Cyprus–Libya route may have existed, the paucity of any other significant Bronze Age urban and trading centers in Libya or western Egypt argues against this (White and White 1996).

<sup>53</sup> White 1996.



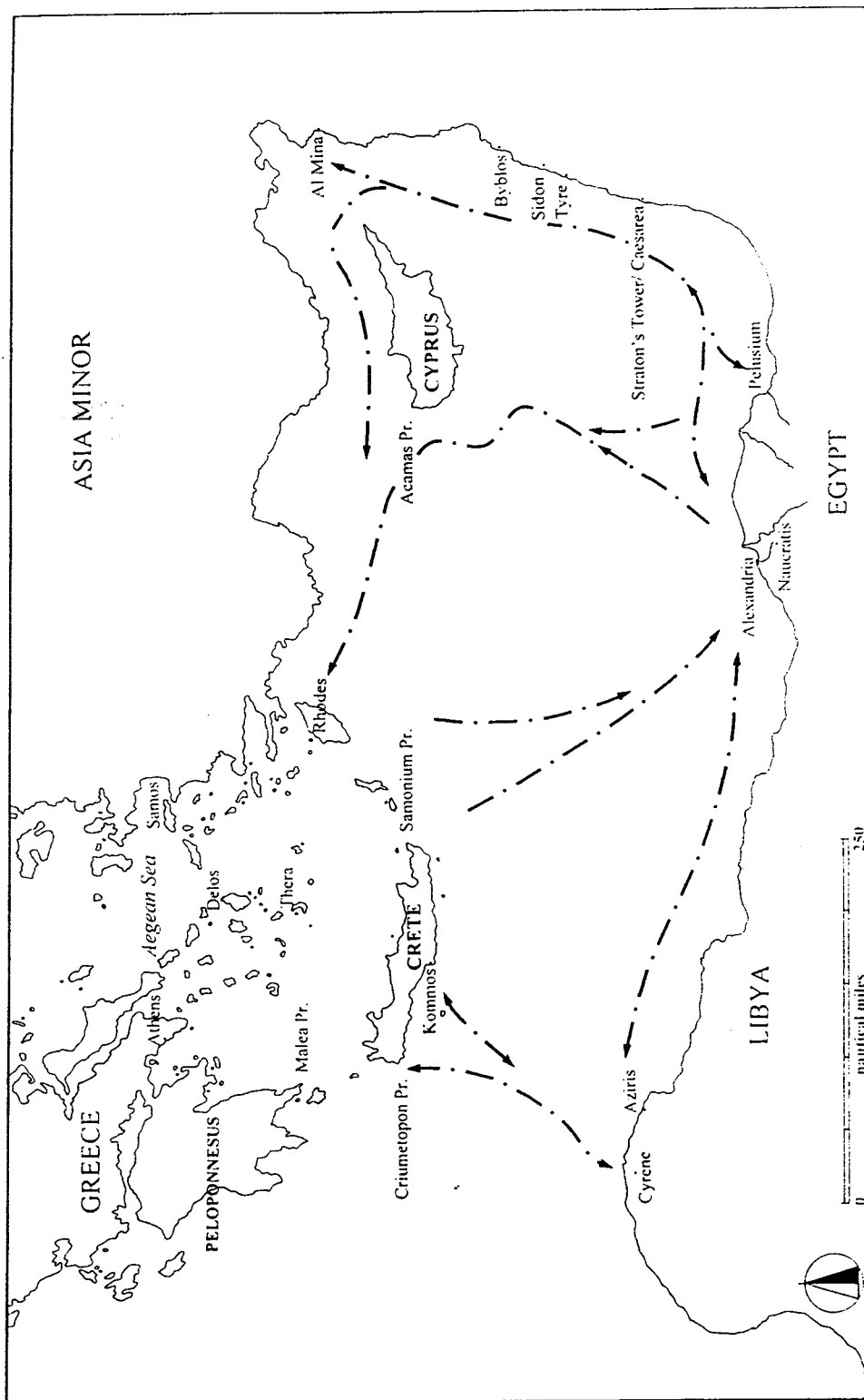


Fig. 3.4. Sea routes between the Aegean and Libya/Egypt from the Iron Age to the Roman era.



distinction between the two at the time.<sup>54</sup> Herodotus relates how the inhabitants of Thera, according to an old tradition, were advised by an oracle to “colonize Libya.”<sup>55</sup> But since none of the Therans knew of its location, they went to Crete to obtain a pilot, Corobius, who knew of Libya only because he had been driven there by adverse winds. Soon they landed on the island of Plataea, just offshore of eastern Cyrenaica, where they established a temporary settlement. Later, in the same account, seafarers from Samos were driven there, again by adverse winds, on their voyage to Egypt; they helped resupply the impoverished Therans before setting out for their original destination.<sup>56</sup> Finally the Therans moved their settlement to the Libyan coast at Aziris before finally founding Cyrene.<sup>57</sup> It is probably no accident that this city was the closest point of approach from Crete.

Intercourse between Libya and the Aegean appears frequent in the Classical period. Cyrene, after its foundation as a Greek colony in the seventh century B.C., became a frequent port of call for Aegean and Levantine ships during subsequent periods. The failed Athenian expedition to Egypt in 457 B.C. returned to the Aegean via Cyrene, and, according to Thucydides, seafarers used Kythera as a landing place for

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<sup>54</sup> “Libya” in epic poetry often denoted the continent of Africa in general. However, this passages (*Od.* 4.93–4) explicitly distinguishes Egypt from Libya; in any event, both areas were often the end result of ships caught in Aegean storms: witness *Hom. Od.* 3.299–300; *Hdt.* 4.152; *Thuc.* 7.50; *Alciphron Letters to Fishermen* 10.3.

<sup>55</sup> *Hdt.* 4.151–62.

<sup>56</sup> The Samian connection is interesting, for Clazomenian and eastern Aegean “Wild Goat” style pottery from the third quarter of the sixth century B.C. turns up at the Demeter Sanctuary in Cyrene. The proximate locations of Samos and Clazomenai, and their associations in Herodotus and the archaeological record, strongly suggest that Samian ships were running this route; see Schaus 1980, 21.

<sup>57</sup> Aziris, or Azarium, has been located (Boardman 1999, 155). Herodotus’s account is buttressed by a fourth-century B.C. inscription (*SEG* 9.3) discovered at Cyrene, which preserves the grant of citizen-rights to a group of Therans and partially relates the account of the colonizing expedition.

ships transiting from Egypt and Libya during his time.<sup>58</sup>

*The Aegean ↔ Libya: Hellenistic/Roman Era* (see fig. 3.4). Maritime interconnections with Cyrene continued throughout the Hellenistic period and into the Roman era. An inscription from that city records the shipment of grain to several Aegean islands and *poleis*, including Megara, Corinth, Athens, Thera, Rhodes, as well as several Cretan and Peloponnesian cities.<sup>59</sup> Strabo must have been reporting a common route when he wrote that the voyage from Cyrene to Criumetopon (Akra Krios on Crete) took “two days and nights.”<sup>60</sup> Likewise Philostratus claims that Libyans crossed to Crete to visit the shrine of Asclepius near Phaistos.<sup>61</sup>

The coastal route between Libya and Egypt certainly existed from the Late Bronze Age, as evidenced by the convenient location of Marsa Matruh, although its use is not mentioned until the early fifth century A.D. when Synesius of Cyrene wrote of his difficulties on a route from Alexandria to Azarium (Aziris).<sup>62</sup>

*The Aegean ↔ Egypt: Bronze Age* (see fig. 3.3). McGeehan Liritzis maintains that there was a maritime connection between Crete and Egypt at the end of the Aegean Neolithic, basing her position on the presence of Egyptian bowls and vases on Crete.<sup>63</sup> However,

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<sup>58</sup> Thuc. 1.110, 4.53.

<sup>59</sup> *SEG* 9.2

<sup>60</sup> Strab. 10.4.5; on night-time sailing, see below pp. 136–85.

<sup>61</sup> Philostratus, *Life of Apollonius* 4.34.

<sup>62</sup> Synesius *Epist.* 4.80–91; see also Sulpicius Severus *Dial.* 1.3.2, 6.1.

<sup>63</sup> McGeehan Liritzis 1988, 251–2, citing *PM* 2:16.

that a direct route between Egypt and the Aegean existed at this time, based on this evidence, is unconvincing. Other modes of trade and exchange, through Levantine middlemen for example, provide plausible scenarios as well. It is generally accepted that the route between the two regions, owing to the presence of predominate winds and wide-spread use of the primitive boom-footed sail, was counter-clockwise, although this view has recently been challenged.<sup>64</sup>

The first evidence of Aegean artifacts in Egypt comes in the form of three silver vessels of Attic origin found in a Tenth–Twelfth Dynasty context—corresponding to Early Minoan III nearly one-thousand years later.<sup>65</sup> Interestingly, the first appearance of the sail on seagoing ships occurs in Egypt during the Fifth Dynasty—again, corresponding to Early Minoan III,<sup>66</sup> and only slightly later in Crete at the end of Early Minoan III.<sup>67</sup>

Evidence for contact between these two regions during the Middle Minoan period comes from Tell el Dab'a, the site of ancient Avaris situated in the eastern Nile delta. Here, in a seventeenth-century B.C. Hyksos palace, excavators discovered frescoes depicting bull-leaping and maze backgrounds—themes strongly reminiscent of Minoan art.<sup>68</sup> It stands to reason that, although little Minoan pottery or similarly viable material

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<sup>64</sup> See below pp. 195–200.

<sup>65</sup> These vessels have been sourced by lead-isotope analysis to the mines of Laurion in Attica (see Gale and Stos-Gale 1981, 191).

<sup>66</sup> Wachsmann 1998, 11–15, figs 2.3 and 2.4.

<sup>67</sup> While the argument might be made that rowed vessels made this journey, I find it untenable as a working hypothesis that they did so regularly (see below pp. 199–200), and thus, in my view, the invention of the sail precludes this route's existence.

<sup>68</sup> Bietak 1995, 19–28; 1999. The bibliography for this site, despite the not-yet-published final excavation report, is growing at an astounding rate. For a recent compilation of sources and arguments of chronology, see Cline 1998. On a related note, an eighteenth-century B.C. cylinder seal from Syria was discovered at Tell el Dab'a; it depicts a sailing vessel with a stepped mast, two seated figures and two oars, and connotes some degree of inter-regional contact during this period (see Wachsmann 1998, 42).

was found on the site, Minoans, if not Minoan concubines as Bietak suggests, arrived by ship.<sup>69</sup>

Seaborne contact during the Early and Middle Bronze Ages appears, then, to have been an intermittent affair; voyages certainly were planned, but not executed on the larger scale of later periods.<sup>70</sup>

It is not until the beginning of the Late Bronze Age, corresponding to the zenith of the Minoan palaces on Crete, that evidence points to a common sea route between the two regions.<sup>71</sup> Egyptian imports, usually in the form of functional items such as storage jars and transport amphoras, make their way to Crete beginning in Late Minoan I, usually at a higher proportion than other near eastern goods.<sup>72</sup> Cline, marshaling the evidence of Egyptian imports in the Aegean, notes that among the entire Aegean area Crete was the primary recipient of Egyptian goods until Late Minoan IIIB, at which time Mycenae acquired a trade status with their southeastern neighbors. Thus we may see here the apparent nadir of Minoan influence in international trade and the emergence of Mycenae as a major power in the Aegean.<sup>73</sup> In Egypt, Aegean connections can be seen by the presence of Late Minoan I-II pottery at several sites, but especially by the preponderance

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<sup>69</sup> Bietak 1995, 26.

<sup>70</sup> During the Early and Middle Bronze Ages in the Aegean, only Crete appears to have been involved in Aegean ↔ Egypt contact, as no Egyptian imports have been detected in the Cyclades; see Merrillees 1979, 11 and Renfrew 1972, 445.

<sup>71</sup> See McCaslin (1980, 104), who convincingly refutes Vercoutter's (1954, 17, 24-5, 173-4) position that there existed an "eastern" route between Crete and Egypt (via Cyprus and the Levantine coast) during the Late Bronze Age.

<sup>72</sup> Cline 1994, 32; Watrous (1992, 172-3, 175) suggests a direct Egypt-to-Crete route based on the presence of two Egyptian jars in a Late Minoan I context and ten vessels in a Late Minoan III context. While the possibility of sailing to Crete from Egypt existed, it is certainly difficult to reconcile weather data and the limitations of available sail technology of that age to arrive at a "common" route. Watrous's argument, generally speaking, is one of negative evidence; for further discussion on this route during the Late Bronze Age, see below pp. 195-200.

<sup>73</sup> Cline 1994, 36.

of Mycenaean (Late Helladic III) pottery found at over thirty sites spread throughout the region.<sup>74</sup>

Perhaps the clearest indicator of a sea route between the Aegean and Egypt comes from the funerary temple of Amenhotep III at Kom el-Hetan in Egypt.<sup>75</sup> Here, at the rear of the temple, stood five statue bases, each bearing a larger-than-life statue of the pharaoh. On the fifth statue base was inscribed a list of Aegean place names, written, so it seems, as a ship's itinerary. Below the names *Keftiu* (Crete) and *Tanaja* (Danaans, or Achaea) are listed in order: Amnisos, Phaistos, Kydonia, Mycenae, Boeotian Thebes or Kato Zakro, Methana (Messana), Nauplion, Kythera, Ilios (Troy), Knossos, Amnisos (again), and Lyktos.<sup>76</sup>

Cline suggests that the list should be read as evidence of an Egyptian embassy sent to the Aegean to formalize trade relations.<sup>77</sup> However, as Wachsmann observes, the list can be interpreted just as legitimately as a Syro-Canaanite (or Aegean) merchant's itinerary brought to Egypt, for the list mentions no Egyptian city: essentially it begins and ends in the Aegean at Amnisos, the port of Knossos.<sup>78</sup> Perhaps the inclusion of Aegean names in this context should come as no surprise, as the other statue bases in the temple mention cities that were not under Egyptian control during Amenhotep III's reign but certainly belonged on Egypt's political map.<sup>79</sup> The view that Syro-Canaanite and/or

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<sup>74</sup> On Minoan pottery found in Egypt, see Kemp and Merrillees 1980, 226–45; on Mycenaean pottery found there, see Cline 1994, 31.

<sup>75</sup> Edel 1966.

<sup>76</sup> Cline 1994, 38–9; Wachsmann 2000, 812–13.

<sup>77</sup> Ibid. 39–42.

<sup>78</sup> S. Wachsmann, personal communication; see also Wachsmann 1998, 297.

<sup>79</sup> For example, Babylonia, the Hittites, and various North Syrian states are listed, all of which were ruled independent of Egypt; see Cline 1994, 38.

Aegean merchants brought the "Aegean List" to Egypt goes hand in hand with several depictions of such foreigners in Theban tombs from the Eighteenth Dynasty. For the most part they are depicted alongside foreigners from other lands, all of whom are bringing goods to pharaoh.<sup>80</sup>

*The Aegean ↔ Egypt: Iron Age to the Classical Period* (see fig. 3.4). After a period of decline in contact between the two regions during the Greek Dark Age, intercourse begins anew in the mid-seventh century B.C. Egyptian trinkets, whose flow had been meager but steady during the early Iron Age, begin to pour into Greece in greater volumes, especially into Crete and Samos.<sup>81</sup> Herodotus relates that Colaeus, a Samian merchant, was traveling to Egypt ca. 640 B.C. when a storm carried him westward to Libya's shores.<sup>82</sup> As Boardman observes, the offhand mention makes this route appear routine.<sup>83</sup> Greek mercenaries fought in Egypt's wars during the seventh and sixth centuries B.C., and were perhaps even encouraged to trade by Psammetichus I.<sup>84</sup>

In the early sixth century B.C., Greek merchants founded the port of Naucratis on the Canopic branch of the Nile, fifty miles from the Mediterranean Sea.<sup>85</sup> According to Herodotus, the Egyptian King Amasis granted the Greeks the privilege of controlling the only sea port Egypt possessed at the time, and hence it was an incentive for Greek ships

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<sup>80</sup> Wachsmann 1987; Cline's view (1994, 39) that there may be parallel depictions of "Egyptians" in the cult center at Mycenae is tempting, but in his words this must remain "a very tentative suggestion."

<sup>81</sup> Boardman 1999, 113–15; on the Samos-Egypt connection, see *supra* p. 58 and n. 56.

<sup>82</sup> Hdt. 4.152.

<sup>83</sup> Boardman 1999, 114.

<sup>84</sup> Hdt. 2.153–54; Diod. 1.67.

<sup>85</sup> Boardman 1999, 118–29; Leonard and Coulson 1981.

to cross the open sea from the Aegean.<sup>86</sup> This they did with remarkable frequency, for ceramics from nearly every major East Greek *polis* arrived at Naucratis in quantity. On return voyages, Greek traders took back trinkets to the Aegean—faience objects, figurines, scarabs, and seals—but also something much more remarkable: concepts of painting, sculpture, and architecture, which would heavily influence the Greeks in the Classical period. Naucratis prospered until the fourth century B.C., when it disappears from history with the founding of Alexander's new capital, Alexandria, downstream at the mouth of the Canopic branch.

Thucydides tells us with all too little detail that 200 Athenian and confederate triremes “arrived in Egypt from Cyprus and sailed from the sea into the Nile” to assist in the expulsion of Artaxerxes, the Persian king, ca. 460 B.C.<sup>87</sup> Later, after the Greeks were besieged and beaten by the Persians, a relieving force of 50 Athenian triremes “put in to shore at the Mendesian mouth of the Nile.”<sup>88</sup> Although these maneuvers are summarily described, it is clear that long, open-sea crossings to Egypt, whether from Cyprus or the Aegean, were rather routine by this time, even for galleys. The reverse was true as well. According to the fifth-century B.C. *Ahiqar* scroll from Elephantine, Ionian merchant ships hauled wine and oil to Egypt *in winter* and returned with cargos of natron, a preserving agent.<sup>89</sup> Traffic between these regions continued into the fourth century B.C., as reinforced by Demosthenes who wrote repeatedly of the route between Rhodes and

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<sup>86</sup> Hdt. 2.178–79.

<sup>87</sup> Thuc. 1.104.

<sup>88</sup> Thuc. 1.110.

<sup>89</sup> Porten and Yardeni 1993, xx–xxi, 82–193, 284–95; Yardeni 1994: 67–78; Thuc. 8.35; see also above pp. 31–9.

Egypt.<sup>90</sup>

*The Aegean ↔ Egypt: Hellenistic/Roman Era* (see fig. 3.4). According to Plutarch, Aratus of Sicyon set out to Egypt in the mid-third century B.C. to petition Ptolemy for aid for the Achaean League: “[He] determined to sail to Egypt...so he put to sea from Mothone above Malea, intending to make the shortest passage.”<sup>91</sup> Plutarch implied that the direct route between the Peloponnese and Egypt was the “shortest passage,” as opposed to making a short crossing to Cyrene, then coasting to the Nile delta, a more difficult and longer journey to be sure.

In the Hellenistic period, Rhodes had acquired a maritime trading empire coveted throughout the Mediterranean.<sup>92</sup> However, in 167 B.C., Rome’s growing influence in the Aegean began to subvert the Rhodian monopoly on trade. Soon thereafter the island fell into economic ruin.<sup>93</sup> The center of Eastern Mediterranean trade soon shifted to Delos (made a free port by the Romans), whose poor harbor nevertheless served as the hub of wine and slave trade in the following decades. Roman merchantmen began to carry the bulk of Eastern Mediterranean trade. Indeed whole fleets of Roman merchantmen carried enormous cargoes of Egyptian grain to Rome.<sup>94</sup> Lucian’s description of the *Isis*,

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<sup>90</sup> Dem. 56.30: “For voyaging from Rhodes to Egypt is uninterrupted;” see also 56.3; 56.27.

<sup>91</sup> Plut. *Arat.* 12.1–5.

<sup>92</sup> Berthold 1984, 38–58; Lycurgus (15)(ca. 330 B.C.) states that men from Rhodes “sail the entire civilized world for trade.”

<sup>93</sup> Rhodes, however, by virtue of its convenient location on the cross-roads between the Levant and the Aegean, continued as a convenient stopping and jump-off point; according to Appian (*BCiv.* 2.89), “[Caesar] departed [Rhodes] toward evening...and after three days at sea arrived off Alexandria;” Diodorus Siculus (3.34.7) writes: “From the Lake of Maeotis [Sea of Azov]...many of those sailing merchant vessels travel with a fair wind and arrive at Rhodes on the tenth day...and from there they arrive at Alexandria on the fourth.”

<sup>94</sup> See Casson 1995, 297–9 and an exhaustive list of references of the Alexandria-Rome route there.



an enormous Roman grain ship driven by weather to the Piraeus while in transit between Alexandria and Rome, best illustrates the route of these ships (fig. 3.5):

The captain said that after they left Pharos under a weak wind, they sighted Acamas in seven days. Then, as it blew against them from the west, they were carried abeam as far as Sidon. From there they encountered a strong storm and came through the Strait to *Chelidonenses* on the tenth day. There they nearly sank. Having sailed by the *Chelidonenses* myself, I know how big the waves can be, especially with a south-west wind (λίψ) whenever a southerly (νότος) is present. For this happens to be the place where the Pamphylian and Lycian seas divide and where the swell is driven by many currents that split apart on the headland—the rocks running alongside the sea's edge are very jagged and sharp. And so the breakers echo with a great roar and make the beach a most horrific place. The waves often reach up as high as the headland itself. Such were the circumstances of the voyage when it was still night and pitch black. But the gods took pity on their cries and showed them a fire from Lycia, so that they knew the place. And one of the Dioscuri showed them a bright light on the mast-top and guided the ship to port, toward the sea, just as it about to slam into a cliff. Then, now that they had fallen off their straight course, they sailed across the Aegean beating against the *Etesians*. Yesterday, seventy days after departing Egypt, they dropped anchor in the Piraeus, after being driven so far downwind. They should have kept Crete to starboard, sailing beyond Malea so as to be in Italy by now.<sup>95</sup>

### The Aegean ↔ the Levant

*The Aegean ↔ Cyprus: Bronze Age* (fig. 3.6). A number of terra-cotta boat models, primarily of round hulls, from the Early- to Late-Cypriot periods indicates that island's early and intimate connection with the sea.<sup>96</sup> However, there is little tangible evidence attesting to a route between that island and the Aegean until the end of the Middle

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<sup>95</sup> Lucian *Nav.* 7–9; discussed in Murray 1995, 39–43.

<sup>96</sup> For an exhaustive study of these boat models and their contexts, see Wachsmann 1998, 61–7; see also Westerberg 1983, 9–18.

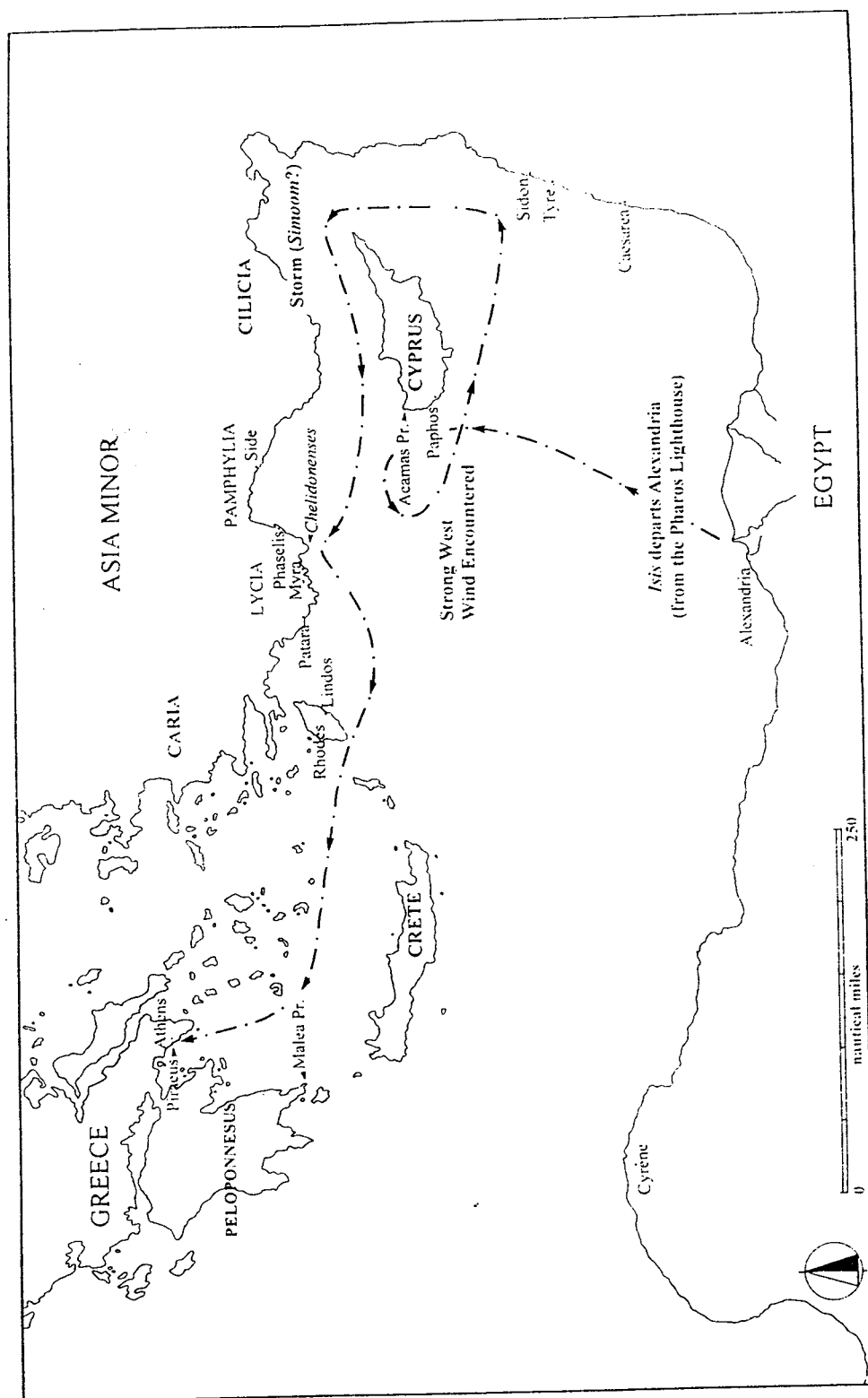


Fig. 3.5. The route of the *Isis* as described in Lucian's *Navigium* 7-9.

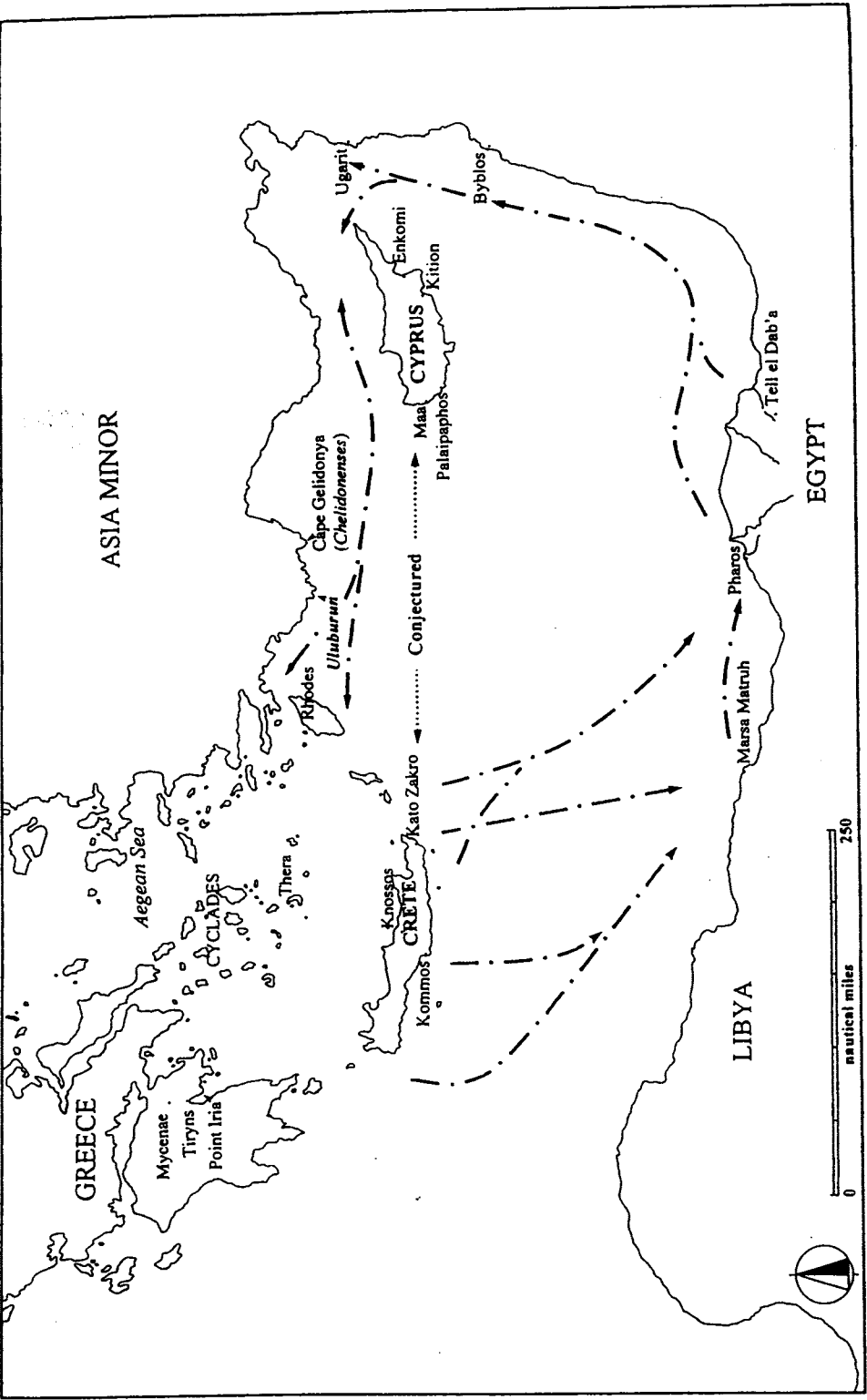


Fig. 3.6. Sea routes between the Aegean and Cyprus during the Bronze Age.

Bronze Age.<sup>97</sup> Even so, we may assume that some degree of contact between these two regions took place at least as early as Middle Minoan/Cycladic III, for Cyprus sat astride the route between Ugarit and the Aegean, a route the evidence of which was plainly in existence from that time forward.<sup>98</sup> In a recent article, S. Wachsmann has drawn attention to the fact that the Cypro-Minoan stems from Linear A, thus indicating specific Crete–Cyprus contact at least as early as the end of the Middle Minoan period.<sup>99</sup>

With the beginning of the Late Bronze Age, connections between these two regions becomes more defined. Cypriot ceramics turn up in Late Helladic/Late Minoan I–III contexts in the Aegean;<sup>100</sup> they are to be found primarily on Crete, but also on Rhodes and in the Cyclades.<sup>101</sup> In the Late Minoan/Late Helladic IIIA period, Cypriot wares arrive mostly in Crete, then shift to mainland sites in the succeeding IIIB period, primarily at Tiryns and Boeotia.<sup>102</sup> This is the time when pottery marks written in the Cypro-Minoan script are found on Mycenaean vessels in both Cyprus and on the Greek mainland.<sup>103</sup> In this period, ca. 1300 B.C., a large, richly-laden cargo-ship filled with ten tons of Cypriot copper oxhide and bun ingots and other Near Eastern and Aegean goods

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<sup>97</sup> The earliest evidence of Creto-Cypriot contact comes in the form of a Middle Minoan IA jar of Knossian fabric discovered in a tomb at Lapithos on Cyprus (see Åström 1979, 56). Published archaeological reports on Late Bronze Age Cyprus are voluminous. On the evidence from pottery for this route, see Cadogan 1993, 91–9.

<sup>98</sup> Cyprus was later used as a benchmark for voyages between the Aegean and the Levant (see *Acts* 21 and *Lucian Nav.* 7–8). Merrillees (1979, 17, 24) makes a compelling case for contact between Cyprus and the Cyclades as early as Early Cycladic/Cypriot III, based on similarities in the stylistic attributes of duck vases belonging to both cultures.

<sup>99</sup> Wachsmann 2000, 2:811–12.

<sup>100</sup> Cline 1994, 60.

<sup>101</sup> Cadogan 1972, 11–12; see also Cline 1994, 61.

<sup>102</sup> Cline 1994, 61

<sup>103</sup> Hirschfeld 1996, 289–97; Hirschfeld 1990.

sank at Uluburun, a cape southeast of Kaş on Turkey's Mediterranean coast.<sup>104</sup> Besides its cargo of metal, the ship was carrying no less than 135 vessels of Cypriot manufacture, most of which were newly-fired.<sup>105</sup> If the ship was headed for an Aegean destination, a likely scenario given its proximity to Rhodes and its cargo of eastern goods, then this special cargo represents more Cypriot material than is currently known in the entire region.

Two other shipwrecks demonstrate a Cyprus–Aegean route during the Late Bronze Age. The first, discovered at Point Iria in the Argolid Gulf, was carrying a mixed cargo of transport vessels and utility wares, mostly of Cypriote origin (*e.g.* Late Cycladic IIC–IIIA *pithoi*), when it sank at the end of the thirteenth century B.C.<sup>106</sup> Y. Vichos envisions the ship proceeding from Cyprus to Crete (either to Knossos or Kommos where it loaded eight stirrup jars dating to Late Minoan/Late Helladic IIIB), then up the eastern coast of the Peloponnese to Point Iria.<sup>107</sup> Its discovery confirms a Cyprus–Argolid connection.<sup>108</sup>

The second ship came to grief off Cape Gelidonya, east of Uluburun on the same stretch of coastline.<sup>109</sup> Dated to ca. 1200 B.C. (Late Helladic IIIB–C), its cargo included Cypriot copper oxhide and bun ingots, an allusion to the continuation of the Cyprus-to-Aegean trade route exemplified by the Uluburun ship a century prior. The crew's

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<sup>104</sup> See most recently Pulak 1997, 233–62, esp. 257; the sinking took place in or after 1305 B.C. (Late Helladic IIIA–Late Helladic IIIB), based on dendrochronology.

<sup>105</sup> Pulak 1997, 242–3.

<sup>106</sup> See Vichos and Lolos 1997, 321–37 and articles in Phelps et al. 1999.

<sup>107</sup> Alternative routes within the Aegean are also discussed in Vichos 1999, 79–80.

<sup>108</sup> Hirschfeld 1990; 1996.

<sup>109</sup> Bass 1967.

possessions suggest that the ship was either of Cypriot or North Syrian origin.<sup>110</sup>

Evidence from Linear B tablets lends further credence to Aegean–Cyprus trade connections: those at Knossos employ the adjective *ku-pi-ri-jo*, interpreted as *Cyprus* (*Cypriot*), to describe various spices; and at Pylos the same word is used as an ethnic adjective to describe shepherds and bronze-workers, thus suggesting that Cypriotes were actually employed by Aegean palace centers during the Bronze Age.<sup>111</sup> We also see *a-ra-si-jo*, transliterated as the Akkadian term for Cyprus (*Alashiya*) in the Knossos archives; it designates a shepherd.<sup>112</sup>

Two routes between Cyprus and the Aegean are apparent: the indirect route has Cyprus sitting astride the Egypt-to-Aegean route illustrated in fig. 3.3. Objects of apparent North African/Egyptian origin discovered alongside Cypriot goods on the Uluburun ship provide the strongest argument for this circuit. The second route was more direct and likely followed the parallel running through both Crete and Cyprus. Whether Bronze-Age ships hugged the coast or stood out to sea is difficult to determine. However, in the view of this author, a combination of strong offshore winds funneling down through gaps in the Taurus range and the dangers of such a hostile shoreline argue more for an open-sea passage.<sup>113</sup>

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<sup>110</sup> Ibid. 1967; on the Chelidonian isles and their navigational utility, see below pp. 123–5.

<sup>111</sup> See Ventris and Chadwick 1973, 98, 136, 199, 223, 441, 558; for the voluminous literature written on the topic, see references in Cline 1994, 130.

<sup>112</sup> Ventris and Chadwick 1973, 533; see also Cline 1994, 130; on the Alashia/Cyprus equation, see most recently Bass 1997, 156–7 and citations there.

<sup>113</sup> According to McCaslin (1980, 21–30, 104–7, fig. 36), the abundant distribution of ancient anchors and Late Bronze Age harbors along the southern coast of Cyprus suggests that ships transiting this route actually favored the open sea crossing between Cape Acamas and Cape Gelidonya, a distance of about 125 nautical miles. Sparse anchor finds along Cyprus's north coast may indicate an avoidance of the area by Bronze-Age ships. This is, of course, an argument from negative, if poorly documented, evidence (see Wachsmann 1985 for a review of McCaslin 1980).

*The Aegean ↔ Cyprus: Iron Age to the Classical Period* (fig. 3.7). Ship-traffic between the Aegean and Cyprus continued into the Early Iron Age, though evidently at a reduced volume. This is attested by Proto-Geometric and Geometric pottery found on Cyprus in the years 1050–900 B.C., and is echoed in the Aegean by the low number of Cypriot ceramics found there. Whereas Bichrome II ware (from the tenth century B.C.) was found early on at Lefkandi on Euboea, the majority of Cypriot pottery in the Aegean appears at Rhodes, Cos, and on Crete, the last of which received mostly luxury items.<sup>114</sup>

The Phoenicians established a trading port along the southern Cypriot coast at Kition during the ninth and eighth centuries B.C.<sup>115</sup> Cypriot/Phoenician trade in *orientalia* begins anew between the Aegean and North Syria. By the eighth and seventh centuries B.C., this route was for the Phoenicians only one leg of an extended route to the west. It is probable that they shared the Aegean–Cyprus sea-lanes with Euboeans,<sup>116</sup> whose Geometric pottery shows up in large quantities on the island, especially at Salamis, and at Al Mina on the mainland opposite. Cyprus certainly served as a regular stop-over for ships of both regions sailing between the Aegean and the Levant.<sup>117</sup>

Finally, in the sixth century B.C., Greek settlements appear on the island, which by now has shifted from Assyrian to Egyptian and then to Persian rule.<sup>118</sup> East Greek and Corinthian pottery appears in quantity in Salamis and its environs, eventually being

<sup>114</sup> As discussed in Boardman 1999, 36–7; Sørensen 1997, 291.

<sup>115</sup> Karageorghis 1982, 122–7.

<sup>116</sup> Karageorghis 1976, 110; 1982, 130; as Boardman (1999, 41–5) admits, the evidence for Euboeans in the east is “wholly archaeological.” While the ethnicity of the seafarers/traders using this route is difficult to discern (as stressed most-recently in Sørensen 1997, 293–5), a number of Geometric- and Archaic-period ships depictions (primarily warships) from Greece suggest the possibility of Euboean participation; see Casson 1995, 65–8, 71–4; see also below pp. 100–8.

<sup>117</sup> Coldstream 1989, 91–2, especially fig. 1, a–c.

<sup>118</sup> Boardman 1999, 43, 107.

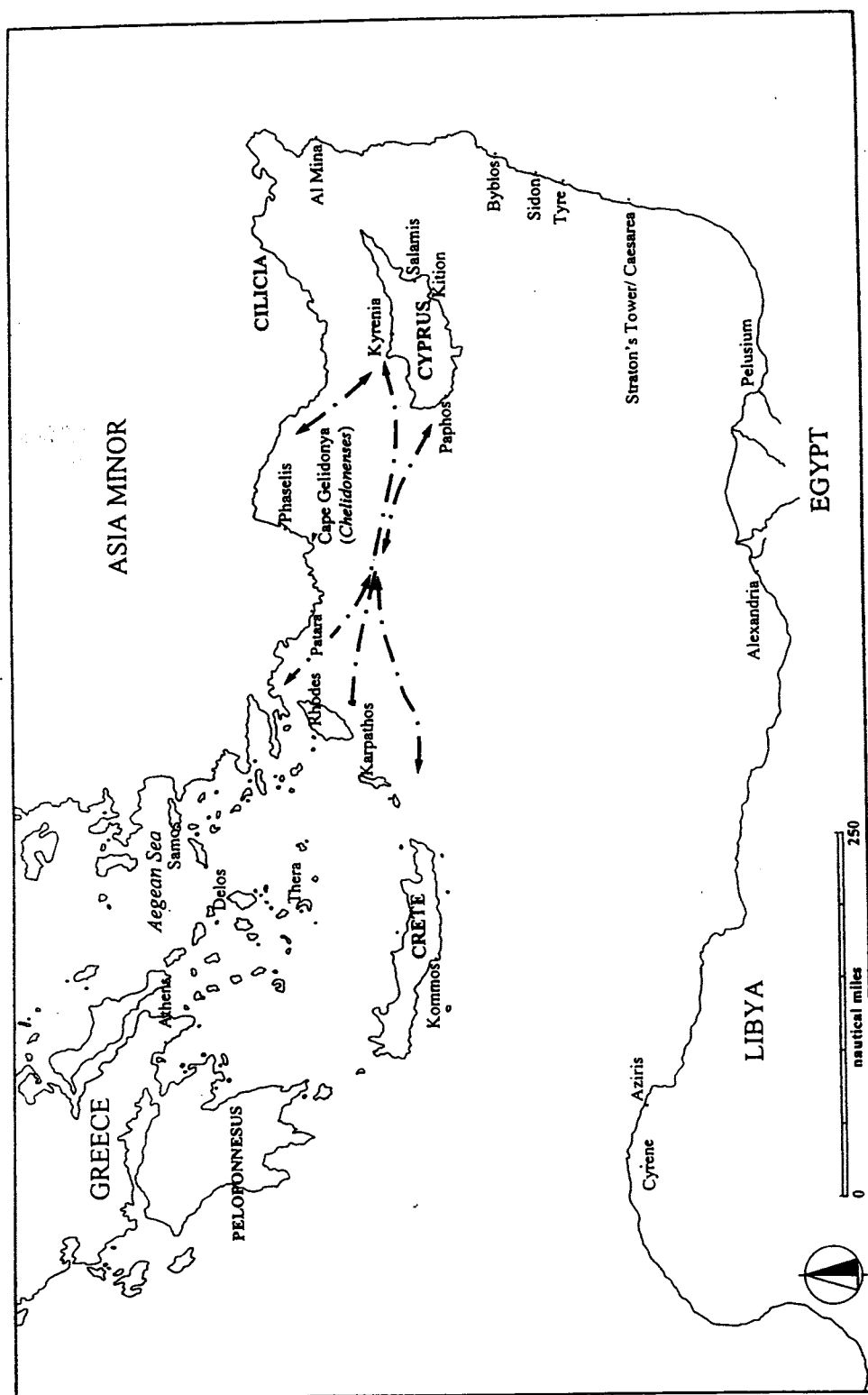


Fig. 3.7. Sea routes between the Aegean and Cyprus from the Iron Age to the Roman era.



supplanted by Attic ceramics.<sup>119</sup> At the other end of the route, we find Cypriot objects of the Archaic period in large quantities at the Samian Heraion, mostly in the form of votive offerings.<sup>120</sup>

A century later, Greeks on Cyprus saw Athenian and Ionian fleets coming to their aid against their Persian overlords;<sup>121</sup> the short, cross-channel route between Cilicia and Cyprus is specified.<sup>122</sup> Indeed, Cyprus was probably a staging area for Persian (viz. Cypriot, Phoenician, Egyptian) fleets intent on naval warfare in the Aegean.<sup>123</sup> The late fourth-century B.C. shipwreck discovered off Kyrenia in north Cyprus bespeaks an active trade between the Aegean and Cyprus. Its cargo consisted primarily of Rhodian amphoras, but also included Samian amphoras, thus intimating trade between Cyprus and the central Aegean.<sup>124</sup>

*The Aegean ↔ Cyprus: Hellenistic/Roman Era* (see fig. 3.7). Throughout the Hellenistic period, Cyprus continued as a force in Eastern Mediterranean commerce and inter-regional politics. Fleets composed of Ptolemaic galleys shuttled back and forth from bases in the Aegean to their headquarters on Cyprus throughout the second and first centuries B.C.<sup>125</sup> Later, during the Roman period, Cyprus produced and exported several pottery types that are found throughout the Mediterranean world.<sup>126</sup> This, combined with

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<sup>119</sup> Sørensen 1997, 290.

<sup>120</sup> Kyrieleis 1989, 53.

<sup>121</sup> Hdt. 5.108–16; Thuc. 1.104.

<sup>122</sup> Hdt. 5.108.

<sup>123</sup> Hdt. 7.89–90.

<sup>124</sup> Wylde Swiny and Katzev 1973, 353.

<sup>125</sup> See Stieglitz 1997, 301–6.

<sup>126</sup> For the archaeological evidence, see Lund 1997, 201–11.

literary evidence of outside contact, makes it incontrovertible that heavy maritime traffic frequented the Aegean–Cyprus route during these times.<sup>127</sup>

*The Aegean ↔ Levantine Littoral: Bronze Age* (fig. 3.8). Maritime contact between North Syria and the Aegean in the Middle and Late Bronze Age is shown by both archaeological and epigraphical evidence.<sup>128</sup> The earliest apparent contact dates to Middle Minoan II, when a tin inventory from Zimri-Lim's reign in Mari mentions a Caphtorite and a Carian—Caphtor being the Near Eastern name for Crete.<sup>129</sup> In fact Caphtor is mentioned in a mercantile context no less than four times in the archives of Mari. At the opposite end of the route, on the Aegean island of Kythera, was found a stone tablet with an Akkadian cuneiform inscription dated to the reign of Naram-Sin, king of Eshnunna (corresponding to Middle Minoan II); its provenance may be explained as a “souvenir or a piece of booty.”<sup>130</sup> The writer of the “Admonitions of Ipu-wer,” an Egyptian text composed between the Sixth and Eleventh Dynasties, laments that “no one really sails to [Byb]los today. What shall we do for cedar for our mummies? Priests were buried *with* their produce, and [nobles] were embalmed with the oil thereof as far away as Keftiu, (but) they come no (longer).”<sup>131</sup> This indicates that Byblos' merchants temporarily ceased shipping beloved oils and resins to Egypt, and that the cargos of oil

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<sup>127</sup> At least two large Roman wrecks of third- to fourth-century date have been discovered recently in deep water midway between Cyprus and Crete, approximately 70 nautical miles from the southern coast of Asia Minor (B. Phaneuff, personal communication). Storms or high winds either blew them off course, or they were keeping far out to sea to avoid the rocky and precipitous coastline.

<sup>128</sup> Astour 1973 remains a dependable source for much of the evidence.

<sup>129</sup> For references on Caphtor and Mari, see Cline 1994, 49 and Astour 1973, 19–21.

<sup>130</sup> Astour 1973, 20, quoting Weidner.

<sup>131</sup> Pritchard 1969, 441; Säve-Söderbergh 1946, 32–3; Wachsmann 1998, 308.

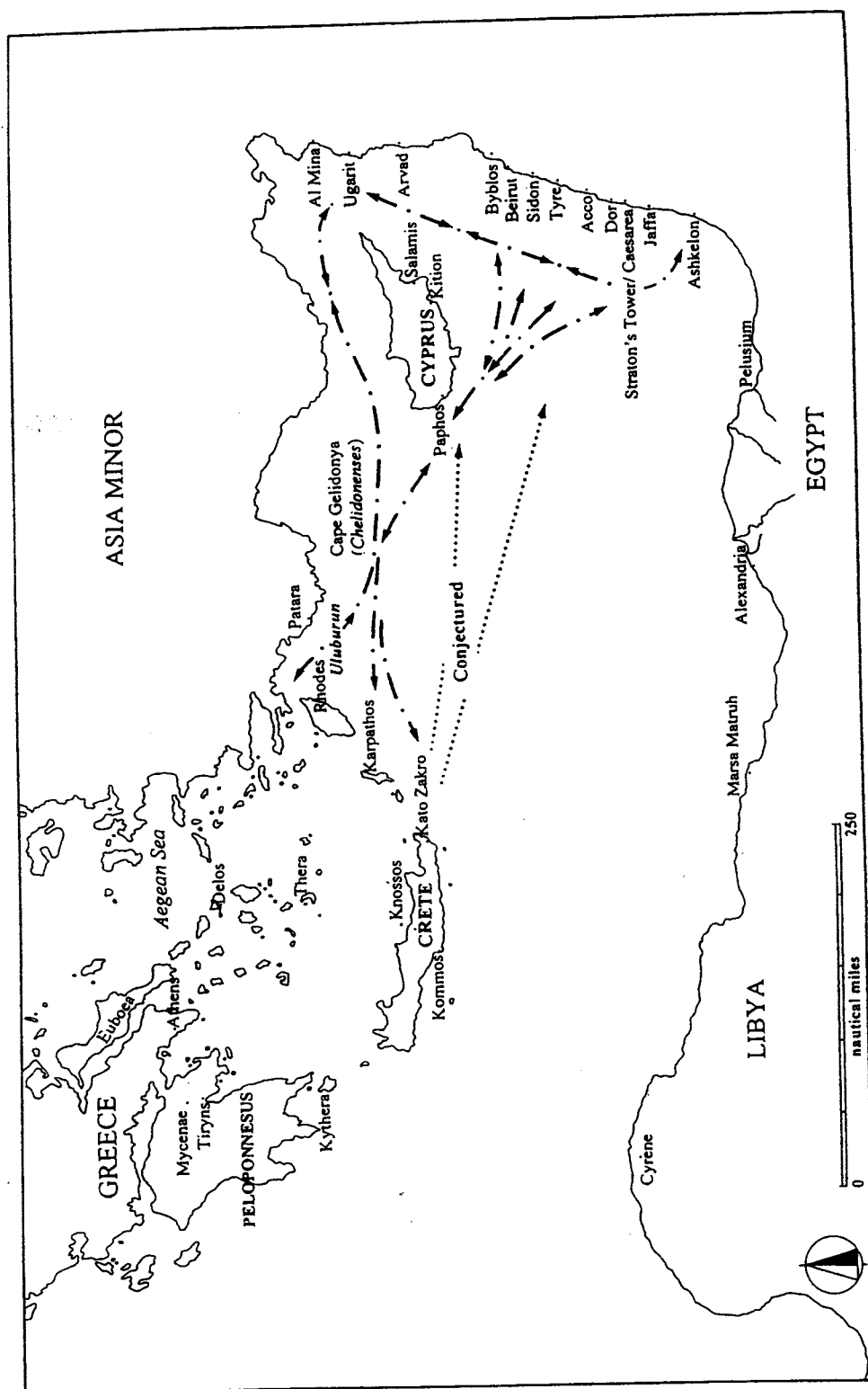


Fig. 3.8. Sea routes between the Aegean and the Levantine littoral.

and resin were known to have been shipped as far the Aegean.

Trade between Ugarit—the Middle/Late Bronze Age port that served the hinterland of Syria, including Mesopotamia—and the Aegean began in earnest at the end of Middle Minoan III and the beginning of Late Minoan I; Minoan wares from these periods are found in Ugarit in some quantity and are even imitated.<sup>132</sup> Ugarit had a sizeable fleet in the Late Bronze Age, as mentioned in *KTU* 2.47 where we read of a request for 150 ships.<sup>133</sup> More germane to this discussion, however, is a letter from an Ugaritic archive from ca. 1200 B.C., which details a royal dispensation to an Ugaritic merchant involved in shipping goods between Crete and Ugarit. It states:

- 1–6 From this day on, Ammishtamru, son of Niqmepa, king of Ugarit, has exempted Sinaranu son of Siginu; he is clear as the Sun is clear.
- 7–9 Neither his grain,, nor his beer, nor his oil will enter the palace (as tax). His ship is free (from claims).
- 10–15 If his ship comes (back) from Crete, he will bring his present to the king and the herald will not come near his house.
- 15–17 Sinara(nu) is dedicated to the king, ..... (ruling)
- 18–20 May Ba<sup>c</sup>lu, lord of Mount Hazi, destroy whoever contests any of these words.
- 21–22 The ...s belong to his sons' sons forever.<sup>134</sup>

Ugarit was not the only Levantine mainland city carrying on an active trade with the Aegean. Cline has cataloged a total of 259 Syro-Palestinian imports in the Late Helladic/Late Minoan I-IIIC Aegean, while “there are over 100 Syro-Palestinian sites at which Mycenaean vessels or artifacts have been found; a total of over 1800 vessels have

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<sup>132</sup> Astour 1973, 21; Schaeffer 1939, 60–7.

<sup>133</sup> Hoftijzer and Van Soldt 1998, 336–7.

<sup>134</sup> Ibid. 340.

been reported to date.”<sup>135</sup>

Although Ugaritic ethnics are absent in Linear B archives, at least at our present state of knowledge, we find a *ku-pa<sub>3</sub>-nu* in a Linear A archive from Hagia Triada, a term that corresponds to Linear B *ku-pa-nu-we-to*, or “citizen of Byblos.”<sup>136</sup> We also have in Linear B archives the gentilics *A-ra-da-jo*, a “man from Arad,” a *Pe-ri-ta*, a “man from Beirut,” and a *Tu-ri-jo*, a “man from Tyre.”<sup>137</sup>

Of course the presence of Levantines in Minoan/Mycenaean texts does not speak to the subject of direct routes between the two areas *per se*: their travel may have been routed through Cyprus, which, as we have seen, dealt heavily in Aegean–Levant trade throughout the Late Bronze Age.

Homer also mentions a direct route between “Phoenicia” and the “windward” (i.e. northern) side of Crete:

...when a year had passed and the season arrived, he placed me aboard a ship bound for Libya, having advised me through lies to carry a cargo with him, but in truth intending to sell me and get a large payment. I went with him on board the ship, suspecting his deceit and yet powerless to do anything. The ship ran before a fresh North Wind on the open sea, to the *windward* of Crete, but Zeus devised our ruin. When we had left Crete, and no other land lay in sight but only sky and sea, it was then that the son of Cronos set a black cloud above our hollow ship, and the sea grew dark beneath it.<sup>138</sup>

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<sup>135</sup> Cline 1994, 49.

<sup>136</sup> Was (1977, 7, 10–11) has shown that Linear B *ku-pa-nu-we-to* (KN As 1517.8) corresponds to Egyptian *kpnt* (= *kbnt*), a seagoing vessel that plied the route between Egypt and Byblos as early as the reign of Thutmose I (on *kbn* ships, see Wachsmann 1998, 19).

Branigan (1967, 117–21) fortifies the assailable Linear A and B evidence by describing a link between Crete and Byblos in metallurgy as early as the Early Minoan III period. Again, however, it must be stated that the connection was likely routed through Cyprus.

<sup>137</sup> On *A-ra-da-jo*, see Ventris and Chadwick 1973, 171, 533; on *Pe-ri-ta*, see Ventris and Chadwick 1973, 330; on *Tu-ri-jo*, see Ventris and Chadwick 1973, 588; Wachsmann 1998, 129.

<sup>138</sup> Hom. *Od.* 14.294–304 (my italics); see commentary in Lorimer 1950, 79.

*The Aegean ↔ Levantine Littoral: Iron Age to the Classical Period* (see fig. 3.8). The many complex mythologies erected around Aegean–Levantine relations during the Early Iron Age reinforce the archaeological record. Scholars generally agree that Phoenicians, who were materially nearly indistinguishable from Cypriotes, were present in the Aegean by the tenth century B.C.<sup>139</sup> Biblical passages reveal east–west traffic in metals between Phoenicia and Tarshish,<sup>140</sup> a town held to be located in southern Spain, during the Early Iron Age; the Aegean, or at least the southern coast of Crete, no doubt witnessed their arrival and departure. A parallel passage in Josephus has these ships routed through Thrace and Pontus during the reign of the Israeli king Ahaziah (ca. 853 B.C.).<sup>141</sup> Homer, as seen in the passage above, speaks with remarkable frequency of Phoenicians and Sidonians being present in his Aegean setting.<sup>142</sup> Herodotus reports on the Hellenic tradition that Cadmus and his Phoenician followers sailed to Boeotia, a region rich in Phoenician artifacts from this period, and brought the alphabet with him.<sup>143</sup> Indeed archaeological research indicates that a strong trade relationship existed between nearby Euboea (at Lefkandi) and Tyre in the tenth century B.C.: open Euboean vessel shapes of the proto-Geometric period are found in quantity in that city, while in Lefkandi we find oriental gold ornaments, bronze bowls, Egyptian faience, and other exotica.<sup>144</sup> In between these two regions we find what appears to be a stopover for ships transiting this

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<sup>139</sup> Negbi (1992, 607) uses the convenient term “Cypro-Phoenicians.”

<sup>140</sup> 2 *Chron.* 9:21, 20:35–7 (recording the tenth century B.C.); *Jon.* 1:3 (eighth century B.C.); *Jer.* 10:9 and *Ezek.* 27:12, 25 (sixth century B.C.).

<sup>141</sup> *Jos. AJ* 9.1.4.

<sup>142</sup> See *Hom. Il.* 23.740–4 and *Od.* 14.285–304, 4.613–19; it is possible that Homer was alluding to the presence of Bronze Age Syro-Canaanite seafarers present in the Aegean during the Bronze Age (see Bass 1998a).

<sup>143</sup> *Hdt.* 5.57–8; in addition, Herodotus (1.105) states that Phoenician visitors and/or settlers built a temple to Aphrodite on Kythera in, what was to him, ancient times.

<sup>144</sup> See Coldstream 1998 with notes.

route. At Kommos, in south-central Crete, Shaw discovered several religious structures of apparent Phoenician construction dated to the latter half of the tenth century B.C.;<sup>145</sup> these strongly suggest a permanent, or at least a semi-permanent, presence of Phoenicians in the Aegean area.

Sidon and Tyre aside, Aegean shapes are found elsewhere in the east during the Early Iron Age, especially at Al Mina at the mouth of the Orontes. A profusion of Greek pottery from the ninth through fourth centuries B.C. has been found here.<sup>146</sup> Although Euboean ceramics dominate in both volume and variety of shapes, Corinthian, Cycladic, Rhodian, Lesbian, Chian, Samian, and Athenian shapes also appear. This, added to the presence of Greek-style architecture, strongly suggests that a Greek “trading station” was established here very early, possibly by the Euboeans themselves.<sup>147</sup>

*The Aegean ↔ Levantine Littoral: Hellenistic/Roman Era* (see fig. 3.8). Returning to the story of Aratus of Sicyon, we later discover that the leader of this Achaean League (mid-third century B.C.) had considerable trouble reaching Egypt. His ship left Malea for the Nile Delta, but was blown off course to Hydria, after which he met a Roman ship *bound for Syria*. According to Plutarch, “Aratus persuaded the master of the vessel to convey him as far as Caria. Thither he was conveyed...[and] from Caria...he made his way across to Egypt...”<sup>148</sup> Implicit in this statement is the existence of a common route between the Aegean and Syria, one which took in Caria. Three centuries later, Paul left

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<sup>145</sup> Shaw 1989, 181.

<sup>146</sup> Boardman 1999, 38–54.

<sup>147</sup> Ibid. 40, 53.

<sup>148</sup> Plut. *Arat.* 12.5.

Miletus in Asia Minor for Tyre by way of Patara, a town on the Lycian coast: "having set sail, we ran a straight course to Kos, then to Rhodes on the next day, and from there to Patara; and having found a ship crossing over to Phoenicia, we embarked and set sail. Having sighted Cyprus, leaving it on the left [in view of Cyprus's southern coast], we continued on to Syria and landed at Tyre; for there the ship was to unload its cargo."<sup>149</sup>

It appears from both Paul's journey to Rome aboard an Alexandrian merchantman and that of Lucian's *Isis* that ships traveling from the Levant to Rome during the Roman era tried to avoid entering the eastern Aegean for fear of having to face Cape Malea in the western Aegean, not to mention Crete's windward shore.<sup>150</sup> Unless the destination actually lay within the Aegean, passing south of Crete was eminently preferable.

### Egypt ↔ The Levant

*Egypt ↔ Cities of the Levantine Littoral: Bronze Age* (fig. 3.9). Unlike the Aegean and Cyprus, ceramic evidence is an unreliable indicator of seaborne contact between Egypt and the Levant, for trade and interaction often took place overland (by the *Via Maris*) as early as Egypt's First Dynasty beginning ca. 3200 B.C.<sup>151</sup> Shortly thereafter, however, evidence of seaborne contact begins to emerge.<sup>152</sup> Beginning in the Fourth Dynasty, and

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<sup>149</sup> *Acts* 21:1–3; this is nearly the reverse route of the voyage of the *Isis* described by Lucian (*Nav.* 7–9); cf. Marcus Diaconus *Vita Porph.* 56–7: "Sailing from Rhodes under fair weather, we had a good voyage for two days when a storm kicked up; toward evening the wind shifted, and we sailed just fine. After four more days at sea, we sailed up to the beach at Gaza on the fifth."

<sup>150</sup> *Acts* 27:4–8; Lucian *Nav.* 9.

<sup>151</sup> Mazar 1990, 108.

<sup>152</sup> Wachsmann (1998, 9–12, 39–47) marshals the evidence.



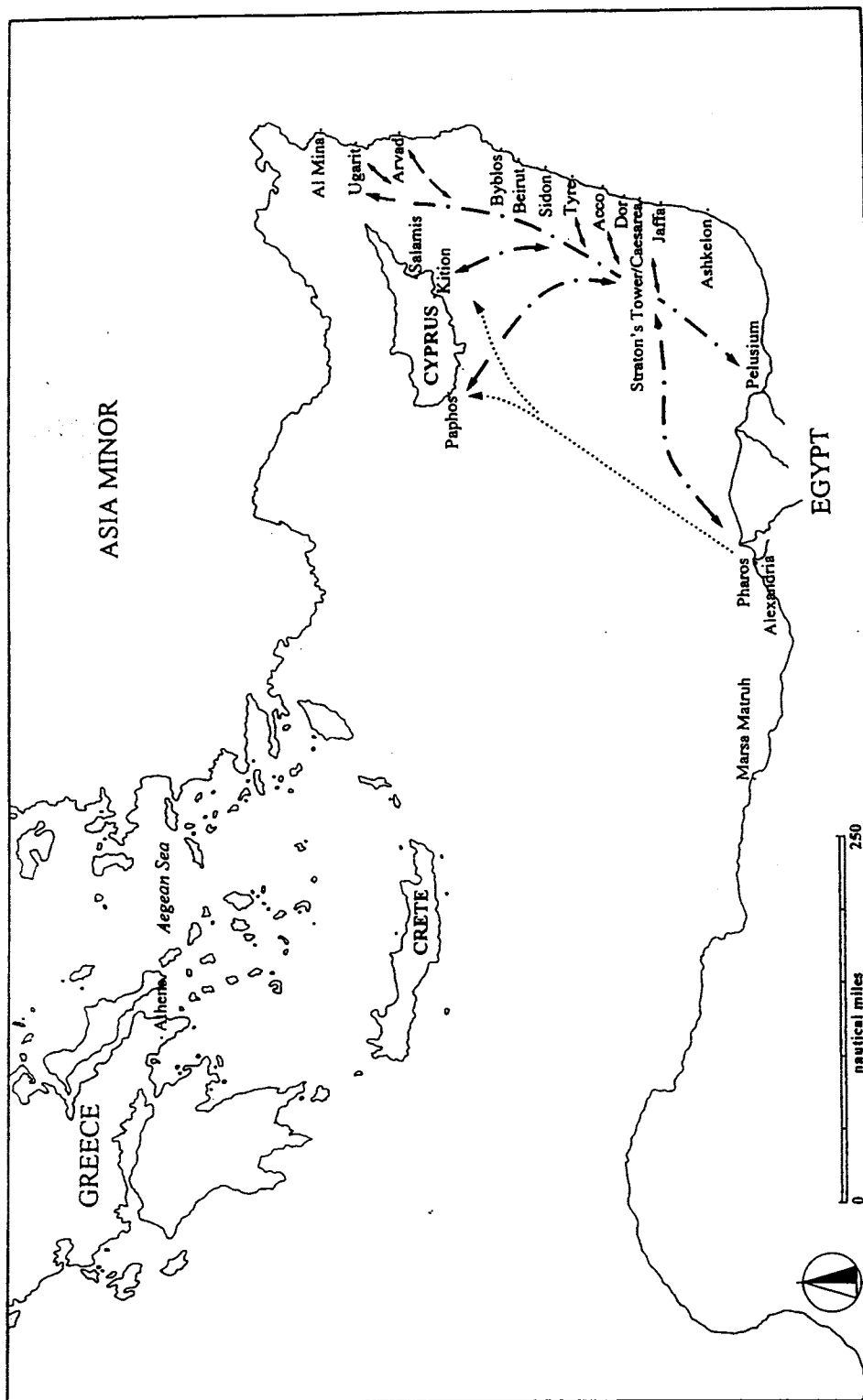


Fig. 3.9. Sea routes between Egypt and the Levantine littoral, including Cyprus.

perhaps as early as Second Dynasty, Egypt's pharaohs established a steady sea route between Byblos and Egypt, primarily for the importation of quality timber, a material Egypt sorely lacked.<sup>153</sup> This route has been called the "primary maritime lane for Egypt" during the Bronze Age.<sup>154</sup> Ships that sailed this route came to be known as *Kbnt* or "Byblos-ships," a term that eventually denoted any seagoing ship. As we have seen in the "Admonitions of Ipu-wer," there appears to have been a hiatus in maritime contact between Byblos and Egypt during the First Intermediate Period (ca. 2100 B.C.).<sup>155</sup>

Throughout the Late Bronze Age, however, especially after the Asiatic campaigns of Thutmosis III (fifteenth century B.C.) and the consolidation of the acquired territory by his successors, Egypt maintained a military and commercial presence in Canaan. The Amarna texts of the fourteenth century B.C. mention Byblos most frequently. The route between Egypt and that already ancient city appears to have remained regular, as a number of these texts from Rib-Hadda record pleas for Pharaoh to probably non-stop, although stops at cities along the way may have been made for emergency or re-provisioning purposes.

In one Ugaritic text, the king of Tyre sent word to the king of Ugarit stating that a ship the latter had sent to Egypt arrived in his harbor, nearly awash from a torrential rain. After its cargo was offloaded the ship proceeded to Acco, at which point the texts

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<sup>153</sup> Wachsmann 1998, 9–12, 19; Montet 1928; that Egyptian ships participated in this route very early is also confirmed by the discovery of an inscribed Egyptian axehead found in the Adonis River in Lebanon (Rowe 1936). It states: "The Boat-crew 'Pacified-is-the-Two-Falcons-of-Gold'; Foundation [gang] of the Port [Watch]." According to Rowe, this was the title both of Cheops (Fourth Dynasty) and of Sahure (Fifth Dynasty).

<sup>154</sup> Stieglitz 1984, 136.

<sup>155</sup> See *supra* p. 77 and n. 131.

ends.<sup>156</sup> As if to complete the text, however, we find depictions of Syro-Canaanite ships in an Egyptian tomb belonging to Kenamun, the Mayor of Thebes under Amenhotep III.<sup>157</sup> In three registers, we see several merchant ships, their decks filled with Syro-Canaanites unloading their native goods onto the wharf (see fig. 4.4). A Syro-Canaanite ship graces the walls of another Theban tomb, that of Nebamun, a physician under the previous pharaoh, Amenhotep II.<sup>158</sup>

*Egypt ↔ Cities of the Levantine Littoral: Iron Age to the Classical Period* (see fig. 3.9).

In 1075 B.C., the Egyptian priest Wenamun was on his way to from Thebes to Byblos (apparently on a Syrian ship) to buy timber for the barge of Amun when he became sidetracked by the *Tjekker*, one of numerous tribes collectively known as the Sea Peoples.<sup>159</sup> Wenamun's inimical conversations with the king of Byblos reveal that Syrian ships and those of the Sea-Peoples had by this time replaced, or at least outnumbered, the Egyptian ships that traversed this route centuries before.<sup>160</sup>

Evidence of this route during the Iron Age, for the most part, is lacking, although the flow of trade goods between Egypt and the Levantine cities of Tyre, Sidon, and Byblos strongly suggest its continuation. Presumably this trade was by way of ship, considering their reputations as Phoenician maritime cities. During the fifth century B.C., Byblian and Egyptian ships participated in Persia's wars against the Greeks; the

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<sup>156</sup> *KTU* 2.38, as discussed in Sasson 1966, 137–8; Hoftijzer and Van Soldt 1998, 334; Wachsmann 1998, 323.

<sup>157</sup> Davies and Faulkner 1947; for a discussion of the ship's nationality, see Wachsmann 1998, 42–5.

<sup>158</sup> Säve-Söderbergh 1946, 54–6; 1957, 25–7; Wachsmann 1998, 45–7.

<sup>159</sup> Pritchard 1969, 25–9.

<sup>160</sup> *Ibid.* 27–8.

Eastern Mediterranean at this time, and throughout the Hellenistic and Roman periods, was criss-crossed by numerous warships transiting to and from Egypt and the Levantine coast.

*Egypt ↔ Cyprus: Bronze Age* (see fig. 3.9). Trade, direct or indirect, between Egypt and Cyprus appears to have begun in the Middle Bronze II period, after 1800 B.C., then increased during Middle Bronze III, reaching its *floruit* during the Late Bronze Age.<sup>161</sup> However, the El-Amarna tablets of the early fourteenth century B.C. provide more information on this route. The first recorded instance of this, indeed of any, open-sea route, as Wachsmann notes, occurs in *EA 114*. Rib-Addi of Byblos reports to pharaoh: “Under the circumstances it goes very badly with me. Here is the other, Amanmasha. Ask him if I did not send him (via) Alashia to thee.”<sup>162</sup> In this case, Amanmasha must have journeyed to Egypt by way of Cyprus (Alashia), using the open-sea route with its favorable breezes to avoid enemy ships along the coast.<sup>163</sup> Other Amarna tablets document this route.<sup>164</sup> The king of Alashia, for example, is reported to have shipped copper<sup>165</sup> and even ships<sup>166</sup> to Egypt. And a ship belonging to the same king is stated to be “in Egypt.”<sup>167</sup> Inasmuch as these texts do not explicitly state the exact route, whether coasting or taking the direct route between Cyprus and Egypt, *EA 114* makes it clear that

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<sup>161</sup> Holmes 1973, 91.

<sup>162</sup> Translated by A. Rainey in Wachsmann 1986, 101.

<sup>163</sup> On arguments concerning the Alashia/Cyprus equation, see Merrillees 1987.

<sup>164</sup> Holmes 1975 is a thorough discussion of the Cypriot–Egypt connection during the Late

Bronze Age.

<sup>165</sup> Moran 1992, *EA* 35.

<sup>166</sup> *Ibid.* *EA* 36.

<sup>167</sup> *Ibid.* *EA* 39.

the open-sea route was in use during the Late Bronze Age. A direct, Egypt-to-Cyprus route, however, would have been a very difficult voyage with the boom-footed sailing rig of the Bronze Age, for the winds between these two regions are overwhelmingly northerly to north-northwesterly (see below Chapter VI). Ships transiting to Cyprus from Egypt likely utilized Levantine coastal winds until Byblos or Ugarit were sighted, at which point they turned westward for the final leg, a 60 nautical-mile voyage.

*Egypt ↔ Cyprus: Iron Age to the Classical Period* (see fig. 3.9). The first half of the first millennium B.C. in Cyprus was one of heavy Phoenician presence and foreign domination. Indeed the Phoenicians are generally credited with conducting the majority of sea-borne trade between that island and the Nile region, especially during the Geometric and Archaic periods.<sup>168</sup> During the sixth century B.C., however, Phoenician influences on the island began to overlap with Egyptian, as King Amasis wrested control of the island from the Assyrians.<sup>169</sup> Directly or indirectly, the Egyptians injected elements of their art into Cypriot art, including stone sculpture and tomb architecture. Egyptian objects poured into Cyprus and an increasing rate while at the same time Cypriotes and Phoenicians were flocking to Naucratis to partake in the blossoming trade there.<sup>170</sup> This route continued into the Classical period; Thucydides mentions a fleet of Athenian triremes sailing to the Mendesian mouth of the Nile from Cyprus, a direct

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<sup>168</sup> CAH 3:1 529; 3:3 65.

<sup>169</sup> Hdt. 2.182.

<sup>170</sup> CAH 3:3 65; Ath. 675 F, 676 A–C; see also above pp. 63–4.

route.<sup>171</sup>

*Egypt ↔ Cyprus: Hellenistic/Roman Era* (figs. 3.5 and 3.9). The waters between Cyprus and Egypt saw much traffic, military and commercial, throughout the Hellenistic period.<sup>172</sup> Cyprus was a province of Ptolemaic Egypt at this time and became heavily involved in the frantic power struggles of Egypt's royal family. Ptolemy VIII (Euergetes II) transferred the Ptolemaic Mediterranean fleet from the Aegean to Cyprus in the later years of the second century B.C., and hereafter the Egyptian admiralty was located not in Alexandria, but in Paphos. Here it resided, its galleys keeping watch over Hasmonean and Syrian affairs, until Rome took control of the island in 58 B.C.<sup>173</sup>

Under Roman rule, during and after the first century A.D., Cyprus became a navigational benchmark for grain ships sailing between Alexandria and Rome. Seven days' out from Alexandria, Lucian's *Isis* touched at Acamas, the westernmost promontory of the island, before encountering a blistering west wind that drove her to Sidon.<sup>174</sup>

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<sup>171</sup> Thuc. 1.104, 1.110.

<sup>172</sup> On commercial traffic between Cyprus and Egypt, see most recently Lund's study on the distribution of Cypriot Sigillata wares in Ptolemaic/Roman Egypt (1997, 201–15, esp. 204–11).

<sup>173</sup> A brief but detailed summary of Ptolemaic affairs in Cyprus is Stieglitz 1997.

<sup>174</sup> Lucian *Nav.* 7–9 (see supra pp. 65–6, notes 94–5, and fig. 3.5); Cic. *Att.* 4.10.1; see also Casson 1995, 298, n. 5 and 1950, 43–51.

## CHAPTER IV

### NAVIGATIONAL INSTRUMENTS AND EXTERNAL AIDS

#### INTRODUCTION

In expounding on his ideal state, Plato conceptualized a system that would allow someone to “add an opinion about sailing and diseases—how we should apply drugs and surgical instruments to those who are sick, and how ships and nautical instruments (ναυτικά ὄργανα) should be used for sailing and in meeting dangers, not only those of winds and sea that involve the voyage itself, but also those dangers with regard to pirates...”<sup>1</sup> What exactly were these “nautical instruments” to which he was referring? In this context, the very word “instrument” carries with it the meaning of something held in the hands and used for position finding at sea, a mechanical device of some sort. The latter-day sextant comes to mind, or an eye-piece, or perhaps a pair of dividers for measuring distances on a chart.<sup>2</sup> Yet numerous excavations of ancient ships have revealed the presence onboard of only one navigational instrument, the sounding-lead. Charts, if they were carried onboard, did not survive, nor did sailing directions (*periploi*), which certainly did exist as early as the fifth century B.C. To grasp a hint of the ancient navigator’s tool kit, we ought perhaps to look beyond the traditional meaning of “instrument” and include other means of wayfinding, both on board and in the

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<sup>1</sup> Plat. *Statesman* 298c–d.

<sup>2</sup> A geared mechanism found aboard the first-century Antikythera wreck was first thought to be some sort of celestial navigational instrument or an astrolabe; but it later proved to be a zodiacal calendar; see de Solla Price 1974.

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environment. The observation of shore-sighting and migratory birds, for example, provided essential directional clues for the seafarer. Crow's nests, a Bronze Age invention, were added to mast-tops to extend the seafarer's horizon, thus enabling land (and perhaps other ships) to be sighted much sooner. The aforementioned sounding lead also furnished valuable wayfinding clues, although its application was restricted to shallower waters. A Talmudic text mentions a seafarer's "sighting tube." And man-made visual aids to navigation, both on the sea and on land, had their origin in Homer's time, if not earlier. This chapter explores these instruments, external aids, and methods of their use.

## NAVIGATIONAL "INSTRUMENTS"

### Birds

The value of birds in ancient navigation is reflected by their importance to navigators in Greek mythology. In the tale of Jason and the Argonauts, for example, Euphemus released a dove to guide the ship through the clashing rocks of the Bosphorus.<sup>3</sup> In the guise of a raven (*corax*), Phoebus Apollo led Battus to Libya where he founded the city of Cyrene.<sup>4</sup> A swan's voice guided storm-tossed merchantmen safely to shore where they founded the city Cynus (Gr. *swan*) in the bird's honor.<sup>5</sup> Indeed, at a practical level, early seafaring peoples routinely read the behavior of birds and their direction of flights

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<sup>3</sup> Ap. Rhod. *Argon.* 2.560–573.

<sup>4</sup> Callim. *Hymns* 2.65; in fact, the raven was considered the messenger of Apollo in Greek myth (Hes. *Sc.* 125 [142]; Schol. Pind. P.48 [28]) and a prophet of storm (Arat. *Phaen.* 963–969; Theophr. *De Signis* 16).

<sup>5</sup> Mela 1.110; cf. the story of Deucalion in Paus. 1.40.1.

as a simple, yet very reliable, wayfinding tool.<sup>6</sup> Their importance cannot be overstated. In the words of one traditional Polynesian navigator, "birds are the navigator's very best friend...and are very useful up to twice the sight range of an island from a canoe...The sight range of land is about ten miles and that of the bird twenty."<sup>7</sup>

In addition to their extended height-of-eye (see below), certain breeds of birds provide particular navigational information. In Oceania, terns, boobies, and noddies (seabirds all) were and are very useful, as they can fly only a limited distance from their nests on land (between 30 and 50 miles); and thus sighting one is a sure sign that land is nearby.<sup>8</sup> When breeding, their Mediterranean equivalents (terns, gulls, and shearwaters) behave in much the same way. Surely their regular behavior of flying away from land to the fishing ground in the morning and returning to the roost in the evening did not go unnoticed, nor their distinctive behavior before the onset of inclement weather.

And finally there is the actual employment of shore-sighting birds, *i.e.* birds whose initial response upon release is to search for land.<sup>9</sup> This practice is evident in the ancient Eastern Mediterranean, where the earliest recorded use is found in the story of Noah in the book of *Genesis*:

At the end of forty days Noah opened the hatch that he had made in the ark, and sent out a raven; it continued flying to and fro until the water on the earth had dried up. Then Noah sent out a dove to see whether the water on the earth had subsided. But the dove found no place where she could settle because all the earth was under water, and so she came back to him in the ark. Noah reached out and caught her, and brought her into

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<sup>6</sup> Hornell 1946 is an excellent treatment on the role of birds in early navigation. See also Gatty 1943, 6–12; Marcus 1981, 112–15; and Marcus 1953, 127–8.

<sup>7</sup> Lewis 1994, 205.

<sup>8</sup> Ibid. 213.

<sup>9</sup> Gatty 1943, 8–9.

the ark. He waited seven days more and again sent out the dove from the ark. She came back to him towards evening with a freshly plucked olive leaf in her beak. Noah knew then that the water had subsided from the earth's surface. He waited yet another seven days and, when he sent out the dove, she did not come back to him.<sup>10</sup>

While there exists a parallel account in the Akkadian *Epic of Gilgamesh*,<sup>11</sup> R.D.

Freedman has argued, convincingly I believe, that it is a later addition, and one borrowed from the Genesis story.<sup>12</sup> In any case, the Deluge stories serve to indicate that there was nothing extraordinary in using birds at sea as an instrument for finding land. And indeed it is the dove (along with its offshoot, the carrier pigeon) that is renowned for their keen sense of direction, reliability, and ease of domestication, not to mention availability: the rock-dove (*Columba livia*) is the only permanent avifaunal resident in the Aegean and thrives in caves fronting the Cretan Sea.<sup>13</sup> It comes as little surprise, therefore, that out of several varying species of birds represented in Aegean wall-paintings, sealings, and pottery, it is the dove that appears repeatedly on the miniature fresco of the Ship Procession at Thera (Late Cycladic I).<sup>14</sup> Here we see a dove (swallow?) emblem used as the prow ornament on Morgan's Ship 4, and several doves in flight grace the hull of the sailing ship (figs. 4.1 and 4.2). Their placement on the most obvious features of the ship dealing with piloting and forward movement—the prow and the hull itself—appears to symbolize the navigational powers and utility of doves as instruments. Perhaps their

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<sup>10</sup> Gen. 8: 6–12.

<sup>11</sup> Pritchard 1973, 69–70.

<sup>12</sup> Freedman 1973; cf. Gaster 1969, 129; a raven-like bird is depicted on the prow of a boat on a cylinder seal from the Second Early Dynastic Period (ca. 2800 B.C.) in Mesopotamia (see Frankfort 1939, pl. 11m).

<sup>13</sup> Thompson 1966, 225–6, s.v. ΠΕ'ΑΕΙΑ..

<sup>14</sup> Morgan 1988, pls. 9 and 11.

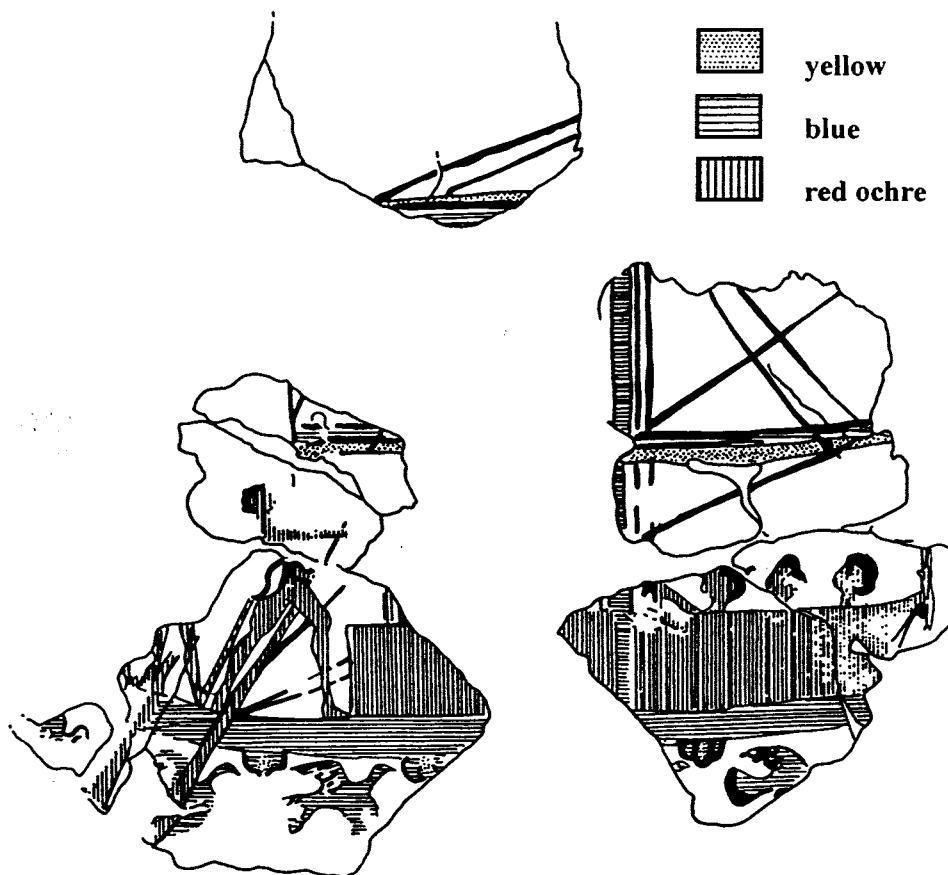


Fig. 4.1. The sailing ship from the Ship Procession fresco at Akrotiri on Thera. Note the doves adorning the hull. (After Morgan 1988, 124 fig. 70; Wachsmann 1998, 94 fig. 6.19)



Fig. 4.2. Detail of the dove motif on the sailing ship from the Thera Ship Procession fresco. (After Morgan 1988, pl. 94)

depictions here represent a true ship decoration of the period, painted or carved on the hull and bowsprit so as to “inject” the navigational powers of birds into the ship. In this context, they foreshadow *oculi* (or Gr. *ophthalmoi*), the “eyes” painted or attached to the bow planking of Greek and Roman ships.<sup>15</sup>

Evidence for the utility of doves at sea is strengthened by several other portrayals in nautical contexts. For example, an unprovenanced terra-cotta ship model from Cyprus (Middle Cypriot I), though highly stylized, contains eight animated figures and two birds, possibly doves, all of which sit atop the caprail.<sup>16</sup> A dove is seen flitting above the prow of ship on a lentoid sealstone of unknown provenance from the Late Bronze Age Aegean (fig. 4.3).<sup>17</sup> And in a scene from the tomb of Kenamun at Egyptian Thebes (ca. 1450–1400 B.C.) we see a duck(?) flying above the prow of a ship in the first register;<sup>18</sup> its position here suggests that it may symbolize the utilization of birds for navigating the Delta, an area that harbors such waterfowl in large numbers.<sup>19</sup> Similarly, a bird is rendered in flight above the mast-top of a ship from the New-Kingdom Tomb of Huy

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<sup>15</sup> On the marble *opthalmos* discovered on the fifth-century B.C. Tektaş Burnu shipwreck, see Nowak 1999, 10–11. Iconography of bird-head devices crowning the stem and stern posts of Etrurian (Villanovan), Aegean, Cypriot, and Egyptian ships of the Late Bronze and Iron Ages may have also signified the importance of birds in general in guiding or “piloting” ships through the open sea (see Wachsmann 1998, 177–97; on Homer’s “beaked” [κορωνίς] ships, see Lenz 1998). In many, if not most, instances, the protome is both facing and flying in the same direction of travel as the ship.

<sup>16</sup> Buchholz and Karageorghis 1973, 161, 471 no. 1718; Westerberg 1983, 9–10 fig. 1; Basch 1987, 70–1 figs. 132–5; Wachsmann 1998, 62 fig. 4.1.

<sup>17</sup> Pini 1975, 142, Nr. 184; the notion that this scene represents the dove-led penetration of the “clashing rocks” of the Argonaut story is attractive, yet must remain speculation.

<sup>18</sup> Davies and Faulkner 1947, 40–6 and pl. 8.

<sup>19</sup> According to Morgan (1988, 67 and fig. 75) the man in the ship’s crow’s nest has just released the bird and “holds forward his hands in a gesture well known to trainers of carrier pigeons.” The bird, however, is independent of this scene, as the man’s hands are arranged in the typical respectful greeting. In any event, the bird is a species of wild waterfowl, not a pigeon or dove. (I thank S. Wachsmann for pointing this out to me.)



Fig. 4.3. Dove flitting above the prow of a ship on a Late Bronze Aegean lentoid sealstone of unknown provenance. (After Pini 1975, no.184)

(Eighteenth Dynasty).<sup>20</sup>

Though far removed from the Mediterranean, an account from the fifth-century B.C. Hindu text *Dialogues of the Buddha* alludes to the practice of employing shore-sighting birds for navigation in the Indian Ocean:

Some seafaring merchants took a shore-sighting bird and set sail in their ship. When they could not see the shore, they released the shore-sighting bird. It flew to the east, south, west, north, straight up, and to all the intermediate points of the compass. If it saw the shore in any direction, it flew there. If it did not see the shore in any direction, it returned right back to the ship.<sup>21</sup>

Not until the first century A.D. do we hear once more of this practice, again in the same corner of the world. In Pliny's description of Cingalese (Ceylon) seafarers, he writes: "They do not observe the stars for navigation, indeed the Great Bear does not appear in those parts; and they carry with them birds, which they frequently release, and they follow their flight as they search for land."<sup>22</sup> From Pliny's tone we might reasonably infer that the practice of using birds for navigation in the Mediterranean had passed out of use. And indeed hereafter references to such practices all but disappear.

### The Crow's Nest

The same laws of physics that made a shore-sighting bird a valuable navigational aid

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<sup>20</sup> Landström 1969, 22; 1970, 98–9; a similar bird is seen in flight atop the mast-top of the great New Kingdom ship-of-state, *Mery Amun*, depicted on a relief from Karnak. According to Jones (1995, 62–4, fig. 58), the bird is not a bird at all, but a "falcon-standard with outstretched wings."

Three boat models from the Nuragic culture on Sardinia parallel the Egyptian association of mast-top and bird (Ringel 1986, Nos. 55, 59, and 60). In all three, generic birds are molded into the mast-top and crow's nest to form part of the suspension ring used for hanging the model.

<sup>21</sup> Taken from the *Digha Nikaya 11 Kevatta Sutta, to Kevatta*; see also Davids 1899, 432.

<sup>22</sup> Pliny *HN* 6.24; on the use of the Great Bear in ancient wayfinding, see below pp. 139–40, 168–76.



apply also to the crow's nest. For as the height-of-eye of the observer increases, so too does the distance to the horizon, according to a fixed formula that takes into account the curvature of the earth.<sup>23</sup> For example, from a height of two meters above the surface (say, the deck level of ancient ship) the distance to the horizon is only three nautical miles.<sup>24</sup> However, when the height of the observer is increased to seven meters, a reasonable height for a crow's nest, the distance to the horizon effectively doubles, becoming six nautical miles. The advantages of an elevated vantage point apply also to the sighting of features that extend above the sea's surface, such as land or other ships.<sup>25</sup> Seven meters aloft in the crow's nest of our hypothetical ship, an observer can sight the mast-top of another ship at 11 nautical miles, visibility and eyesight permitting.<sup>26</sup> If on the other hand our observer were standing at deck level (two meters), that distant ship could not be sighted until it was within 9 nautical miles. It is apparent, therefore, that the benefits of a crow's nest were incalculable, whether navigating in shallow waters near low-lying shores (e.g. coasts of Libya and Egypt), piloting through the more open spaces of the Aegean and Mediterranean, or attempting to sight other ships (friendly or otherwise) at sea.

*Late Bronze Age.* This principle, known today as *geographic range*, was not lost on the

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<sup>23</sup> Bowditch 1981, 392–4, table 40; see above p. 25, n. 53.

<sup>24</sup> Reynolds (1996, 336) statement that “the horizon from Bronze Age vessels with their low freeboards was about 32 km (20 mi)” is erroneous.

<sup>25</sup> Bowditch 1981, 132, table 8.

<sup>26</sup> On conditions of visibility in the Eastern Mediterranean, see pp. 24–31.

ancient seafarer, for as early as the Late Bronze Age, if not earlier,<sup>27</sup> crow's nests appear on Syro-Canaanite merchant ships in two ship-scenes, both from Egypt. The first is from the tomb of Kenamun, the Mayor of Thebes under Amenhotep III (fig. 4.4), and the other is from the tomb of Iniwia.<sup>28</sup> In both instances, artists placed the box- or basket-shaped crow's nest on the upper, anterior face of the mast, forward of the intricate rigging arrangement; this was the only convenient place for a crow's nest on such a sailing rig. While it offered a steady platform for adjusting lines and tackle, as represented in both scenes by a man bending over the top edge and tugging at two lines, it should not be misconstrued as its only purpose: there are plenty of depictions of ships from Old, Middle, and New Kingdom Egypt without crow's nests, their upper rigging filled with sailors climbing on and clinging to lines and yards, making adjustments.<sup>29</sup> Rather, we should interpret these crow's nests as navigational devices, employed on the open sea as a look-out platform for sighting distant landmarks, and in shoal waters as a means by which to sight submerged reefs or a quickly approaching bottom.

By 1200 B.C. the Egyptians co-opted this apparently Syro-Canaanite invention and converted it into a weapons platform on their oared warships. In the scene of a naval battle carved in relief on the mortuary temple of Ramses III at Medinet Habu are nine ships, four of which are Egyptian and five of which are those of the Sea Peoples—an

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<sup>27</sup> McGeehan Liritzis (1988, 252–3, fig. 14) posits an Early-Helladic date for a sherd from Pelikati, Ithaca, which depicts a curved ship with a mast capped by what appears to be a crow's nest.

<sup>28</sup> On the Kenamun scene, see Davies and Faulkner 1947, 40–6, pl. 8 and Wachsmann 1998, 42–5; on the Iniwia scene, see Landström 1970, 138, fig. 403. On a discussion of the painting in the Iniwia tomb and its apparent representation of a Syro-Canaanite ship, see Wachsmann 1998, 56–60, fig. 3.30.

<sup>29</sup> See for example Vinson 1993, fig. 49, which portrays sailors climbing the rigging of a ship outfitted with a crow's nest.

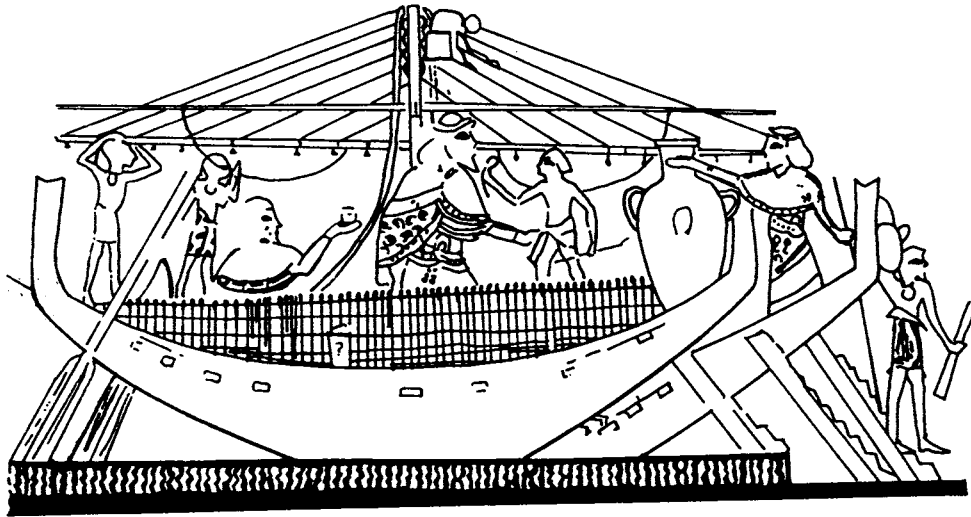


Fig. 4.4. Detail of ships from the Kenamun scene. (After Davies and Faulkner 1947, pl. 8).

invasion force comprising, among others, the *Peleset*, *Sikila*, *Denyen*, and *Sheklesh*.<sup>30</sup>

Their ships appear to be locked together, as the warriors from each side battle it out with spear, sword and bow. A basket-shaped crow's nest crowns every mast, and in each one we find a warrior either in the act of slinging stones or, in the case of the invaders' ships, falling out of his perch, pierced by an arrow (fig. 4.5). To what degree this new shape and placement of the crow's nest was designed explicitly for a military purpose is unclear, for one of very similar appearance adorns the mast-top of a New Kingdom sailing ship, apparently of unmilitary character, carved on a block at Saqqara.<sup>31</sup> In any event, the crow's nest disappears from the iconographic record, only to emerge again some four hundred years later during the Geometric period.

*The Seventh-Century B.C. Aegean.* The crow's nest reappears in iconography in the eighth and early seventh centuries B.C., primarily in the Aegean in the region of Boeotia, but also as far afield as Sardinia<sup>32</sup> and Assyria, where Phoenician ships appear on reliefs from the Palace of Sargon at Khorsabad ca. 722 B.C. (fig. 4.6).<sup>33</sup> By all accounts, it would appear that the Phoenicians inherited the structure from their forerunners in the Late Bronze Age, the Syro-Canaanites. And the periodic presence of Phoenicians in the Aegean (and Sardinia) as early as the tenth century B.C., if not earlier, must have inspired Greek shipbuilders to affix a similar structure to their mast-tops as navigational

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<sup>30</sup> Nelson et al. 1930, pl. 37; Nelson 1943, 40–5; Wachsmann 1998, 163–75.

<sup>31</sup> Vinson 1993, 136–9, fig. 49 ([E.] Berlin 24025).

<sup>32</sup> Ringel 1986, nos. 55 and 60.

<sup>33</sup> Casson 1995, 66, n. 115 and fig. 92.

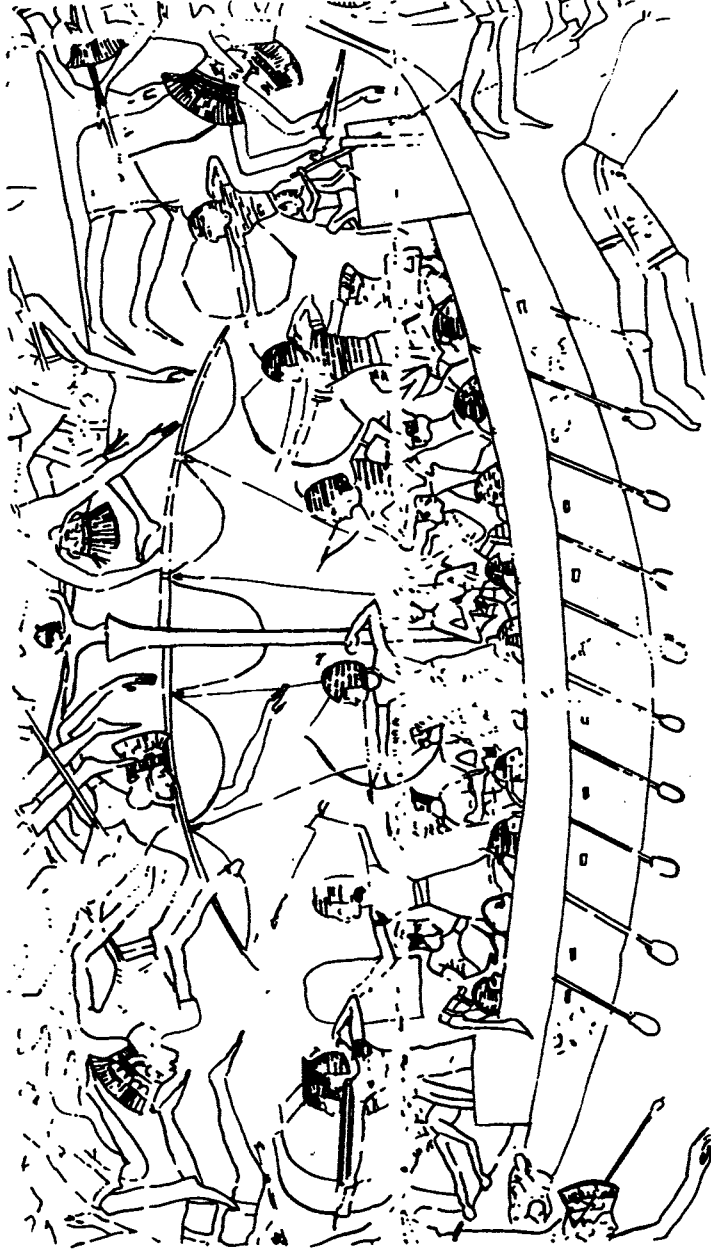


Fig. 4.5. Detail of an Egyptian ship from a relief at Medinet Habu (Ramses III).  
(After Nelson et al. 1930, pl. 39)

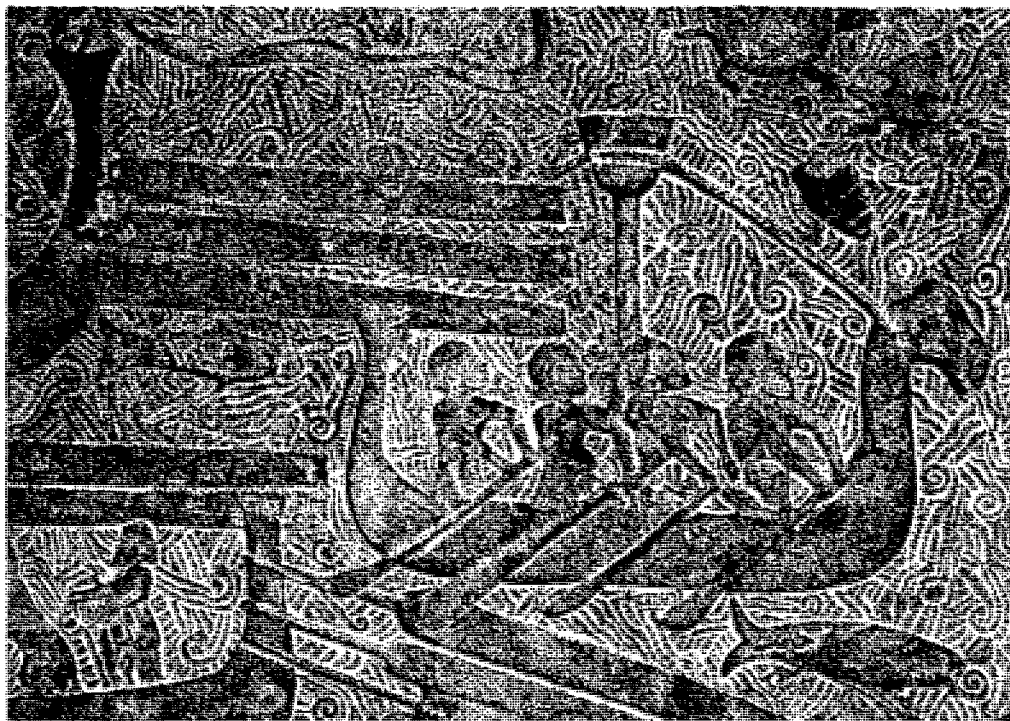


Fig. 4.6. Phoenician ships on reliefs from the Palace of Sargon at Khorsabad, ca. 722 B.C. Note the mast-top and its similarity to those depicted at Medinet Habu. (After Casson 1995, fig. 92)

aids.<sup>34</sup>

The Boeotian examples date to the seventh century B.C. and appear on galleys with waterline rams. The first is found on a bronze diadem from Thebes (fig. 4.7).<sup>35</sup> Two lines represent the mast and forestay, while at the top, on the posterior face of the mast, is attached a plain box. The second example, depicted on a large bronze fibula, portrays a similar box, with a smaller box placed within (fig. 4.8).<sup>36</sup> H. Walter interpreted the shape as a ship's lantern, unaware of the third example from another bronze fibula (fig. 4.9), which clearly shows a man's neck and head, facing forward, peeking out of a box identical to the first two.<sup>37</sup> On the deck of the ship, two warriors armed with spear and shield spring forward, one from the poop and the other from the fore-peak, while a third, unarmed man stands abaft the mast.

All three crow's nests are conspicuously similar to one another in that the artists depicted each on the after face of the mast—as compared to the Late Bronze Age practice of placing it at the fore (Syro-Canaanite ships) or on top (Egypt and the Sea Peoples). It would appear from the third example that crow's nests of this period served both as a navigational aid and as a fighting top, a place from which to hurl spears, sling rocks, or use a bow. And indeed this view is reinforced by a scene from the Aristonothos vase (ca. 650 B.C.), in which we see armed warriors (pirates?) on a galley (left) preparing to board an Etruscan merchantman (right), its crew ready to defend (fig.

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<sup>34</sup> It was also during the eighth and seventh centuries B.C. that Aegean civilization was going through an orientalizing period whereby art, technologies, ideas, and even an alphabet were acquired and influenced through contact with the east, especially Phoenicia.

<sup>35</sup> Helbig 1887, 113–4, n. 1, fig. 23.

<sup>36</sup> Walters 1899, 372–3, fig. 85.

<sup>37</sup> Hampe 1936, no. 62a, pl. 4; Basch 1987, fig. 404; Morrison and Williams 1968, pl. 8c.

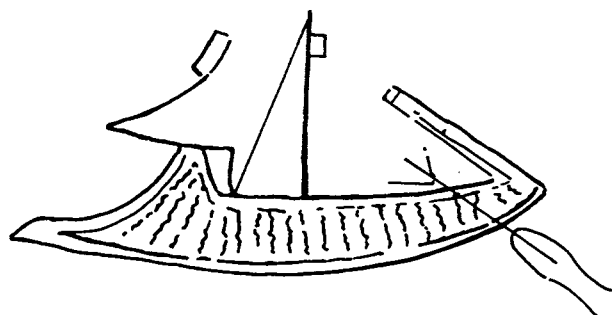


Fig. 4.7. Ship with a crow's nest on a diadem from Thebes, seventh century B.C. (After Helbig 1887, fig. 23)



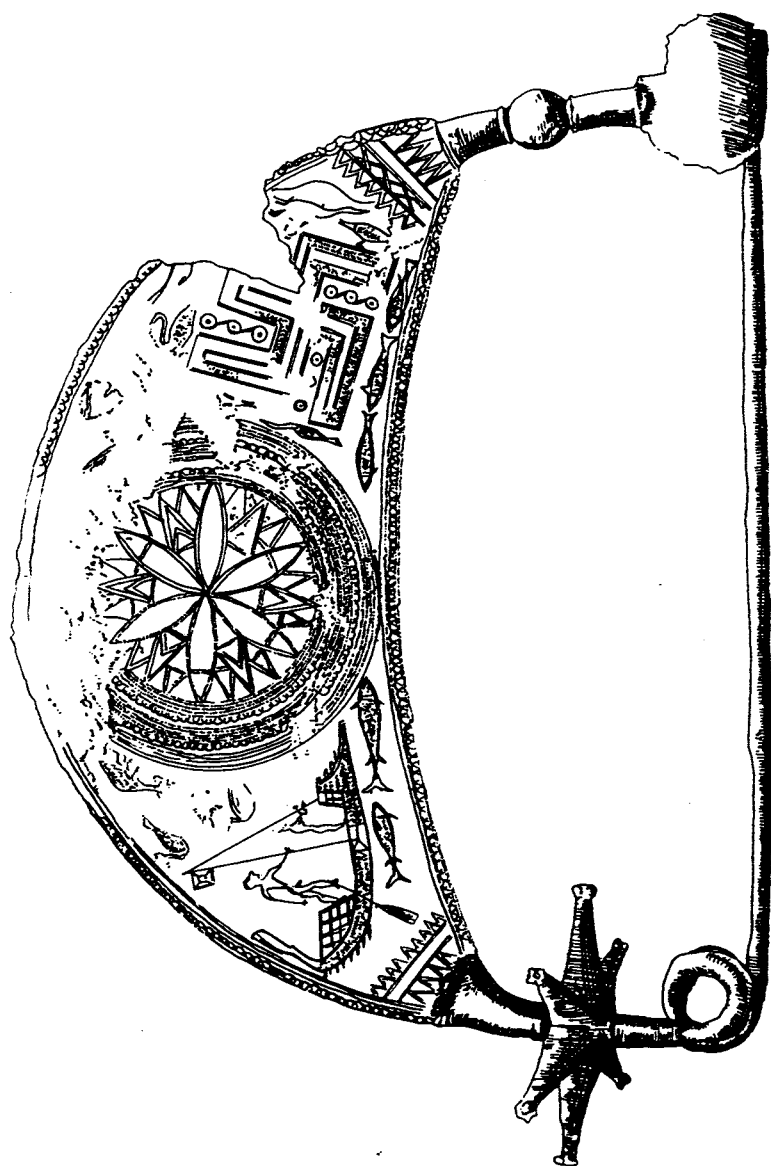


Fig. 4.8. Ship with a crow's nest depicted on a large bronze fibula from Boeotia, seventh century B.C. (After Walters 1899, 372 fig. 85)

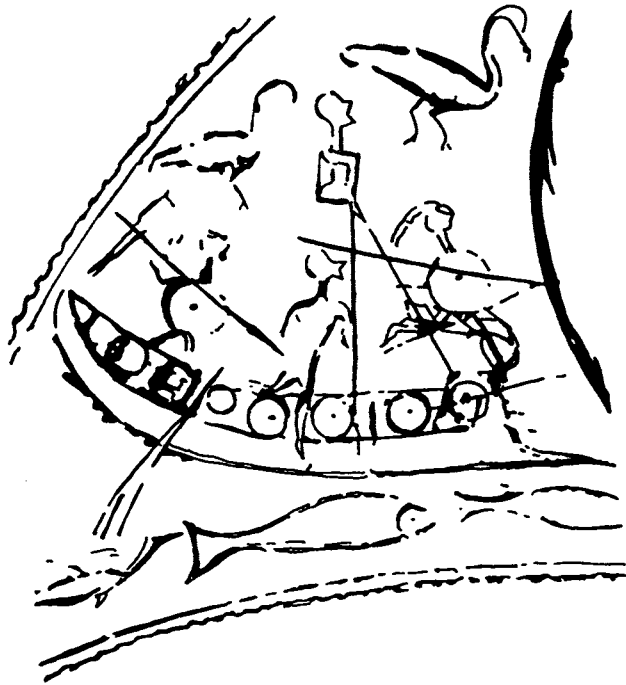


Fig. 4.9. Galley with a crow's nest on a bronze fibula from Thisbe (Boeotia), 700–650 B.C. (After Morrison and Williams 1968, pl. 8c)



Fig. 4.10. Detail of ships from the Aristonothos vase, 700-650 B.C. Note the shield-toting warrior atop the mast of the Etruscan ship on the right. (After Morrison and Williams 1968, pl. 9c)

4.10).<sup>38</sup> At the mast-head of the Etruscan ship is a warrior preparing to cast his spear. Although no structure is delineated, he is clearly standing in a crow's nest. Its appearance here, however, aboard a merchantman, reveals its primary role as a navigational aid.

*The Roman Era.* From the seventh century B.C. down to the late Roman period, the crow's nest disappears from the abundant iconography of warships and merchantmen: crews of the former routinely stepped their masts during engagements or left them ashore;<sup>39</sup> and iconography of the latter displays a simple mast-top arrangement concerned only with yard and sail adjustment. Indeed, in the first and second centuries A.D., when we first hear of geographic range and a comprehension of its mechanism, the crow's nest is conspicuously absent. Theon of Smyrna notes: "And often during a voyage, if one cannot see the land or an advancing vessel, those who have climbed up the mast may see it, as they are in a high place and so see over the curvature of the water which blocked their vision."<sup>40</sup> Piloting in waters of uncertain depth, it would now appear, is done by lookouts in the bow.<sup>41</sup> Nevertheless, the literary record also makes it possible to trace

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<sup>38</sup> Morrison and Williams 1968: fig. 9c; Torr (1964, 92) suggests that merchantmen carried the crow's nest as a defense against pirates (on piracy in the Graeco-Roman world, see de Souza 1999). The appearance of a crow's nest aboard an Etruscan ship should come as no surprise, as the Euboeans and Phoenicians established contact with, and colonies near, the Etruscans beginning *ca.* 800 B.C. (see Tandy 1997, 4).

<sup>39</sup> Cf. Athenaeus (5.208e) who writes of crow's nests and their use aboard large warships as platforms from which to hurl stones and missiles; Byzantine warships employed the crow's nest for similar purposes (see Leo *Tactica* 19.7)

<sup>40</sup> Theon 3.3; see also Strab. 1.1.20; Cleom. 1.8.7; and Ptol. *Alm.* 1.4.

<sup>41</sup> Soph. *Gathering of the Achaeans* 3–6: "You, seated at the rudder, shall show to the one at the prow the path to Ilium, so that he can point it out for the sons of Atreus;" Philostr. *Imag.* 2.15–22: "And Tiphys...is pilot of the ship; he is said to be the first of men to have the courage to learn the distrustful art. And Lynceus son of Aphareus is stationed at the prow; he is expert at seeing a great distance and looking down into the depths, the first to discern submerged reefs and the first salute land appearing on the far

the intermittent use of the crow's nest, at least from the second century A.D. Athenaeus, for example, a writer from Roman Egypt, points out the similarity between the *karchesion*, a tall drinking-cup, and *karchesion*, a mast-top.<sup>42</sup> To the latter is attached the so-called *thorakion* (θωράκιον) or crow's nest, a word that literally means "breast work."<sup>43</sup> He describes this as "rectangular everywhere except at the base and top; these project outward a little in a straight line." He further characterizes this apparent hour-glass shape as *trielikitous*, or "thrice-coiled,"<sup>44</sup> perhaps referring to the manner in which the hour-glass frame of the crow's nest was sheathed.

Talmudic literature (A.D. 400–500) reveals that Jewish seafarers were familiar with the crow's nest. As R. Patai points out, the words for mast—*toren* in Hebrew, *isqarya* in Aramaic—are flavored by their cognate verb meanings: *toren* (Aramaic *turna*) is derived from the verb *tur*, to espy; and likewise *isqarya* comes from the verb *saqar*, to 'view or espy.'<sup>45</sup> That it was used fundamentally as a lookout perch for piloting is also evident in *Leviticus Rabba*: "Like a pilot (navigating officer, skipper) that sits on top of the mast and dozes off."<sup>46</sup> And in the *Testament of Naphtali*, we read:

...Levi and Judah were sitting on the mast to see which way the ship went. As long as Judah and Joseph were of one mind, so that Judah directed Joseph which way was good, and in that direction he steered the ship, they sailed in peace and without hitch. But all of a sudden a quarrel arose between Joseph and Judah, and Joseph did not handle the ship according

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horizon."

<sup>42</sup> Ath. 11.472–9.

<sup>43</sup> A thorax (θώραξ) was a breastplate, cuirass, or corslet.

<sup>44</sup> Here Athenaeus (5.209d) is describing the ship of Hieron II (ca. 306–215 B.C.), the king of Syracuse; I retain Gulick's meaning here (Loeb edition 1967).

<sup>45</sup> See Patai 1998, 28–9 and references there.

<sup>46</sup> *Leviticus Rabba* 12.1; cf. *Esther Rabba* 5: "Like unto this ship that sleeps in the heart of the sea...Like unto this captain, who sits upon the top of the mast, swaying back and forth, back and forth;" see also Patai 1998, 105.

to his father's word and Judah's guidance. And the ship went crooked way and the seawaves turned it onto a rock, until it was broken up. Then Levi and Judah came down from the mast[head]s to save themselves, and my other brothers also escaped with their lives to shore.<sup>47</sup>

In both instances, D. Sperber cogently interprets the "top of the mast" and the "mast-[head]" as crow's nests, under the assumption that slumbering on a yardarm was unlikely, and that Judah was "sitting" aloft for some time.<sup>48</sup>

### Sounding Leads

While the mast-top helped provide navigational information from above the surface of the sea, the sounding lead, or lead plummet, provided valuable navigational information from below the surface. The lead is employed by seamen even today to gauge depth during the approach toward shoal waters (in depths shallower than 20 meters) and in restricted visibility. The line to which the lead is attached is marked or knotted at a standard interval, usually in fathoms, for ease of reading. As in modern times, most examples from the Roman period contain a recessed bottom into which tallow or some other sticky substance would have been placed to collect a sample of the seabed. When the sample was retrieved, the seafarer could then evaluate the potential holding ability of the ship's anchor or anchors on a particular type of bottom (sand, mud, rock), taking into account past experience, the size of the ship, the height of the seas, the strength of the wind, and other environmental factors.

Several models of riverine boats from the Middle Kingdom tomb of Meket-Rē'

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<sup>47</sup> *Testament of Naphtali* 2:10; Sperber 1986, 88–9.

<sup>48</sup> Sperber 1986, 57, 89.

include small figures standing at the bow and holding what appear to be sounding leads.<sup>49</sup> Each depicts the sounder just before the weight is to be thrown, with the weight dangling on a rope from one hand and the other hand held up as if grasping a coil. If the scale is approximate, these leads are approximately 40 cm tall and bell-shaped. Of the three Bronze Age shipwrecks that have been excavated so far in the Mediterranean, only the Uluburun ship carried anything resembling a sounding lead.<sup>50</sup> The weight is rectangular in cross section, with its edges and corners rounded from heavy use. Its height is 9.5 cm, and the dimensions of the base (8.2 cm x 5.3 cm) are larger than the truncated top (5.3 cm x 3.1 cm), near to which a hole (dia. 1.1 cm) was fashioned. The lack of a recessed base and the discovery of smaller net weights nearby argue against this identification, although, tomb models aside, with only one sample from the Bronze Age, it is difficult to determine just exactly how sounding leads of the period are supposed to appear. And while it is possible that the weight may have belonged to a seine net, lead weights from these usually come in even numbers, and yet only one large lead was found on the Uluburun ship.<sup>51</sup> In any event, the lead may have been used for both purposes.

Herodotus, our earliest written source for the use of the sounding lead, indicates that by the fifth century B.C. seafarers used sounding leads for both sounding and sampling: "For this is the nature of the land of Egypt: first, when you approach it by ship and are still a day's journey from land, if you lower a sounding line (καταπειρητήρη) you will bring up mud from a depth of eleven fathoms. This shows that the sediment

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<sup>49</sup> Winlock 1955, pls. 33, 34, 35, 36, 37, 40, 41, 42, and 43.

<sup>50</sup> Pulak 1988, 33 (catalog no. KW 267). In the Kenamun scene from Egyptian Thebes (see *supra* n. 28), a man in the bow of the Syro-Canaanite ship takes soundings with a sounding "staff."

<sup>51</sup> C. Pulak (personal communication).

from land reaches this far.”<sup>52</sup> His account suggests that seafarers frequenting the waters off the Delta were able to deduce, as a rule of thumb so to speak, the approximate distance from land by measuring the depth of water. And no doubt the brown, silt-laden color of the Nile outflow provided a general indicator of location during the approach to the region as well. To be sure, the dangers of navigation along the desolate coast of Egypt and Libya are manifest in the low-lying shoreline and the shallows that stretch far out to sea—and thus the need for such navigational markers as the Pharos and the Temple of Arsinoe/Aphrodite (see below) to direct ships toward navigable channels.

While the fourth-century B.C. Kyrenia ship excavated off Cyprus yielded no sounding leads, their large numbers found out of context and on Roman-era shipwrecks demonstrates their regular use, and hence loss, in antiquity.<sup>53</sup> Israeli waters in particular have produced a number of sounding leads, the shapes of which include hemispherical, conical and bell.<sup>54</sup> According to J.P. Oleson, they invariably feature a “tethering hole in a stout lug at the upper end, and a concave base designed to hold a lump of tallow.”<sup>55</sup> It was one of these that sailors let down into the Adriatic Sea during Paul’s journey to Rome in the first century: “When the fourteenth night came, while were being carried about in the Adriatic in the middle of the night, the sailors were suspicious that we were approaching some land. And having taken a sounding (βολίσαντες) they found us to be in 20 fathoms, and having moved on a little farther they sounded again and found 15

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<sup>52</sup> Hdt. 2.5.

<sup>53</sup> According to Oleson (1994, 29) a sounding lead was found aboard a shipwreck of ca. 500 B.C., as yet unpublished, near Gela, Sicily.

<sup>54</sup> Kapitän 1969–1971, 56; Oleson (1988, 30, 34–7) attempts a preliminary classification by shape.

<sup>55</sup> Oleson 1988, 30.



fathoms.”<sup>56</sup>

Despite its obvious utility for piloting and anchoring in shoal waters, the sounding lead *as a wayfinding instrument* held limited value. In conditions of poor visibility, at night or during a fog for example, a sounding might indicate potential danger if the water was becoming shallower, as in Paul’s story above, but it could not reveal geographic position. In any event, as far as we know, the ancient world produced no hydrographic charts with which to compare the sounding to obtain position-finding information. While it is tempting to credit the ancient seafarer with the ability to memorize depth information and relate it to a “mental” chart, evidence for such a notion, to my knowledge, does not exist.

### Viewing Tube

Two Talmudic passages speak of a viewing-tube (*sh’fofereth*, *mezupit*), with which Rabban Gamliel, a Jewish sage, used for sighting landmarks:

It was taught: Rabban Gamliel had a [viewing-] tube (*shefoferet*) [through] which he would look and sight two thousand cubits on land and in the other direction two thousand cubits at sea.<sup>57</sup>

Rabban Gamliel had a viewing-tube (*mezupit*) with which he would sight by eye two thousand cubits on the land-horizon (*le-mishor*), and he would sight

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<sup>56</sup> Acts 27:27–8.

<sup>57</sup> 8.1.2 B. ‘Ērubhin 43b; Sperber 1986, 107; Patai 1998, 37.

with it at sea.<sup>58</sup>

The nature of this tube is somewhat ambiguous. If it was an optical instrument capable of magnification, its invention predates the telescope, a Dutch invention, by some 1,400 years. D. Sperber suggests that the tube may have been employed as a means by which to gauge distance from land, as Jewish law required that seafarers observe certain rules of the Sabbath if they enter within two thousand cubits (3,000 feet) of the coast: "We may assume that Rabban Gamliel knew the coastline well, with its major landmarks. It is feasible that he had a tube of given length and diameter, perhaps fitted with two hairs across the aperture, which he placed to his eye and sighted against a given landmark—a tower, or a tree; if it filled up the aperture or the space between the two hairlines, he knew he was within the distance of two thousand cubits from it."<sup>59</sup> If this was its intended purpose, what are we to think of its other use—that of sighting in the "other direction...at sea"? Why would it have been important to know the distance to other ships? Or perhaps it was meant to sight ships at sea *from land*, their range being of some importance for whatever reason.

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<sup>58</sup> 8.1.3 B. 'Ērubhin 4.2, 21d 48; Sperber 1986, 107.

<sup>59</sup> Sperber 1986, 107–8; to calibrate the tube, however, would require knowing the distance between the two objects sighted on land and the actual distance from them (or a point mid-way between them) to the observer.

## EXTERNAL AIDS

### Seamarks

Unsuspected shallows and submerged reefs are the nightmare of every seafarer, and the Eastern Mediterranean, especially the Aegean, has its large share. The submerged reef near Yassiada, for instance, just west of the Bodrum peninsula off Turkey's Aegean coast, has claimed a fourth-century Roman ship, a seventh-century Byzantine ship, a sixteenth-century Ottoman ship, and a modern Levantine freighter, among others. In antiquity, however, we hear very little of marks erected in the water in such areas to serve as a warning to seafarers.<sup>60</sup> Most likely this lacuna is due to the fact that man-made structures in areas exposed to heavy seas could hardly withstand a Mediterranean winter, and thus these marks were somewhat rare. Nevertheless we hear of one instance in Herodotus in which such a mark was erected. In 480 B.C., ten ships belonging to the fleet of Xerxes, the Persian king bent on conquering Greece, were sailing southward between the Magnesian peninsula and the island of Skiathos when three of them "dashed themselves against a submerged reef called the Ant...The foreigners then brought a pillar of stone and set it on the reef; and presently, when they were free from their impediment, the fleet set out from Therma...It was Pammon of Skyros who pointed out the location of the reef, in the straight itself."<sup>61</sup> We may speculate that these "foreigners"—composed of Carians, Lycians, Cypriots, Phoenicians, and Egyptians—may have derived the idea for a seamark from the Levant, whose shoreline is also pock-marked with reefs both

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<sup>60</sup> Pausanias (4.35.1) describes a large, submerged rock at the entrance to the harbor of Methone (Mothone) in the south-west Peloponnese; despite its obvious hazard to seafarers, the author mentions no structures erected on or near it to serve as a warning.

<sup>61</sup> Hdt. 7.183.

submerged and awash.

Seamarks are also mentioned in Arrian's account of Nearchus, Alexander the Great's admiral, who explored the haunts of the Persian Gulf littoral in the fourth century B.C.:

[They] anchored at the mouth of a lake, full of fish, called Cataderbis, near here was a small island called Margastana. From there, they sailed out about sunrise and, in single file, passed the shallows, which were marked on either side by poles driven down, *just as in the strait between the island of Leucas and Acarnania* [located in the Ionian Sea] *signposts have been erected for those sailing by as a deterrence to running aground in the shallows.* But the shallows near Leucas are sandy and allow men to refloat their ships quickly; here, however, deep and viscous mud lies on both sides of the channel so that nothing could possibly get them off if they ran aground there.<sup>62</sup>

Stakes and pilings were commonplace as navigational aids in the adjacent Adriatic Sea, especially at the approaches to river mouths, near harbor entrances, and in the larger rivers. The Villanovans and the Etruscans, for example, had a penchant for major hydraulic works, including the construction of pilings mid-river for the demarcation of a navigable channel.<sup>63</sup> Infrequent references to seamarks aside, it is tempting to imagine coastal cities erecting seamarks in dangerous, though somewhat protected, areas in order to protect valuable shipping.

## Landmarks

Natural landmarks provided the most essential wayfinding clues in antiquity. That the

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<sup>62</sup> Arr. *Indica* 41.1–7 (my italics); the Persian Gulf, unlike the Mediterranean, has a well-documented history of seamarks erected as a warning of hazardous waters (see Khalilieh 1999, 219).

<sup>63</sup> Neilson 1999. Although veritabily far-removed in time, the sixteenth-century Turkish mapmaker Piri Reis noted that the approaches to Venice were marked with stakes so that seafarers would avoid shoal waters to either side (Soucek 1996, 141).

earliest navigators relied on the recognition of capes, headlands, island peaks, and conspicuous natural features as the most basic of wayfinding practices is evident in the *Epic of Gilgamesh*: “[A]le-wife, which is the way to Utnapishtim? [What are] its markers? Give me, O give me, its markers! If it is possible, the sea will I cross.”<sup>64</sup>

While Mesopotamian in origin, this early mention of wayfinding by the use of established markers could have applied equally to the Eastern Mediterranean. The more conspicuous the profiles of these terrestrial features were, the more likely that they would have been memorized by seafarers, whether coasting or making direct crossings. One early example of a mnemonic comes from Egypt: the Sixth-Dynasty cenotaph of Uni, a general under Pepi I, mentions rebels “in *Antelope-Nose*.” It then goes on to state:

I made a landing at the rear of the heights of the mountain range on the north of the land of the Sand-Dwellers. While a full half of this army was (still) on the road, I arrived, I caught them all, and every backslider among them was slain.<sup>65</sup>

“Antelope-Nose” was probably the Carmel ridge, a very prominent natural landmark for ships entering or departing the harbor at Haifa even today (fig. 4.11).<sup>66</sup> Similarly, the salient headland at Akra Krios in south-west Crete was known to Strabo as the “Ram’s Forehead,” or Criumetopon (Κριουῦ μέτωπον).<sup>67</sup>

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<sup>64</sup> Pritchard 1969, 91.

<sup>65</sup> Ibid. 228.

<sup>66</sup> Breasted 1988, 1:§315; Pritchard 1969, 228 nos. 10–11; Aharoni 1979, 135–7; Wachsmann 1998: 9–10; Defense Mapping Agency 1995, 31–2.

<sup>67</sup> Strab. 10.4.2; cf. Scylax 47, 68; see also Paus. 3.23.1 and Philostr. *VA* 4.34.

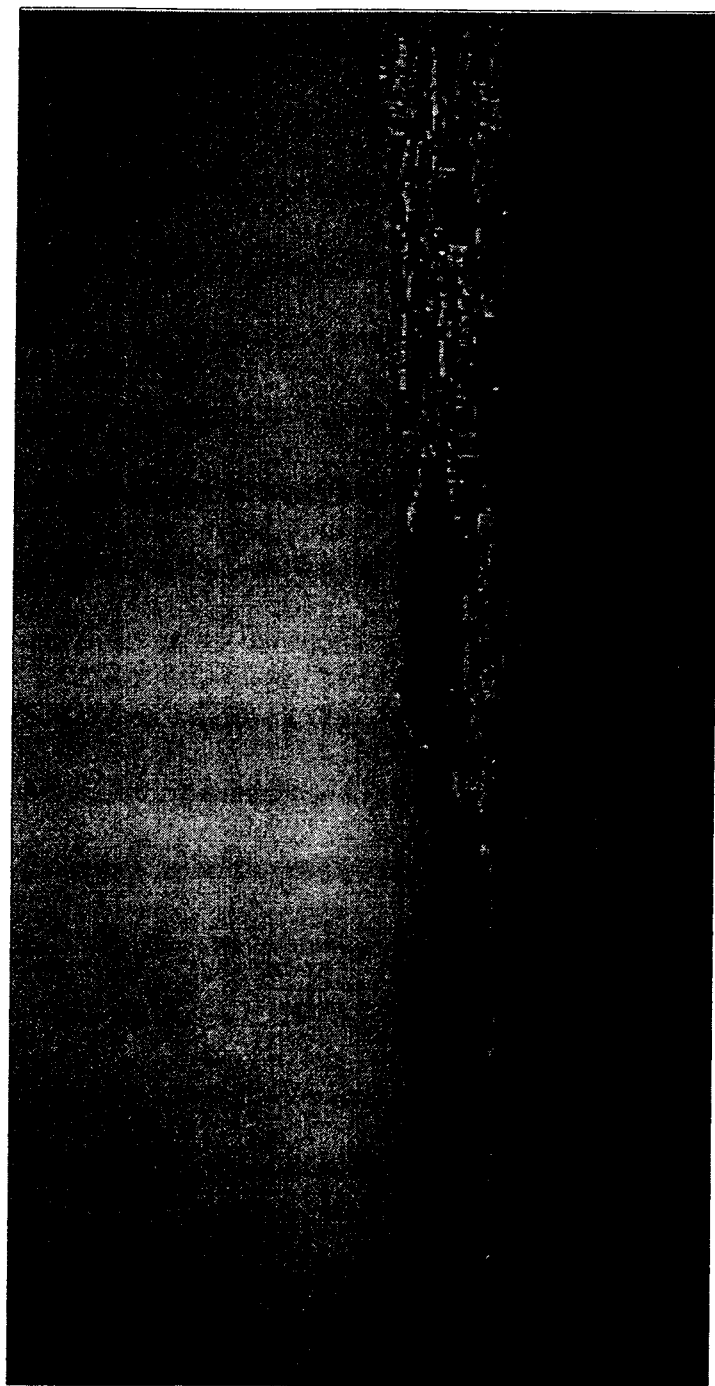


Fig. 4.11. The Carmel Ridge near modern-day Haifa, by far the most conspicuous landmark along the Phoenician coast. (Courtesy S. Wachsmann)

*The Aegean* (fig. 4.12). While allusions to prominent landmarks are missing in the evidence from the Bronze Age Aegean, we know from Homer's *Odyssey* that the recognition of natural landmarks as signposts did fall within the ken of seafarers. Cape Malea, at the southeastern tip of the Peloponnesus, was in antiquity perhaps the most notorious of all Eastern Mediterranean landmarks: "But when you round Malea, forget your home" was the ancient adage.<sup>68</sup> Winds are in constant conflict near this steep headland (the very tip is a cliff some 60 meters in height), and they produce large waves which are in turn augmented by rapid surface currents. Up until the modern era, sailing vessels transiting westward through this channel were often tied up here for days waiting for the winds to abate.<sup>69</sup> It was here also that Menalaus, Agamemnon, and Odysseus nearly met their end on the way home from Troy.<sup>70</sup>

Cape Sunium, whose cliff-face stands some 70 meters above sea-level at the very eastern tip of the Attic peninsula, constituted a convenient landmark for seafarers long before the gleaming white temple of Poseidon was erected there in the fifth century B.C.; the route home taken by Menalaus was marked first by "holy" Sunium, the "cape of Athens," then by Malea.<sup>71</sup>

The lofty island of Euboea was of some import to Homeric travelers. Here, at its southern end at Cape Geraestus, Nestor made a special stop and on the "altar of

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<sup>68</sup> Strab. 8.6.20. Even in the Roman era, rounding Cape Malea successfully was a feat of seamanship. An inscription on the tomb of a certain Flavius Zeuxis at Hierapolis (Asia Minor) states: "as a merchant he had rounded Cape Malea seventy-two times on voyages to Italy" (*IGRR* 4.841).

<sup>69</sup> Conlin (1998) examines strategies practiced by sailors, ancient and modern, to sail this area safely; Defense Mapping Agency 1995 (140) states that "violent squalls occur frequently near this headland, spilling over from the high mountains above it."

<sup>70</sup> Menalaus in Hom. *Od.* 3.286–90; Agamemnon in *Od.* 4.514–17; and Odysseus in *Od.* 9.80–1, 19.186–7; see also Hdt. 4.179.

<sup>71</sup> Hom. *Od.* 3.278, 287.

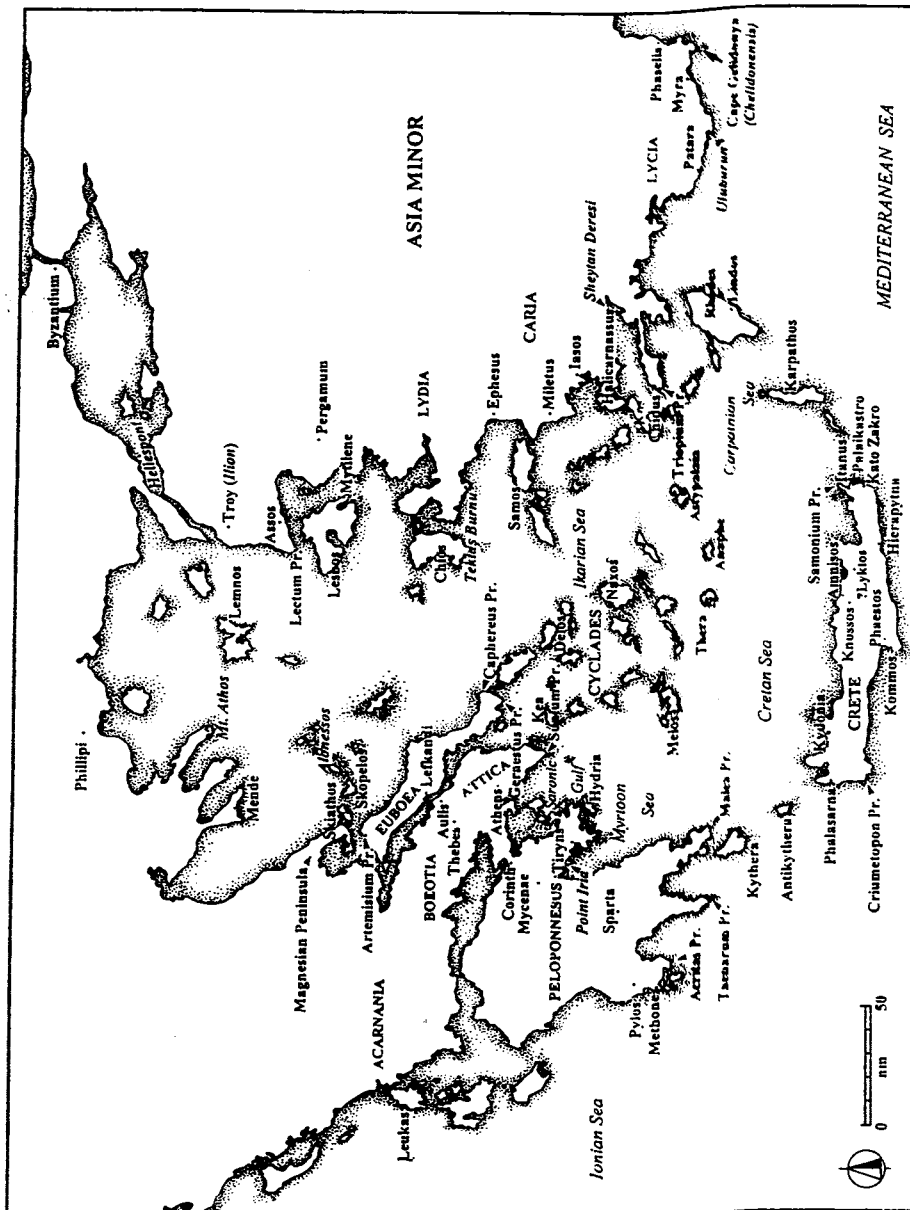


Fig. 4.12. Notable landmarks and man-made aids to navigation in the Aegean.



Poseidon, placed many thighs of bulls, having traversed the great sea."<sup>72</sup> For Nestor, this bold headland marked the beginning of *terra cognita* and the remaining route to Pylos was a coastal one.

The promontory at Caphereus, some 17 nautical miles northeast of Geraestus, was the scene of the popular story of Nauplius. Odysseus betrayed the son of Achaean, Palamedes, who was later stoned to death during the Trojan War. Seeking revenge, his father sailed to Caphereus and on the steepest heights burned fires in order to lure ships onto the sharp rocks at its base—forming, in effect, the first ancient lighthouse. The many references of this story in antiquity strongly suggest that beacon fires were commonly lit at night as a navigational aid, at least in some areas of the Aegean.<sup>73</sup> In fact, eighteenth-century corsairs were known to have erected a signal-station here to aid ships entering the Euboean Channel in the dark.<sup>74</sup>

While the capes at Sunium, Malea, and in southern Euboea were famous throughout antiquity as well-recognized signposts for seafarers, the Aegean hosted a number of other natural guides. In the north, at the very tip of the easternmost spur of the Chalcidice peninsula, sits Mt. Athos, a towering peak of marble 1,935 meters in height. Its lofty summit allowed it to be sighted easily from enormous distances and during summer it usually peeks above a ceiling of haze. It was noted in antiquity that its

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<sup>72</sup> Hom. *Od.* 3.176–9; Hecataeus *Frag.* S 59 C; Ar. *Eq.* 559–60; Scylax of Caryanda (58) refers to a temple of Poseidon at Geraestus and provides the distance (1350 stadia) between it and Euboea's northern tip, which was marked by a temple of Zeus; see also Ap. Rhod. *Argon.* 3.1244; Strab. 10.1.7.

<sup>73</sup> Eur. *Hel.* 1122–30; Dio Chrys. *Hunters of Euboea*; Prop. 4.114–18; on a discussion of the Nauplius story in ancient literature, see Ormerod 1997, 69–71, 77–9. Wachsmann (1998, 320) suggests that structures painted in the Miniature Fresco at Thera (Late Cycladic I) may have been lookout towers, erected as an “early warning system” against pirates.

<sup>74</sup> Ormerod (1997, 79) cites Chandler's *Travels in Asia Minor and Greece* (1764–1766).

shadow at sunset stretched as far as Lemnos, some 40 nautical miles distant.<sup>75</sup> The western coast of Asia Minor also hosted a number of prominent capes and headlands, each of which won notoriety among seafarers in antiquity. The Lectum promontory, for instance, just south of the Troad was, like Malea, known for the fierce winds swarming around its base; Agamemnon, we are told, established an altar to the Twelve Great Gods here.<sup>76</sup> And, according to Herodotus, a strong north wind forced a Hellenic fleet en route from Mycale to the Hellespont in 479 B.C. to find shelter in the lee of the promontory.<sup>77</sup>

Further south, the narrow and lengthy Cnidian peninsula thrusts westward into the Aegean and forms one of the most conspicuous landmarks in this region. The double-harbor town of Cnidus, founded as early as the Early Iron Age, sat at its western extremity on the Triopium promontory and offered an easily-recognizable stopping point for local and inter-regional seafarers. During the fifth century B.C., merchantmen from Egypt often touched here before heading into other areas of the Aegean; winter merchant shipping fell easy prey to oared warships in this area during the Peloponnesian War.<sup>78</sup>

Cape Sidero, known in antiquity as the Samonium promontory, occupies the eastern extremity of Crete and juts northeastward toward the island of Karpathos; one side of the cape is washed by the Cretan Sea, the other by the Mediterranean. Numerous rocky islets lay close offshore and, when not awash, peak only two or three meters above the swells. Numerous winds collide here during *la belle saison*, and perhaps this is why

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<sup>75</sup> Ap. Rhod. *Argon.* 1.601–6.

<sup>76</sup> Strab. 13.1.48.

<sup>77</sup> Hdt. 9.114.

<sup>78</sup> Thuc. 8.35; see above p. 35, notes 70–1.

we hear in the Linear B tablets of a "Priestess of the Winds" at nearby Itanus.<sup>79</sup> During the Minoan era, this cape must have seen much ship traffic transiting between the harbors and anchorages of Knossos and those of Kato Zakro and Palaikastro. Jason and the Argonauts touched here on their way home from Libya and found shelter in one of its many inlets and bays.<sup>80</sup> During the Greek and Roman era the promontory was a jump-off point for the open-sea voyage to and from Egypt.<sup>81</sup> Paul's took note of this cape on the way to Rome from Caesarea.<sup>82</sup>

*The Asia Minor Coast, the Levant, and Egypt* (fig. 4.13). Despite the rocky and elevated coastline of southern Asia Minor and the Syrian coast, very few landmarks used by seafarers are specified in ancient literature. Of note are the five Chelidonian isles that stand seaward from modern-day Cape Gelidonya on the Lycian coast. They are known in Turkish today as *Beş Adalar* (Five Islands). Not long after a Late Bronze Age ship ran out of sea near here ca. 1200 B.C., this cape came to be known as the Hiera (Holy) Promontory, thus suggesting a religious reverence for it on the part of Aegean seafarers. Its appellation may be explained by the presence of good water along this otherwise arid and hostile shore.<sup>83</sup> The location of these isles within two or three nautical miles from an already projecting shore encouraged their use by seafarers as a benchmark of progress eastward or westward. They were sufficiently well-known to Aegean sailors so as to

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<sup>79</sup> See p. 7, n. 1.

<sup>80</sup> Ap. Rhod. *Argon.* 4.1689–93.

<sup>81</sup> Strab. 10.4.5.

<sup>82</sup> Acts 27:7

<sup>83</sup> Bass 1967, 164 and n. 10; Pliny (*HN* 5.35) maintained that these isles were "extremely dangerous to mariners (*pestiferae navigantibus*)."

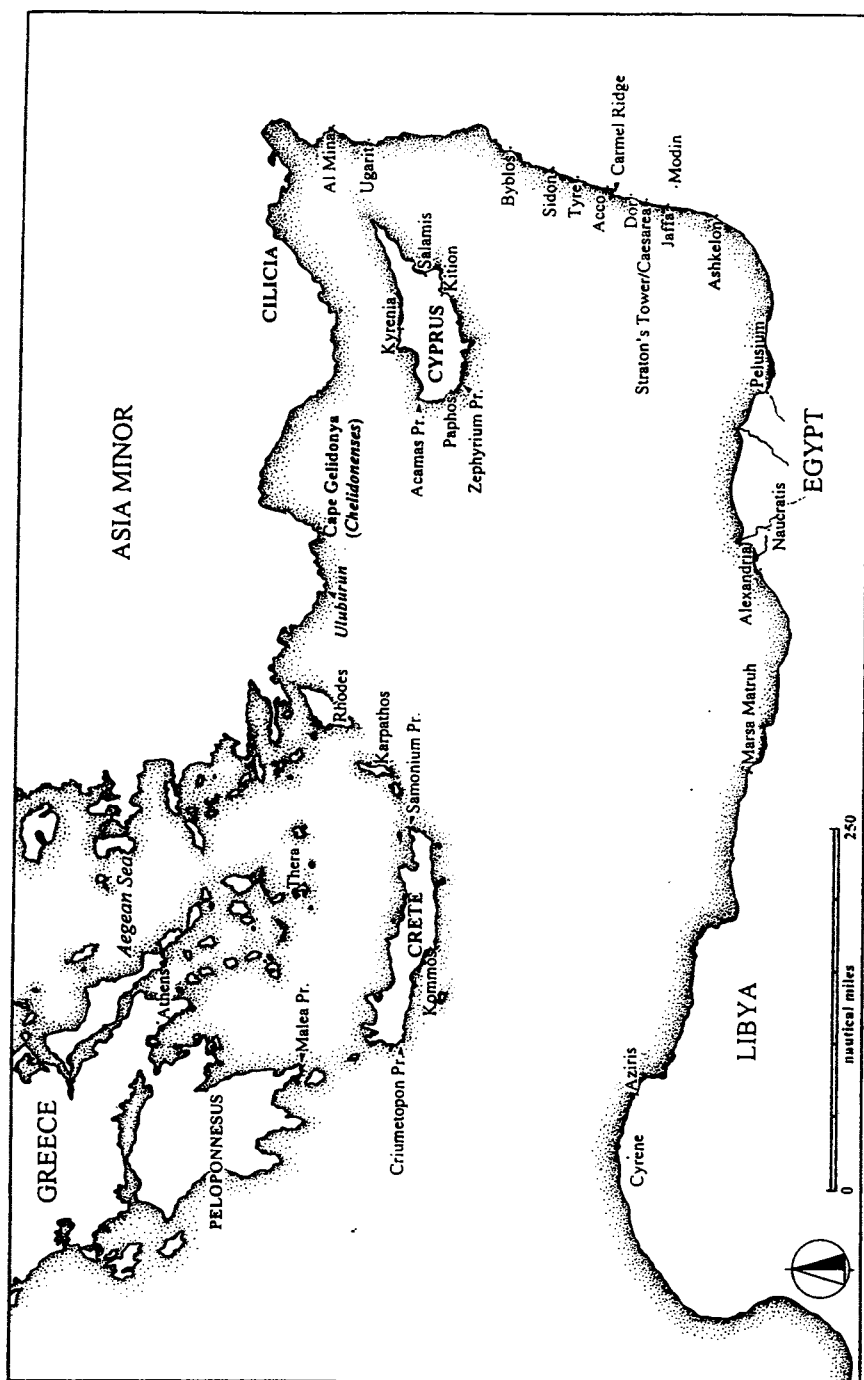


Fig. 4.13. Notable landmarks and made-made aids to navigation along the coast of Asia Minor, the Levant, and Egypt.

serve as markers indicating the easternmost extent of Greek hegemony after the Persian Wars of the fifth century B.C.<sup>84</sup> Before or during the first century A.D., the cape and its isles provided a convenient back-bearing for ships heading to the Egyptian port at Canopus, which, as Strabo points out correctly, lies directly to the south on the same meridian.<sup>85</sup> Lucian's *Isis* touched here in the second century A.D. on its voyage between Pharos and Rome.<sup>86</sup>

The coastline between the Carmel range and the Nile Delta is a low lying one. On occasion its horizon is broken here and there with plateaus and spurs stretching from the hinterland to the coast. Generally speaking, however, the shoreline is visible from seaward only within two or three nautical miles, and thus navigation along this coast was, as a rule, hazardous. Diodorus Siculus, a first-century B.C. writer, notes:

...a sandbank extends along the whole length of Egypt, not discernible to the unacquainted approaching by sea. Consequently, those who think that they have escaped the menace of the sea, and in their ignorance are glad to turn toward the shore, suddenly run the ship aground; and some, unable to see land beforehand on account of very low-lying ground, are barely aware that they are being cast ashore when it happens, some of them in swampy and marshy places, other in desert areas.<sup>87</sup>

Only when man-made aids to navigation were erected after the fourth century B.C. could seafarers rely on specific marks visible from several miles offshore to gauge their voyage.

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<sup>84</sup> Dem. 19.273; see also Plut. *Cim.* 12.2, 13.5.

<sup>85</sup> Strab. 14.3.8.

<sup>86</sup> Lucian *Nav.* 7–9; see also Strab. 14.6.2 and above pp. 65–6.

<sup>87</sup> Diod. Sic. 1.31.3–5; discussed in Altman 1988, 231–3.

## Aids to Navigation

*The Aegean* (see fig. 4.12). When important sea lanes were devoid of natural and conspicuous landmarks, man-made structures discernible from ships at sea were sometimes erected in key areas to serve the same purpose. The Greek epics reveal that prominent funerary mounds (*tumuli*) were a common sight along shores adjacent to well-trafficked sea-lanes.<sup>88</sup> The Hellespont and Dardanelles certainly have their share of such mounds, most of which are named after those slain in the Trojan War. According to Homer, Argive spearmen “erected a huge magnificent tomb,...on a projecting headland beside the broad Hellespont, that it might be seen from far at sea both by men that now are and that shall come hereafter.”<sup>89</sup> In Egypt’s Delta, Menalaus erected such a mound for his dead brother, Agamemnon.<sup>90</sup> On Circe’s island, Elpenor, one of Odysseus’s crewmen, rated a funeral mound built “where the headland stretches out the farthest.”<sup>91</sup> While coasting along the Magnesian headland in Thessaly, Jason and his crew spotted the prominent tomb of Dolops and made a special stop there.<sup>92</sup>

Seafarers of the Adriatic, Ionian and Aegean Seas during and after the sixth century B.C. had the added advantage of highly-visible navigational aids in the form of shrines and temples erected on promontories and headlands sacred to seafarers. E.

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<sup>88</sup> The practice of erecting funerary mounds on headlands as aids to navigation finds a parallel in the Beowulf saga from Scandinavia. In Swanton’s (1978, 169) translation, we read: “...Now that I have paid for the hoard of treasures with the find mound after the pyre on the headland by the sea; it shall tower high on Whale’s Cape as a remembrance to my people, so that seafarers when they drive their tall ships from afar across the mists of the flood will thereafter call it Beowulf’s Barrow.”

<sup>89</sup> Hom. *Od.* 24.80–4; see also Ap. Rhod. *Argon.* 2.841–53.

<sup>90</sup> Hom. *Od.* 4.655.

<sup>91</sup> Hom. *Od.* 12.11.

<sup>92</sup> Ap. Rhod. *Argon.* 1.585. Pausanias (9.11.3) describes one such mound on the island of Ikaros, “on a headland sticking out into the Aegean.”

Semple has documented some 175 promontory shrines stretching from one end of the Mediterranean to the other.<sup>93</sup> In the Eastern Mediterranean, the best surviving examples are Poseidon's aforementioned temple at Sunium and his shrine on Euboea's Cape Geraestus. Moreover, Strabo and Pausanias mentions Poseidon's grove and temple at Taenarum, the promontory at the tip of the south-central Peloponnese, and at Antikyra in the Corinthian Gulf.<sup>94</sup>

Several other notable headlands boasted temples dedicated to other gods associated with navigation: Apollo, according to the Homeric hymn, was dear to headlands.<sup>95</sup> His haunts included the Triopium promontory, where he had a temple as early as the fifth century B.C.,<sup>96</sup> and the treacherous southern tip of Leukas in the Ionian Sea.<sup>97</sup> Likewise was Aphrodite and Artemis associated with voyaging and headlands: Aphrodite's epithets include "Giver of fair voyages," "She who keeps lookout from the headlands," and "Aphrodite of the Heights." Her temples sat near to Apollo's at Cnidus, and, as "Aphrodite of the Harbor," greeted ships heading for Aegina's seaport.<sup>98</sup> Artemis was dear to the Argonauts and presided over their Euboean haunts.<sup>99</sup> Her temple at Artemisium, near Euboea's northern tip, served as a highly-visible rallying point for Greek warships during the second Persian war.<sup>100</sup> At the western end of Crete,

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<sup>93</sup> Semple 1927, 355.

<sup>94</sup> Strab. 8.5.1; Paus. 3.25.4, 10.36.4.

<sup>95</sup> *Hymn. Hom. Ap.* 140–5.

<sup>96</sup> Thuc. 8.35.

<sup>97</sup> Strab. 10.2.8–9; on Leucas, see *supra* n. 62.

<sup>98</sup> Paus. 1.1.3, 2.29.6; Semple 1927, 367–8; Photius (167) mentions a safe-haven named "Aphrodite's Anchorage" off the east African coast.

<sup>99</sup> Ap. Rhod. *Argon.* 1.568–72.

<sup>100</sup> Hdt. 7.176, 7.183, 7.194.

a temple of Artemis dating to the Classical/Hellenistic period was built atop Phalasarna's acropolis, Cape Koutri (height 90 meters).<sup>101</sup> The cape itself protected and concealed the entrance to a well fortified harbor, one suspected of being a pirate base.<sup>102</sup> According to its excavator, the temples "would have been a mark to returning vessels."<sup>103</sup> The cape, along with its southern neighbor at Akra Krios (ancient Criumetopon), would have been an excellent signpost for ships transiting between Libya and Kythera, a route employed during Thucydides' time.<sup>104</sup>

Nor was Athena excluded. Her sanctuary, dedicated as Athena "Mistress of the winds," occupied a headland near Methone (or Mothone) on the Acritas promontory in the southwest Peloponnese. Here the strong but erratic winds of the Adriatic have been known to wrestle with the *Lips/Africus* to the detriment of local seafarers.<sup>105</sup> At Hermione in the southern Argolis, a temple of Athena "Guardian of the Anchorage" stood on a rocky cape as a landmark for seamen.<sup>106</sup> Early in the third century A.D. we hear of her temple adorning the noted promontory at Cape Sidero (Samonium promontory).<sup>107</sup>

*The Levantine Coast* (see fig. 4.13). Purpose-made navigational aids along the Levantine coast were, evidently, a rarity in the Bronze and Iron Ages. When close

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<sup>101</sup> Hadjidaki 1988.

<sup>102</sup> Cf. de Souza 1999, 59.

<sup>103</sup> Hadjidaki 1992, 244.

<sup>104</sup> Thuc. 4.53; see supra n. 58.

<sup>105</sup> Paus. 4.35.8.

<sup>106</sup> Ibid. 2.34.8–10.

<sup>107</sup> Müller 1855–1861.



inshore, navigators undoubtedly utilized as signposts the walled cities situated on or near the shore between Ugarit and Gaza—Arvad, Byblos, Sidon, Tyre, Acco, Dor, Jaffa, and Ashkelon—their high reliefs discernible on the horizon and their silhouettes distinguishable from one another. Mt. Carmel near Haifa, already a prominent natural landmark for shipping, boasted religious structures in view of the sea as early as the ninth century B.C.<sup>108</sup>

We first hear of Straton's tower, a coastal city with a minor headland 50 kilometers north of Tel Aviv, in the fourth century B.C.<sup>109</sup> Conveniently located on the busy route between Egypt and Phoenicia, the city takes its name from its large tower, which, presumably, acted as an aid to navigation designed to draw ships toward its two small harbors.<sup>110</sup> Later, at the end of the first century B.C., Herod the Great would graft his new city, Caesarea (after Caesar Augustus), onto the dilapidated foundations of Straton's Tower.<sup>111</sup> His builders constructed an artificial breakwater incorporating the minor headland on the south and extended it seaward in an arc toward the north; a northern breakwater perpendicular to shore, the end of which formed the harbor's entrance, finished the enclosure. Atop both arms of the harbor stretched large stone walls with evenly spaced towers, "the largest and most beautiful of which was called Drusium, from Drusus, the son-in-law to Caesar."<sup>112</sup> While Josephus grants few

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<sup>108</sup> *1 Kings* 18:20–45, esp. 32 and 43–4; see above p. 117 and fig. 4.11; H. Frost (1991, 355; 1998, 74–5) suggests that Ugarit's high acropolis (two kilometers inland), atop which sat two large temples, would have been a highly visible landmark for approaching seafarers during the Late Bronze Age.

<sup>109</sup> *P. Mich. Zen.* 70; Abel 1923, 410–11; Raban 1992, 7–22.

<sup>110</sup> Holum et al. 1988, 27–8.

<sup>111</sup> *BJ* 1.21.5–8. Both the harbor and the city of Caesarea have been under continuous excavation since the 1970s (see Holum et al. 1988; Raban 1989).

<sup>112</sup> *BJ* 1.21.6.

details, we may presume that this largest tower, located at the terminus of the southern breakwater at the harbor's mouth, was erected on the model of the Pharos, on whose peak a flame was kept alight as a beacon for ships at sea.

As in the Aegean, the occasional funeral mound acts as a prominent landmark for sailors. For instance, in the apocryphal book *I Maccabees*, from the second century B.C., we are told that a general erected for his fallen brother a mausoleum composed of "seven pyramids, arranged in pairs...he surrounded them with tall columns surmounted with trophies of armor as a perpetual memorial, and with carved ships alongside the trophies, plainly visible to those at sea."<sup>113</sup> This tomb complex was located near Modin on a high ridge some 26 kilometers from shore. Eusebius noted that tourists still visited the structure in his day (fourth century A.D.).<sup>114</sup>

*Egypt* (fig. 4.14). Ships approaching Egypt's Delta from seaward were confronted with numerous channels, some sufficiently wide and deep to allow communication upstream with the main cities of the Nile, others shallow cull-de-sacs flanked by a multitude of marshy islands. And although evidence of Bronze Age ports along the Delta's Mediterranean shore, or even a short distance inland, is lacking, the major channels (Canopic and Pelusiac channels for instance) must have seen much maritime traffic. How ships of the period dealt with these dangers in any systematic way is difficult to determine.

Evidence of attempts made to address the problems of safe pilotage begins to

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<sup>113</sup> *I Macc.* 13:28–30.

<sup>114</sup> Eus. *Onom.* 703; see also Stieglitz 1997, 303.

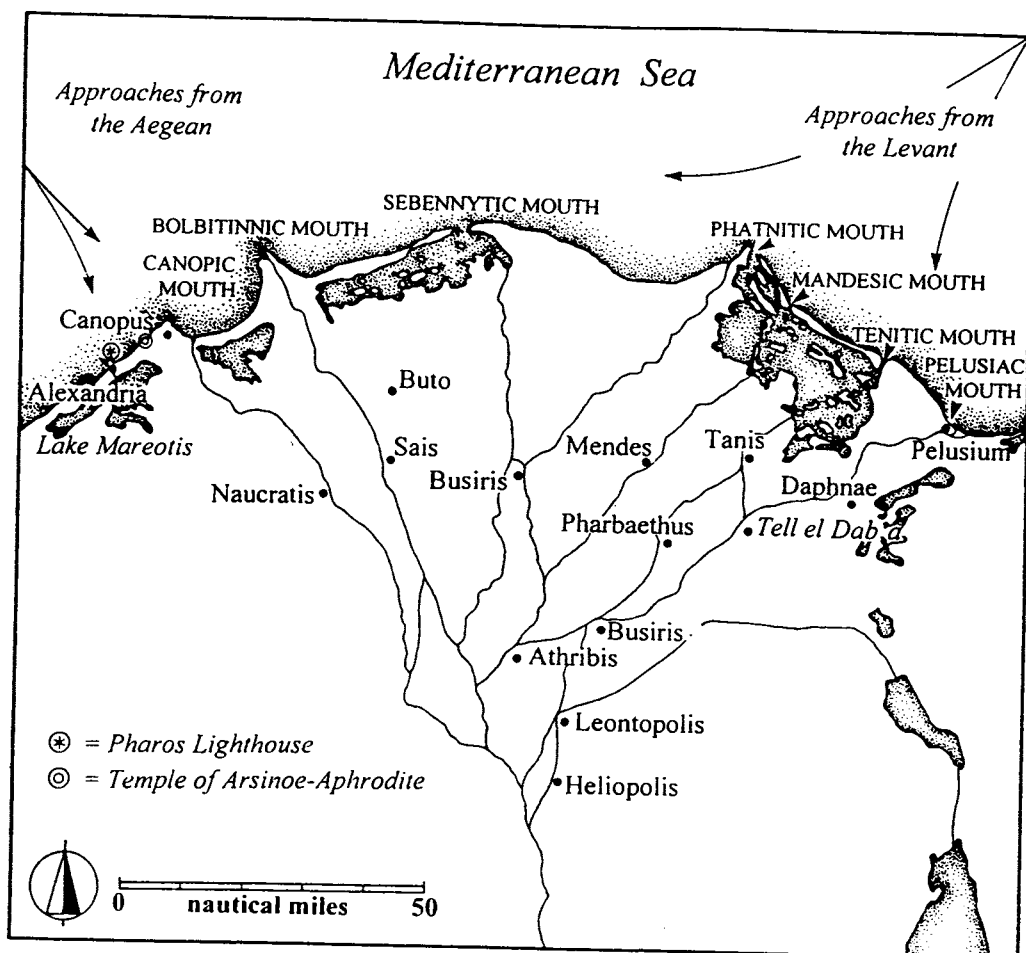


Fig. 4.14. The Nile Delta and its principal sites.

appear in the fifth century B.C., if not earlier. Herodotus defined the Delta's seashore as reaching from the "watchtower of Perseus" (σκοπή Περσέος), the western boundary, to the salting factories of Pelusium, the eastern boundary.<sup>115</sup> Although he provides no further details of its specific use or location, the so-called watchtower may have been erected at the Canopic mouth, which clearly defines the western edge of the Delta. Here it would have conveniently served as a channel guide for Aegean ships bound for Naucratis, the Greek port situated some 50 kilometers upstream.<sup>116</sup> Herodotus tells us also that a temple of Heracles, old even in his time, sat near the Canopic mouth.<sup>117</sup> Herakles was considered a god of travelers, and the placement of his temple here makes sense if the Canopic mouth was the first stop for foreign visitors.<sup>118</sup> Indeed, at least in Herodotus's day, incoming ships must have been compelled to stop here, for we also read of a "Guardian of the Mouth" (στόματος φύλαξ) whose occupation must have involved the levying of tolls.<sup>119</sup> Absent in Herodotus' account is a funeral mound dedicated to the helmsman of Menalaus, a certain Canopus (purportedly the settlement's namesake), who perished on the way home to Sparta after the Trojan War.<sup>120</sup>

Approximately fifty years after the foundation of Alexandria in 332 B.C., just

<sup>115</sup> Hdt. 2.15.

<sup>116</sup> See above pp. 63–4.

<sup>117</sup> Hdt. 2.113; this temple had minor associations with the myth of Helen and Paris and their misadventures in Egypt after her abduction.

<sup>118</sup> Herakleion, the gateway city that presumably arose around Herakles's temple, is believed to have been found recently four nautical miles offshore of Alexandria in 10 meters of water; the ancient mouth of the Canopic branch of the Nile was located nearby (see Jaroff 2000, 59).

<sup>119</sup> Hdt. 2.113. According to the *Ahiqar* scroll from Elephantine (475 B.C.), Ionian and Phoenician merchant ships were required to pay a duty and tithe respectively on their cargos. If the final destination was upstream at Memphis (as Porten and Yardeni [1993, xx] suggest), then the Canopic mouth would have served as one logical place to intercept Ionian ships approaching from the Aegean.

<sup>120</sup> Scylax 106; cf. Hom. *Od.* 4.655; an Egyptian etymology for "Canopus" has been proposed by M. Malaise (1999).

west of the Canopic mouth, ships approaching the western Nile Delta encountered two additional aids to navigation: the Pharos lighthouse and the temple of Queen Arsinoe-Aphrodite.<sup>121</sup> The former aid, perhaps the first of its kind, was erected under Ptolemy I Soter and his successor Ptolemy II Philadelphus on an island before the port of Alexandria. Standing some 100 meters in height, its primary purpose was to act as a beacon for mariners making the dangerous approach to the harbor.<sup>122</sup> Intensified, presumably, by burnished bronze mirrors, the flame atop the structure was fueled by resinous wood, or perhaps dried animal dung. If we apply the rules governing geographic range (see above), a lookout at sea, in optimum visibility, could sight the tower from a 7-meter high mast-top at 27 nautical miles—perhaps further at night if the flame had sufficient luminosity.<sup>123</sup> This nearly accords with Josephus's description, for he notes that the light was visible from seaward at 300 stadia, or 34.5 nautical miles.<sup>124</sup>

Poseidippus describes the latter aid, erected by Ptolemy II Philadelphus for his wife Arsinoe:

Midway between the shores of Pharos and the mouth of the Canopus I have my place surrounded by waves, this windy breakwater of sheep-rich Libya stretching towards Italy's western wind. Here Callicrates built me and named me the temple of Arsinoe-Aphrodite. Come to the one that will be called Zephyritis-Aphrodite, you pure daughters of Hellenes. Come too you men who work on the seas. For our captain has built this

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<sup>121</sup> Strab. 17.1.6; Pliny *HN* 36.18; Page 1970, 444–9.

<sup>122</sup> Poseidippus (*Epigr.* a) mentions the difficulty mariners faced in navigating “Bull’s Horn,” one of the narrow and shallow channels leading to the port. The Pharos lighthouse (as Strab. 17.1.6 indicates) provided the necessary bearing to manage this and other dangerous waterways.

<sup>123</sup> Clayton (1988, 147) asserts that the light was needed more during the day than at night “since sailing at night was avoided in antiquity.” Yet, beside the fact that daylight severely refracts light of any candlepower, Pliny remarks: “The only danger is, that when the fires are thus kept burning *without intermission* (my italics), they may be mistaken for stars, the flames having very much that appearance at a distance.” For a discussion of the frequency of nocturnal navigation, see above pp. 166–7, esp. n. 54.

<sup>124</sup> Jos. *BJ* 4.5.610–15.

temple as a safe harbor from all the waves.<sup>125</sup>

Protected from the north-west winds, this area made an ideal landmark and haven for ships approaching from the Levantine shores and bound for Alexandria, or for those from Cyprus or the Aegean who misjudged the longitude and made landfall too far to the east. The temple also stood witness to the mercantile traffic exiting the Canopic mouth and headed for the large entrepot under Pharos. The two aids, used concurrently, must have made for highly accurate piloting in the area.

The archaeological, iconographic, and literary record provide ample testimony of ancient navigational aids, both aboard ship and externally. While we can only make inferences on the use of shore-sighting birds from the Biblical account, Late Bronze Age iconography, and ethnographic parallels, there appears to have been a tradition of acquiring positional information from the sighting and behavior of seabirds. The mast-top made its debut in the Late Bronze Age and continued in use into the Iron Age and later; the high perch afforded a bird's eye view not only of the extended horizon but also of the waters immediately before the ship, thus making it the most important navigational and piloting "instrument" aboard ship in antiquity. The quantity of ancient sounding leads found throughout the Mediterranean attests its importance also, not so much as an instrument designed to reveal geographic position (although a familiarity of sea-bottom materials may have offered wayfinding clues), but rather to indicate the approach of shoal water in conditions of limited visibility, such as at night or during

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<sup>125</sup> Poseidippus *Epigr.* b; see also Strab. 17.1.16.

thick haze or fog.

The literary and archaeological record also reveal the employment of external aids to navigation that provided the necessary positional clues required for safe piloting and landfall. While evidence for seamarks is rare, that for landmarks is ample. Salient headlands and island peaks recognizable from sea provided the most basic of wayfinding clues. Templed promontories and other man-made aids provided what nature could not—identifiable signposts along existent routes. By the third century B.C., lighthouses and towers begin to appear, inspired by the construction of the Pharos lighthouse in Alexandria.

## CHAPTER V

## NIGHT-TIME NAVIGATION AND CELESTIAL AIDS

## INTRODUCTION

In Chapters III and IV we discussed the existence and frequency of open-sea transits in antiquity. Voyages often took place after night-fall, whether for tactical reasons, to catch diurnal winds, or simply because certain routes required more than a day's sail to complete. In the absence of daytime references, the actual *practice* of night-time sailing infers a certain degree of knowledge of the night sky, and in fact a plurality of the cultures that ring the shores of the Eastern Mediterranean held a curiosity of the heavens. In Minoan Crete, for instance, *Arcturus* and the Moon were venerated; Cycladic and Helladic art featured icons of celestial bodies and constellations; Egyptian priests from the Old Kingdom maintained their calendars according to Sothic cycles (risings and settings of the star *Sirius*); and Levantine cultures benefitted from Mesopotamian astronomical traditions.<sup>1</sup> For the most part, these cultures employed the rising and setting episodes of certain stars for the maintenance of religious and agricultural calendars. Whether ancient seafarers themselves attained a high degree of astronomical knowledge or were rather the recipients of such knowledge—acquired and maintained by a religious caste—is a complex, indeed a seemingly unanswerable, question.<sup>2</sup> However,

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<sup>1</sup> See for example Evans 1998; Μπαρδάνης 1988–1989; Dicks 1970; Clagget 1995.

<sup>2</sup> Helms 1988 provides numerous examples of cultures that hoard specialized knowledge for prestige and political reasons.



in subsequent history it can be demonstrated that navigators were often in the vanguard of attaining practical astronomical knowledge. Witness, for example, the navigators of Polynesia, or the Portuguese of the fifteen and sixteenth centuries.<sup>3</sup> They, too, shared the need for accurate prediction and location.

In this chapter I begin with the essentials of astronomy, to be followed by a brief but essential examination of astronomical knowledge among ancient Eastern Mediterranean cultures. Only in this framework can we place the ancient navigator and examine his craft. Where evidence from archaeology and ancient texts fall short of answering specific questions, I explore ethnographic parallels from Polynesia and Northern Europe, whose archipelagos and transiting distances mirror closely those of the Mediterranean.

## ESSENTIALS OF ASTRONOMY

The earth revolves on its axis once every twenty-four hours in a west-to-east motion, counter clockwise when viewed from above the north pole (fig. 5.1). It completes one revolution around the sun in a little over 365 days. The celestial coordinate system used by astronomers today extends earth's geographic coordinate system into space, so that we have a north pole and a north celestial pole (represented today by *Polaris*—a *Ursae Minoris*), and a south pole and a south celestial pole. A projection of Earth's equator constitutes the celestial equator, while the ecliptic is a line (tilted a maximum of) 23.5° from the celestial equator; it marks the annual path of the sun on earth's celestial

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<sup>3</sup> Polynesian navigators were the astronomers of their day (see Lewis 1994, 119–20); on Portuguese navigators, see Boxer 1991.

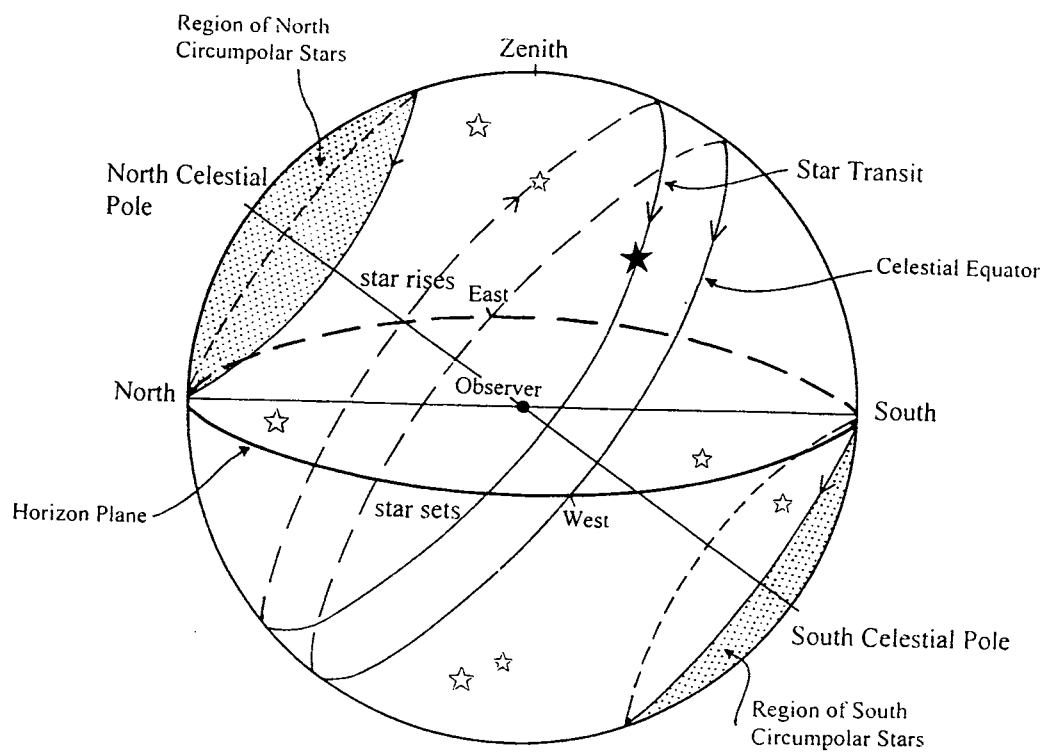


Fig. 5.1. The celestial sphere. (Adapted from Roy 1984, 172 fig. 1)

sphere and accommodates the zodiacal constellations, spaced roughly  $30^\circ$  apart, as well as most of the planets in our solar system.<sup>4</sup> The ecliptic is also indicated by the sun's ever-changing rising and setting azimuth as the seasons progress: at the summer solstice, the longest day of the year (21 June), the sun reaches its northernmost limit at sunrise and sunset; and on the winter solstice (21 December), the shortest day of the year, the sun reaches its southernmost limit. The sun's midday position is subject to the same cycle, so that in mid-winter it is low in the southern sky and high in the southern sky toward summer. In between these dates occur two twenty-four hour periods, the equinoxes ("equal nights"), during which night and day are of almost equal duration: the vernal equinox occurs on 21 March, the autumnal equinox on 22 September. Our seasons are fixed by these four dates.

In the night sky of northern latitudes, then, are three groups of stars: the zodiacal constellations (*Taurus, Gemini, Cancer, et al.*); the circumpolar constellations (*Ursae Major* and *Minor*); and those on either side of the zodiac (*Canes Major* and *Minor, Orion, Hercules, Cygnus, etc.*). Ancient seafarers found circumpolar and other non-zodiacal constellations of some import. Perhaps the Bear (Greek *Arctos*) is mentioned the most often in seafaring contexts. It went by many names in antiquity, just as it does today. Besides *Arctos*, it was known to the Greeks also as *Helice* (or *Helix*), to the Romans as *Ursa Major*. In English it is variously known as the Bear, Great Bear, the Wain, and the Big Dipper.<sup>5</sup> Little (or Lesser) Bear was known to the Greeks as

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<sup>4</sup> Eclipses, as the word connotes, take place only when the sun and moon are on this line.

<sup>5</sup> Today, as in antiquity, the Big Dipper is actually an asterism within the larger constellation of *Ursa Major*.

*Cynosura* and to the Romans as *Ursa Minor*, the sibling of *Ursa Major*. In Mediterranean latitudes (between  $32^\circ$  and  $40^\circ$  North), these two constellations never rise or set but revolve around the celestial null point in a counter-clockwise direction. To the casual observer, this phenomenon was perhaps the easiest to observe, primarily because most stars rise on the eastern horizon and trace an arc across the sky until they set directly opposite on the western horizon, appearing some time later again on the eastern horizon.

The star that occupies true celestial north varies over the millennia due to precession, a phenomenon which is caused by a very slow wobble in earth's rotation, much like a child's top begins to wobble as it slows its spinning: Earth's center of gravity does not coincide with its center of rotation, the equator, due mostly to the gravitational bulge at earth's midriff, but also because the earth's axis is tilted  $23.5^\circ$  from the ecliptic. The wobble is further exacerbated by Earth's moon, which causes the precessional wobble to flutter slightly, a phenomenon known as nutation (fig. 5.2). Accordingly, the north celestial pole, as a celestial coordinate (i.e. as seen from earth), describes a circle in the north sky approximately every 26,000 years. Every so often a prominent star wanders in to take up position as the "north star." *Polaris* ( $\alpha$  *Ursae Minoris*) occupies this position today. The result of precession is a uniform shift in the position of the constellations as viewed from earth. In the Early Bronze Age (ca. 2500 B.C.), for example, *Thuban* ( $\alpha$  *Draconis*) of magnitude 3.65 occupied the residence of true celestial north, although a very prominent *Kochab* ( $\beta$  *Ursae Minoris*) of magnitude

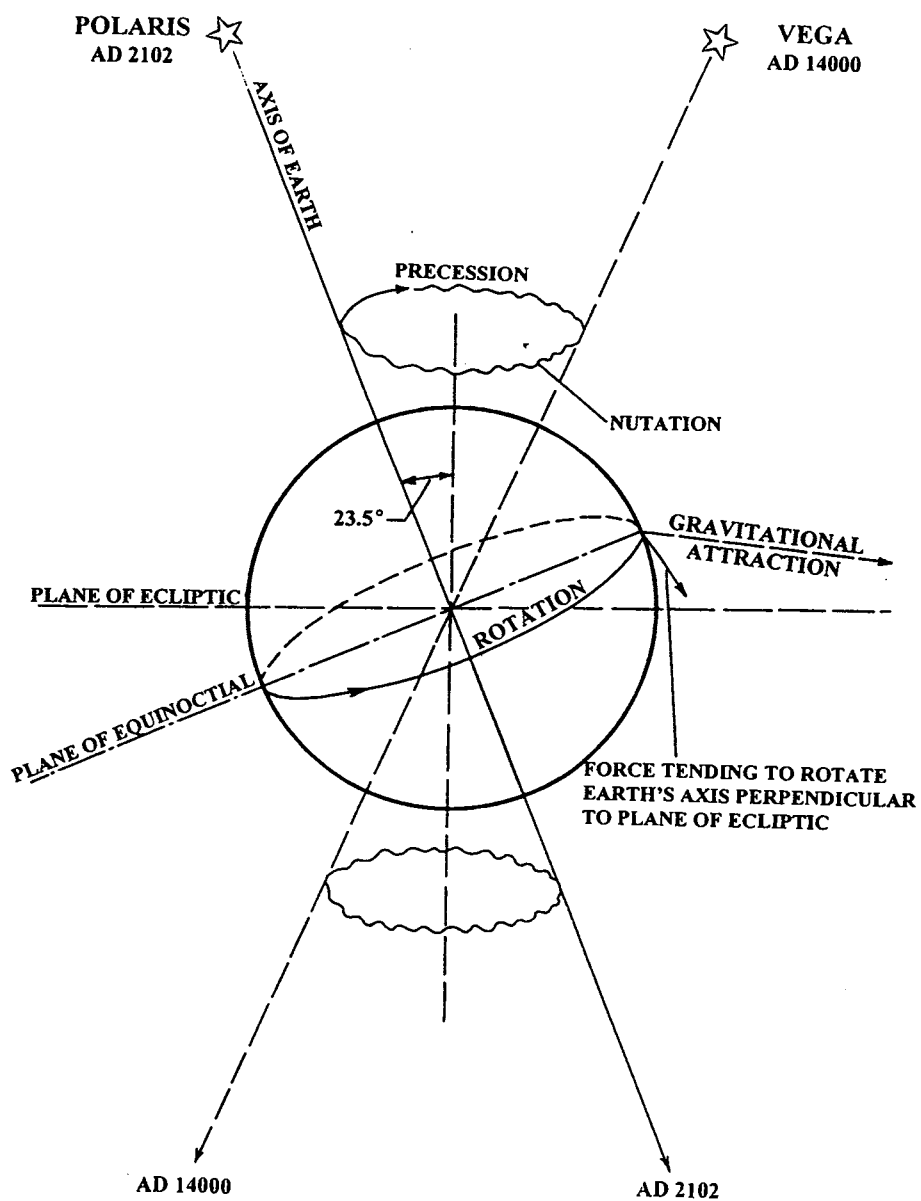


Fig. 5.2. Precession and nutation. (After Bowditch 1984, 379 fig. 1419d)

2.08 circled only six degrees out (fig. 5.3).<sup>6</sup> By the Middle Bronze Age, *Thuban* had shifted away from the north celestial pole, and *Kochab* slid closer, such that by 1700 B.C. these two stars rotated equidistant from each other around the null-point, *Kochab* being more conspicuous than *Thuban*. At the end of the Late Bronze Age, their positions had not changed perceptibly, although *Kochab* remained the brightest indicator of the north celestial pole, and did so until ca. A.D. 1300 when *Polaris* took over as the closest prominent star (fig. 5.4).<sup>7</sup>

### ANCIENT ASTRONOMICAL KNOWLEDGE IN SEAFARING CONTEXTS

After the eighth century B.C., details of Greek and Roman navigational techniques, however incomplete, begin to appear in texts. Greek astronomers of the Classical and Hellenistic periods eventually mapped the skies of the northern hemisphere according to scientific principles; and even a treatise on astronomy as it relates to seafaring was penned in the third century B.C. by Aratus in his work *Phaenomena*, which has survived in its entirety. Ptolemy's second-century *Almagest* on astronomy and his *Geography* became indispensable to Columbus and cartographers of the Middle Ages. In the periods before the Classical age, however, we are left with iconography and archaeology for elucidation. Also, the application of archaeoastronomy to this corner of the world is recent, and strides are being made to extrapolate just how much the peoples of the

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<sup>6</sup> Stars with a high magnitude number, *i.e.* six or above, are very dim, a factor not aided by summer skies which in the Mediterranean can be very laden with dust and haze. In point of fact, the unaided eye is able to see up to a sixth magnitude star, although there are nearly 6,000 stars of this magnitude or brighter in the night sky. Therefore, the stars discussed here are all of second magnitude or brighter.

<sup>7</sup> It is *Kochab*'s association with the constellation *Ursa Minor*, however, that made that constellation famous as an ancient navigator's guide (see below).



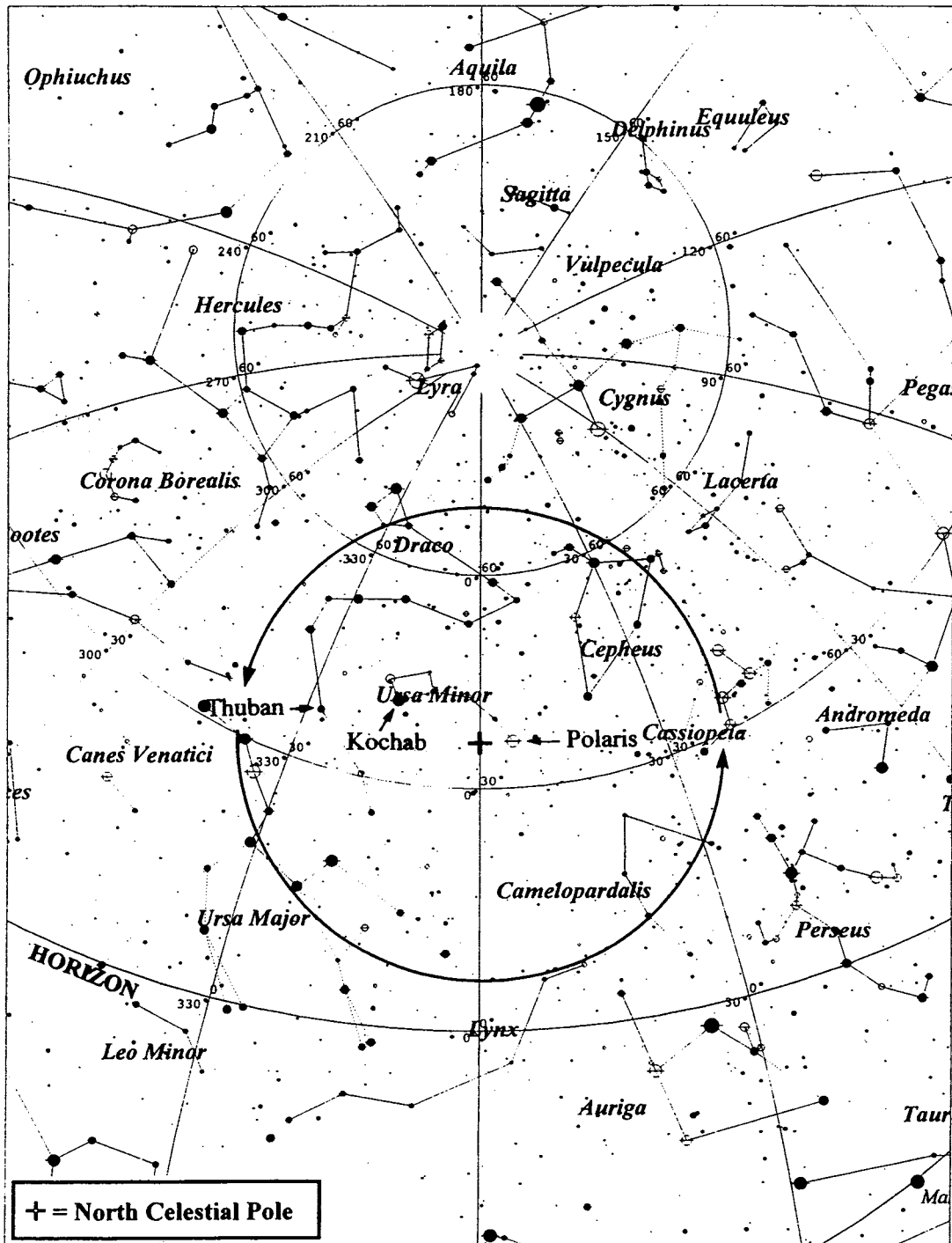


Fig. 5.4. The northern sky in the vicinity of Crete in A.D. 1300.



Bronze and Early Iron Ages knew of the heavens.<sup>8</sup> Taken together, the evidence for celestial navigation in the Bronze and Early Iron Ages is still meager by comparison to later periods. Even so, we can bring the extent evidence to bear on the navigational parameters set forth in Chapters II and III. The results, though tentative and sometimes necessarily deductive, point to the beginning of traditions that would endure into the Classical age and beyond.

### Neolithic

The usage of stars for sailing at night probably dates back to the Neolithic or even earlier. In the Aegean we know that paddled boats of the later Palaeolithic and Mesolithic crossed from the Argolid to Melos to obtain obsidian, and had done so regularly for centuries.<sup>9</sup> Their forward progress was slow, to be sure, perhaps less than two knots.<sup>10</sup> If voyages were to be maintained within the limits of daylight, this placed a restriction on which islands could be successfully attempted, a scenario that does not take into account the effects of contrary winds and currents. Whether they took the direct route to Melos or coasted up to Attica and island-hopped to their destination is open to question, but it is certain that they could *regularly* cross between 10 and 20 nautical-mile stretches of open water—a voyage whose duration hugged the margins of daylight.

Crete is believed to have been colonized by migrant farmers from Anatolia as early as the eighth or seventh millennium B.C., although hunter-gatherers surely landed

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<sup>8</sup> See for example Blomberg and Henricksson 1996; Henricksson and Blomberg 1996; Powell 1993.

<sup>9</sup> See above pp. 44–5.

<sup>10</sup> See above, p. 45, notes 9–10.

there earlier. Broodbank and Strasser have shown that the colonization of this island must have been deliberate and that a minimum number of people and livestock were required to sustain its initial population.<sup>11</sup> From what we know of visibility and the limitations of paddled craft, this colonization and its maintenance are a further indication that a navigation system embracing celestial observation was in place this early. The colonization of many other Aegean islands and Cyprus in the Final Neolithic serves also to indicate a high level of navigational confidence—and one that must have entailed the usage of some system of reference for sailing at night, if only the circumpolar stars for orientation.<sup>12</sup>

### **The Bronze Age Aegean**

The development of celestial navigation (much like many other aspects of sailing), however, appears to have had its true start in the Bronze Age when trade routes began to involve open-sea voyages of many days' duration. To be sure, the international milieu of maritime trade and traffic encouraged the acquisition of navigational knowledge. Thus it should not come as a surprise that the first appearance of sails in the Aegean coincides with that of nautico-celestial motifs.<sup>13</sup> For instance, Arthur Evans suggested in 1925 that the circular symbols above sailing ships depicted on Minoan seal-stones symbolized

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<sup>11</sup> See p. 45.

<sup>12</sup> No direct or indirect evidence of night-time navigation exists for Egypt and the Levant before the Bronze Age began. Unlike the Aegean, the geography of the far-eastern Mediterranean did not *necessarily* mandate communication by sea, especially in pre-civilized societies. The Levantine coast stretches nearly straight north and south, and travel is facilitated by relatively flat coastal plains, interrupted only here and there by mountain ranges that were relatively easy to bypass. In Egypt, although the Nile flourished with riverine craft as early as the Palaeolithic, there is no evidence of seafaring before the Bronze Age (see Wachsmann 1998, 9).

<sup>13</sup> What appear to be celestial motifs (stars and spirals) adorn many Early Cycladic II "frying pans," which often depict oared/paddled vessels as well (Coleman 1985, 191–219, pls. 33–7). That the artist(s) intended to associate ships with stars, however, must remain speculation.

different phases of the moon or other heavenly bodies, and that “they refer to the duration of the voyages undertaken; the crescent moons would in this case mean two month and the disk a still longer voyage”(fig. 5.5).<sup>14</sup> Numerous Early and Middle Minoan seals published since then possess the same or similar nautico-celestial motifs.

Above the sheer of one such ship depicted on a seal from the Ashmolean Museum in Oxford hovers what appears to be a full moon (fig. 5.6).<sup>15</sup> On another from the National Museum in Athens, again above the sheer of the ship, appear two floating disks perhaps representing stars.<sup>16</sup> One seal from the University Museum collection in Philadelphia (CMS XIII) bears a possible half-moon, although the numerous chips on the seal leave open the question of lunar phases (fig. 5.7).<sup>17</sup> The notion that the moon was a celestial aid for seafarers in any period, however, should be dismissed, for its phases are complex and it moves fast through the night sky; sophisticated time-reckoning equipment and extensive tabulation of observations would have been required to make any meaningful use of this body. Instead, it is probable that these shapes were bright stars or possibly the planet Venus, which often appears very bright above the western horizon in the early evening after sunset.

Cycladic islanders also held an interest in the stars. Rock art and graffiti on moveable stones from Naxos, dated to the Early Cycladic I–II periods, have been interpreted as depicting several zodiacal constellations, including *Virgo*, *Gemini*,

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<sup>14</sup> Evans 1925, 207 and fig. 5.

<sup>15</sup> Ashmolean Museum No. 1938-762; see Basch 1987, 102, D1; Henricksson and Blomberg 1996, 107–11.

<sup>16</sup> Basch 1987, 102, D6.

<sup>17</sup> Ibid. 103, E2.

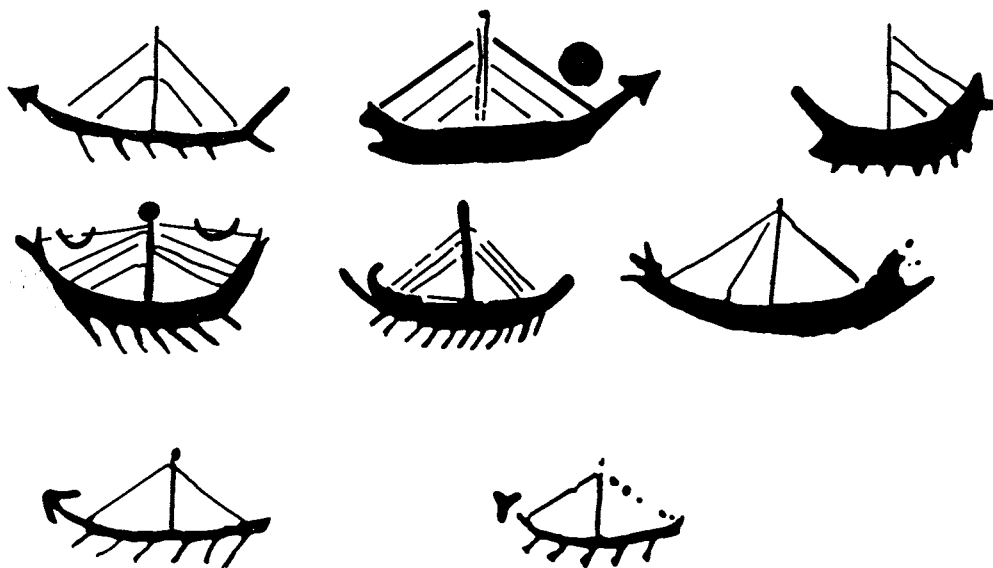


Fig. 5.5. Ships and celestial imagery on Minoan seal-stones. (After Evans 1925, 207 fig. 5)



Fig. 5.6. Minoan seal from the Ashmolean Museum depicting a sailing ship below a celestial body. (After Basch 1987, 102 fig. D1)



Fig. 5.7. Ship on a Minoan seal from the University Museum in Philadelphia (CMS XIII). (After Basch 1987, 103 fig. E2)

*Capricorn, Pisces, Sagittarius, Aquarius, Scorpio, and Libra.*<sup>18</sup>

Associations of ships with heavenly bodies are found in the Thera wall-paintings from the West House at Akrotiri, a Cycladic town buried by a massive volcano at the beginning of Late Minoan IA.<sup>19</sup> The fresco portrays several small and large boats partaking in a ship procession between two or more coastal towns. Of the larger vessels, nearly all boast what appears to be a large, sixteen-pointed star on the bowsprit;<sup>20</sup> a “star” is also emblazoned on the hull of the so-called “flagship” (fig. 5.8). These motifs embody the natural elements so characteristic of Minoan and Cycladic art. According to L. Morgan, the “individual emblems (*as opposed to the universally applied star emblem*) are all animal. Dolphins epitomize the marine environment of the ships; the bird...may have evoked navigation powers. Dolphins, birds and butterflies are together images of swift movement through sea and air and thus appropriate as emblems of transport.”<sup>21</sup> Much like the birds depicted on the sailing ship represented navigational guidance over open water by day,<sup>22</sup> so may have the star emblem, so appropriately placed at the bow, embody the employment of guide-stars for navigation at night.<sup>23</sup> The so-called “guide-star” is not without a parallel in Cycladic and Minoan art, for it is also found on a gold ring of unknown provenance unearthed near Knossos (fig. 5.9).<sup>24</sup> The scene, although

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<sup>18</sup> Doulas 1990a, 84–5; Doulas 1990b, 159, citing Μπαρδάνης 1988–1989, 434–46.

Unfortunately, I was not able to acquire these images before this study’s deadline.

<sup>19</sup> See Marinatos 1974, 19–31 color pl. 2; discussed extensively in Wachsmann 1998, 86–99 figs. 6.2–6.24, 6.27.

<sup>20</sup> This star motif is very common to Late Minoan IB Marine Style pottery; see Morgan 1988, 131–2.

<sup>21</sup> Morgan 1988, 133 (my italics); cf. Broodbank 1993, 327.

<sup>22</sup> See below pp. 91–6.

<sup>23</sup> Although cf. Morgan 1988, 166.

<sup>24</sup> *PM*, 250 fig. 47b, 953; Nillson 1950, 39 fig. 7.

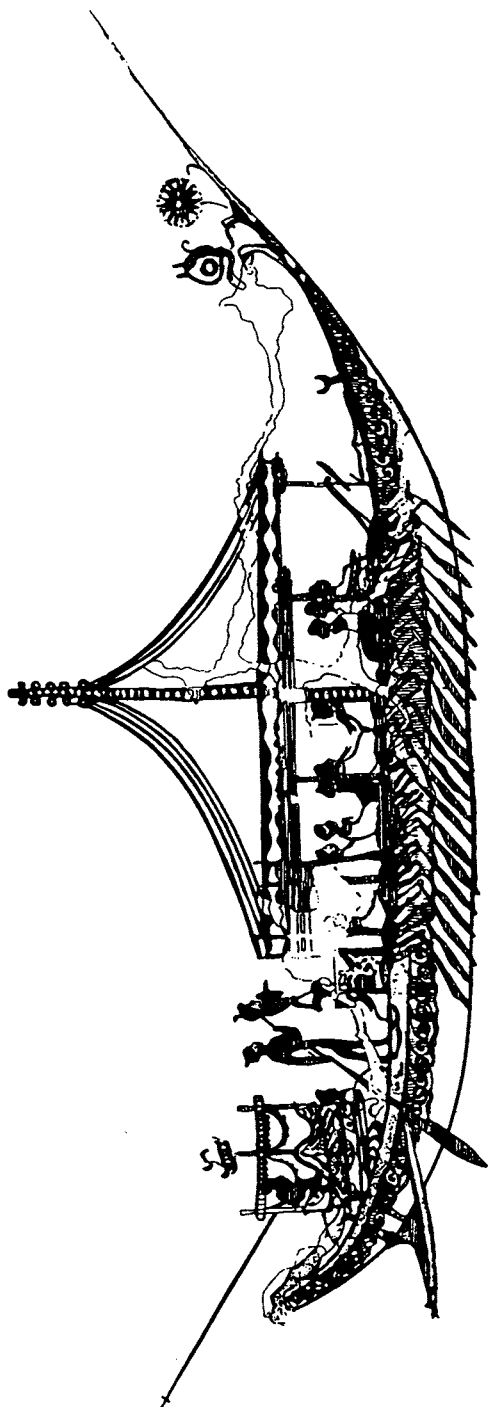


Fig. 5.8. The best-preserved ship from the Ship Procession fresco on Thera. Note the sixteen-pointed star on the bowsprit. (After Wachsmann 1998, 92 fig. 6.13)



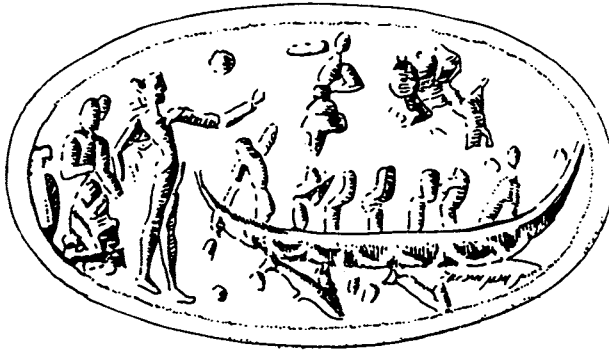


Fig. 5.9. Departure scene on a gold ring of unknown provenance found near Knossos. Note the circular object floating above the bowsprit. (After Nilsson 1950, 39 fig. 7)

somewhat damaged, clearly represents the departure of a long-boat. A man on shore salutes a deity floating above the boat. Dolphins swim beneath the hull. At the tip of the bowsprit perches a small, circular orb, strongly reminiscent of the guide-star on the ships of the Thera frescoes.

This symbolism of star and ship may have been happenstance were it not for the discovery of two nearly contemporary parallels: one comes from a fresco fragment from Pylos, which depicts a mast-top and rigging very similar to those on the Thera ships; a fragment from the same painting depicts an eight-pointed star, probably placed on the hull, as in Ship 2 from Thera (fig. 5.10);<sup>25</sup> the other appears on two ship representations from a Late Minoan I/Late Minoan IA fresco at Aya Irini on Kea, which boasts a star above both of their bows.<sup>26</sup>

We find similar celestial imagery on other artifacts from the Bronze Age Aegean. For example, on a mold from Palaikastro appear two deities next to a large solar disk; this is composed of two large concentric circles and surmounted by several “rays” (fig. 5.11).<sup>27</sup> And on a bronze tablet from Psychro in Crete is depicted three pairs of horns, a fish, a bird, and a man dancing. In the upper right hangs a crescent moon, which indicates that the celestial body in the upper left is a nocturnal body, either the sun, a star, or a planet; between the upper pair of horns are two small cruciform incisions,

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<sup>25</sup> Lang 1969, pl. 89 F nw; See also Morgan (1988, 166 and pls. 166–7), who considers these stars to be prow emblems, or possibly the insignia of the Thera fleet. She is quick to state, however, that these associations may have occurred unbeknownst to the artist(s) of the frescoes.

<sup>26</sup> Morgan 1993–1994, 243–4; according to her, “features such as hull decoration (dolphins, star, festoon), (?) ship’s cabin, and paddles in a small boat, recall the Thera Ship Procession.”

<sup>27</sup> Nilsson 1950, 282, fig. 141.



Fig. 5.10. Fresco fragment from Pylos depicting a star reminiscent of those on the Theran ships. Its provenance has been linked to nearby fresco fragments depicting a ship's rigging. (After Lang 1969, pl. 89, 18F nw)



Fig. 5.11. Mold from Palaikastro on Crete depicting a solar disk. (After Nilsson 1950, 282 fig. 141)

apparently representing stars (fig. 5.12).<sup>28</sup>

Finally, two gold rings—one from Mycenae, the other from Tiryns—feature a more accurate facsimile of the heavens. A golden ring found at Mycenae hosts a religious scene in which three divinities approach a fourth divinity crouched below a tree (fig. 5.13). Above, four parallel wavy lines, perhaps representing the Milky Way, stretch from left to right below a crescent moon. The nineteen-pointed orb represents either the sun or a very prominent nocturnal body, such as a bright star or possibly Venus.<sup>29</sup> The ring from Tiryns portrays four “genii” approaching a seated figure (fig. 5.14). On the upper register float the familiar crescent moon and sun, while the background is blanketed with small dots, probable symbolizing a star-field.

Recent studies on Minoan archaeoastronomy by M. Blomberg and G. Henricksson have revealed at least a fundamental knowledge of the heavens on the part of the Minoans.<sup>30</sup> Their investigation of the Middle Minoan IB/Late Minoan IA peak sanctuary at Petsophas, 255 meters above the Minoan palatial site of Palaikastro in eastern Crete, revealed walls with peculiar orientations. Two adjoining walls of one building are less than 90°, and the placement of its foundation—on a slope near the top—suggests an ulterior motive for its location. They discovered that the walls were oriented so that “the first rays of the rising sun would completely illuminate the western wall only at the summer solstice.”<sup>31</sup> Seven kilometers to the west lay the only other conical peak, Modi, directly over which the sun would have set during the spring and fall

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<sup>28</sup> *PM*, 632, fig. 470.

<sup>29</sup> Evans 1901, 10 [108], fig. 4.

<sup>30</sup> See *supra* n. 8.

<sup>31</sup> Blomberg and Henricksson 1996, 31.

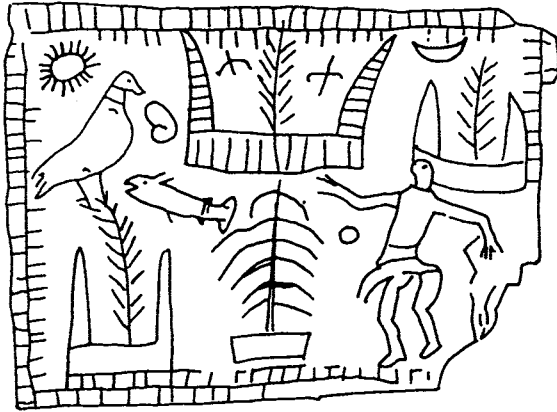


Fig. 5.12. Bronze tablet from Psychro bearing celestial imagery. (After Nilsson 1950, 171 fig. 72)



Fig. 5.13. Gold ring from Mycenae depicting the sun (star?), moon, and Milky Way above a cultic scene. (After Nilsson 1950, fig. 158; Evans 1901, 10 [108] fig. 4)



Fig. 5.14. Gold ring from Tiryns. Compare its star field and celestial bodies to fig. 5.13. (After Nilsson 1950, fig. 55)



equinoxes. In addition, “the first crescent moon and the full moon are also observed sometimes to set behind Modi at the equinoxes.”<sup>32</sup> This calls to mind the passage in the *Odyssey* in which a disguised Odysseus weaves for his wife a false tale of his wanderings:

Among their cities is Knossos, a great city  
where Minos ruled for nine years,  
conversing with almighty Zeus.<sup>33</sup>

This mention of *Minos enneoros*, coupled with the discovery of the observatory at Petsophas, led Blomberg to postulate that the Minoans, as early as Middle Minoan IA, discovered the *oktaëteris*, the “eight year cycle at the end of which the sun, the moon, and the earth have very nearly the same relationship to each other as they had at the beginning of the cycle.”<sup>34</sup> The “ninth year” mentioned in the *Odyssey* makes sense if Minos conferred with Zeus at the end of the eight-year cycle, once the sun, moon, and earth had aligned themselves again. The discovery of such a phenomenon is testament to the amount and longevity of celestial observations which took place, whether it was for religious, calendrical, or navigational purposes, or some combination thereof.

Perhaps more pertinent to our discussion here was the discovery of two sets of foundation walls, one at the same peak sanctuary on Petsophas, the other on a peak

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<sup>32</sup> Blomberg and Henricksson 1996, 31.

<sup>33</sup> Homer *Od.* 19.178–80. Many translations interpret τῇσι δ’ ἐνὶ Κνωσός, μεγάλη πόλις, ἐνθα τε Μίνως ἐννέωρος βασιλεὺς Διὸς μεγάλου ὁραιστῆς as “Among their cities is the great city Cnossus, where Minos reigned *when nine years old*, he that held converse with great Zeus.” I am compelled to agree, however, with Blomberg and Henricksson (1996, 28–9), who rely on Plato’s use of the term *enneoros* to mean a duration of time (see Plat., *Leg.* 1.624 A): “*for nine years*.” I retain their meaning here.

<sup>34</sup> Blomberg and Henricksson 1996, 28.

sanctuary at nearby Traostalos, both of which point to the rising and setting of *Arcturus* ( $\alpha$  *Bootis*)—a star which finds frequent mention in nautical contexts in Homer and later texts.<sup>35</sup> With adjustments for precession, Blomberg and Henricksson found that at Petsophas the wall's optimal usage would fall ca. 1866 B.C. +/- 80 years, and that of Traostalos ca. 1752 B.C. +/- 138 years.<sup>36</sup> Both dates fall within the time frame of each structure's construction.

Curiously, it was approximately at this time that the constellations as we know them appear to have been invented. Two astronomical studies, one by M. Ovenden, the other by A.E. Roy, concluded that the constellations were invented at a certain time and place.<sup>37</sup> Both observed that the southern sky has no ancient constellations, despite having very bright stars, and moreover that there was a "zone of avoidance" in the southern sky. Its angular radius, i.e. the shadow in the sky not visible to Mediterranean seafarers, corresponded to between  $36^\circ$  and  $38^\circ$ , and its center corresponded to the south celestial pole. These numbers, then, accounting for precession, indicate the observers location and time: Ovenden arrived at a date of 2800 B.C. and a location centered around the Aegean island of Astypalaia. Similarly, Roy computed a date of 2500 B.C. in the vicinity of Crete.<sup>38</sup>

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<sup>35</sup> See pp. 169, 171, 175–6.

<sup>36</sup> Henricksson and Blomberg 1996, 107–11. Petsophas overlooks the sea in an arc stretching from the north to the southeast. Traostalos, however, overlooks the entire eastern horizon. Both locations served major Middle Minoan centers with harbor facilities: Petsophas belonged to Palaikastro, Traostalos to Kato Zakro. Traostalos, the highest peak in eastern Crete, may have been used specifically for observation of navigation stars, as its walls are aligned only to Arcturus.

<sup>37</sup> Ovenden 1967; Roy 1984; Powell 1993, 48; Maunder 1922, 157–8.

<sup>38</sup> Both Ovenden and Roy attribute the invention of the constellation to the Minoans, although their derived dates predate this civilization by a few centuries. This is not to say, however, that Cretans were not active seafarers before the advent of Minoan palatial civilization.

## Bronze Age Egypt and the Levant

Egypt attained a high degree of astronomical knowledge as early as the Proto-Dynastic Period.<sup>39</sup> At this time observations of the heavens led to the maintenance of a luni-stellar calendar, which used the heliacal rising of the star *Sothis* (*Sirius*) to regulate the inconvenient phases of the moon. Eventually, by the third millennium, the moon was discontinued as a calendrical tool while Sirius continued to be used down to the Roman era as a harbinger of the Nile's annual inundation. An extensive list of constellations was maintained throughout the Old, Middle, and New Kingdoms; and the Egyptian zodiac was split into a very convenient star-clock of 36 decans, or ten-day weeks, during which a new constellation wandered into heliacal position.<sup>40</sup>

In spite of these numerous astronomical references, very few allusions to Egyptian navigation and night-time sailing have come down to us. Thus, it is difficult to reconcile the high degree of Egyptian astronomical comprehension with the remarkable dearth of nautico-celestial references. The frequent mentions of the celestial barque in Egyptian religious texts also fail to enlighten, primarily because they deal with river craft. Iconography, too, lacks relevant depictions.

A very late text, however, provides some insight. The Egyptian priest Wenamun, who, in 1075 B.C., was commissioned to acquire ship timber from for the barque of Amon-Re, journeyed to the Levantine coast from the Nile Delta.<sup>41</sup> His mission went

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<sup>39</sup> For a general introduction to Egyptian astronomical knowledge, see Claggett 1995.

<sup>40</sup> Claggett 1995, 48–53; Georgiou (1997, 119–20) erroneously suggests that Homer's *Il.* 10.251 and *Od.* 14.483 allude to a Egyptian-style system of decans for time-keeping at night. These two passages, however, are too far removed in time and space to qualify even as parallels.

<sup>41</sup> Breasted 1988, 2:§888.

awry when a crewman robbed him, after which he was ridiculed by the kings of Dor and Byblos. As he moved from port to port, he states "I went clear of Tyre by taking the light of the stars as the only guidance until reaching the realm of Zeker-bal, the ruler of Byblos."<sup>42</sup> Apparently, the *Tjeker* were nearby, one of the many Sea Peoples from whom Wenamun stole silver in recompense for his loss. Consequently, Wenamun wanted to steer clear of their coastal patrols by slipping far out to sea under cover of darkness and around to the next port of Byblos. If translated correctly, it is a rare comment on the usage of stars at sea in this period.<sup>43</sup>

### Phoenicians, Greeks, and Romans

Following the collapse of the Late Bronze Age palace-based cultures, a dim period ensued, the peoples of which produced nearly no textual references, nor indeed any iconographic evidence, of night-time navigation. With the dawn of the Archaic and Classical periods, a more diverse body of seafaring evidence becomes available. Hesiod indicates the importance of stars in the everyday life of farmers; not trusting inaccurate civic calendars, those involved in agriculture relied on the periodic risings and settings of specific stars to reveal the times of sowing and harvesting.<sup>44</sup> The Greeks eventually adopted astronomy as a theoretical topic, which quickly developed into a serious philosophical and practical pursuit by the fourth and third centuries B.C. Accuracy of observation became a contest, and so too did the positing of theories of planetary and

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<sup>42</sup> Goedicke 1975, 45.

<sup>43</sup> Cf. Pritchard's translation (1969, 26): "I went out of Tyre at the break of dawn...Zakar-Baal, the Prince of Byblos,...ship."

<sup>44</sup> Hes. *Op.* 609–15.

cosmic motion. Greek playwrights wrote of specific celestial phenomena in surprising detail, aware that their audiences would comprehend the significance of the rising and settings of certain stars, the predicted appearances of certain planets.<sup>45</sup>

Most importantly we learn from the words of Homer as well as Classical writers themselves that voyages were not necessarily planned to continually maintain in sight coastal or insular landmarks. These references occur in sufficient quantity to dispel any doubt that some passages involved several days of planned non-stop sailing.

Odysseus, for instance, understood that the Nile lay quite a distance south of the Aegean, for he states to his loyal swineherd Eumaeus: "Setting out from broad Crete on the seventh day, we began to sail easily with the North Wind blowing strong and steady, as if we were sailing downstream. Therefore, no harm came to my ships, but we sat unscathed and free from sickness, and the wind and helmsmen kept the ships on course. On the fifth day (πεμπταῖοι) we came to fair-flowing Aegyptus."<sup>46</sup> In Thucydides' *Peloponnesian War* we read that Kythera, an island in the south-west Aegean, was a "landing place for the merchant ships from Egypt and Libya."<sup>47</sup> This passage, if made directly from Libya, is at least 200 nautical miles in length, assuming there was no stop at Crete, in which case it would have measured some 150 nautical miles. At one point in the same war, two Spartan triremes arrived in Sicily from Libya, a voyage of "only two days and a night."<sup>48</sup> The Augustan writer Strabo states that "the voyage from Samonium

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<sup>45</sup> See for example Eur. *Ion* 1150.

<sup>46</sup> Hom. *Od* 14.252–8; although Homer has a propensity for exaggeration—witness the 17 days (ἑπτὰ δὲ καὶ δέκα) he has Odysseus spend sailing to the land of the Phaeacians (*Od*. 5.278)—five days is a realistic time-frame for an Aegean-to-Egypt voyage, especially with a predominant north-west wind.

<sup>47</sup> Thuc. 4.53.

<sup>48</sup> Thuc. 7.50.

(a promontory in southwestern Crete) to Egypt takes four days and four nights (τεττάρων ἡμερῶν)” and the voyage from Cyrene in North Africa to Criumetopon in south-central Crete is “two days and two nights (δυεῖν ἡμερῶν καὶ νυκτῶν πλοῦς).”<sup>49</sup> Lucian’s story of the *Isis* warrants repeating: “The captain said that after they left Pharos (Egypt) under a weak wind, they sighted Acamas in seven days. Then as it blew against them from the west, they were carried abeam as far as Sidon. From there they encountered a strong storm and came through Aulon to Chelidonenses on the tenth day.”<sup>50</sup> Acamas, as we have seen (figs. 3.3, 3.5), is a mountain and cape in southwest Cyprus, a distance over 250 nautical miles from Pharos, and one well out of view of the Levantine coast.<sup>51</sup>

In addition to these specific mentions of multi-day voyaging in antiquity, there are even more specific mentions of sailing at night. In one case, Herodotus has the Greek fleet await the arrival of the Persian fleet, “and then, after midnight had passed (μετέπειτα νύκτα μέσσην), put to sea to meet the ships that were sailing round Euboea.”<sup>52</sup> In another, Xenophon tells us that “the *Paralos* (Athens’ state ship) arrived in Athens *at night* (νυκτὸς)” with a report of the disaster at Aegospotami in 405 B.C.<sup>53</sup> These two sources, in addition to Thucydides, Strabo, Lucian, Arrian, and Heliodorus, among others, mention night-time sailing with remarkable frequency, practiced either for

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<sup>49</sup> Strab. 10.4.5.

<sup>50</sup> Lucian *Nav.* 7; *Chelidonenses* is modern day Cape Gelidonya on the Mediterranean coast of Turkey. A Late Bronze Age shipwreck excavated here in the 1960s foreshadows Lucian’s comment (see Bass 1967, 14–16 and above pp. 123–5). A voyage from Cyprus to eastern Egypt “maris vasti transverso” is recorded in Lucan 8.460–6.

<sup>51</sup> An underwater survey conducted near Cape Akamas in the harbor at Kioni revealed ceramics ranging in date from the eighth century B.C. to the fourteenth century A.D., thus demonstrating that northwest Cyprus lay along the trunk route between the east and west; see Leonard 1995, 133–52.

<sup>52</sup> Hdt. 8.9.

<sup>53</sup> Xen. *Hell.* 2.2.3.

tactical reasons, to catch early-morning or late-evening breezes, or simply because the voyage required three or four or more days to complete.<sup>54</sup>

## NAVIGATION STARS

What type of reference system did ancient seafarers employ when sailing at night? And how did they maintain course in the absence of landmarks? More specifically, “des marins primitifs ont-ils pu s’orienter et se sont-ils orientés en pleine mer sans le secours d’instruments d’observations ou avec des instruments très rudimentaires? En d’autres termes, une navigation astronomique a-t-elle existé avant que sa naissance ne soit effectivement prouvée par des traités de navigation ou par des tables utilisables pour traduire géographiquement le résultat des observations astronomiques?”<sup>55</sup> To begin exploring several possible solutions to these questions, let us examine a passage from the *Argonautica*, the epic poem of Jason and his crew of *Argo* written by Apollonius Rhodius in the third century B.C. When Jason began the trek back to Thessaly from Libya, it required two days to sail the 300 nautical miles of open sea to Karpathos, whence they proceeded to eastern Crete, whose many headlands were presumably well-known landmarks.<sup>56</sup> After spending a night there,

they drew water and embarked, intending first to proceed under oars  
beyond the height of Salmone (Samonium Promontory). Then,

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<sup>54</sup> See also Hdt. 8.6–9; Thuc. 1.48, 2.97, 3.49, 3.81, 3.91, 4.31, 4.42, 4.53, 4.120, 6.65, 7.50, 8.41, 8.101–2; Xen. *Hell.* 1.1.11, 1.1.13–16, 1.6.24–9, 2.1.32–2.3; Dem. 50.20, 56.30; Xen. *Oec.* 21.3; Diod. 13.39.1; Strab. 1.1.20, 10.5.1–19; Plut. *Luc.* 3.3; Lucian *Nav.* 8–9, *Peregrinus* 43, *Toxaris* 19; Arr., *Ind.* 23.4, 25.4–8, 27.1, 29.1, 38.6; Hel. *Aeth.* 5; Synesius *Epist.* 4.

<sup>55</sup> Adam 1966, 92.

<sup>56</sup> This assumes an average speed of 6.25 knots over 48 hours, which is doubtful given the presence of a headwind the whole way (cf. Hom. *Od.* 5.278); on landmarks, see pp. 122–3, 128.

immediately, while running over the depths of the Cretan Sea, night began to frighten them, the night they call the Shroud (κατουλάδα); on that fatal night neither stars nor sparkling moon was visible; but black chaos had descended from heaven, or some other inmost darkness had arisen from the depths of the earth.<sup>57</sup>

Eventually they reached Anaphe, Thera's neighbor to the east, a crossing of only some 60 nautical miles. It is important to emphasize here that this distance is only a fraction of the distance from Libya to Karpathos. What was the difference between that large stretch of open sea and this relatively short passage? Perhaps the sun had set on the Cretan Sea when the sky was thick with clouds. Thus, it would seem that the so-called "Shroud" was not necessarily unique to the Cretan Sea, but is instead a phenomenon and appellation applied to any situation involving open-sea navigation under cloudy skies, a rarity during Mediterranean summers. As a result, without any stars by which to steer, the Argonauts were totally without reference.<sup>58</sup> We might conclude from this passage, therefore, that stars and other celestial phenomena were used as points of reference for these night-time crossings. Again, literature reinforces this view.

Of all ancient texts, one short passage in Homer's *Odyssey* lists nearly all the navigation stars and constellations employed in antiquity. Upon building his raft, Odysseus set sail and "watched the *Pleiades* and late-setting *Bootes*, and the Bear, which is also called the Wain; it circles where it is and keeps an eye on *Orion*. It alone has no part in the baths of Ocean. The beautiful goddess Calypso advised him to keep this one

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<sup>57</sup> Ap. Rhod. *Argon.* 4.1692–8.

<sup>58</sup> Pseudo-Apollodorus 1.9.26: "Sailing by night they encountered a violent storm, and Apollo, taking his stand on the Melantian ridges, flashed lightning down, shooting a shaft into the sea. Then they perceived an island close at hand, and anchoring there they named it Anaphe, because it had loomed up unexpectedly;" a similar episode is Ovid's *Tr.* 1.2.22–36.



on his left as he sailed over the sea.”<sup>59</sup> The Bear is the constellation most-often mentioned in nautical contexts and, as previously mentioned, goes by many names. In Greek, it translates as *Arktos* and *Helice* (or the Helix), and sometimes *Axis*; in Latin it is known as *Ursa Major* (used here). The *Pleiades* are a deep-sky cluster consisting of exactly 100 stars within the constellation Taurus; it is famous for its seven stars which were known as the “seven sisters” in mythology, although in truth there are only six visible. *Bootes*, known also as *Arctophylax* and the Plow, has as its brightest star *Arcturus*. *Orion* is one of the most prominent constellations in the Mediterranean night sky; its several high-magnitude stars make it easy to locate.

Approximately five hundred years after the Homeric poems were compiled, Apollonius tells us in the *Argonautica* that “on the sea sailors from their ships looked to *Helice* and the stars of *Orion*.”<sup>60</sup> While he may have been following Homer’s epic tradition, his audience was expected to understand the existence, if not the usage, of these essential navigation stars.<sup>61</sup>

Of all these constellations, only *Ursa Major* and *Ursa Minor* were circumpolar. Homer, who, like Apollonius, mentions only the larger of the two bears, says that it “alone has no part in the baths of Ocean,” meaning that the constellation somersaults all night long around the celestial north pole, never touching the horizon. As mentioned above, it is due to precession that *Kochab*, the brightest star in *Ursa Minor* (and not today’s Polaris), occupied the central position in antiquity. By at least the Classical

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<sup>59</sup> Hom. *Od.* 5.270–7.

<sup>60</sup> Ap. Rhod. *Argon.* 3.744–6.

<sup>61</sup> In Euripides’s *Phoenician Women* (834–5), composed ca. 408 B.C., Teiresias tells his daughter: “Lead on before me...like the mariner’s star. You are the eyes for my wretched blind feet.”

period a distinction between Greek and Phoenician sailors and their preferred constellations began. According to the third-century B.C. writer Aratus,

In order to steer their ships, the Achaeans on the sea take their mark by *Helice* (*Ursa Major*), whereas the Phoenicians cross the sea trusting in the other (*Ursa Minor* or *Cynosura*). But *Helice*, appearing clear at earliest night, is easily recognized; but the other is small, yet better for sailors; for all of her stars wheel in a smaller orbit; by her, then, the Sidonians sail their ships.<sup>62</sup>

Ovid (d. A.D. 17), too, who may have read Aratus's poetry and therefore may have borrowed his impressions, perpetuates this distinction between Achaean (i.e. Greek) and Sidonian (i.e. Phoenician) sailors: "You two beasts, great and small, one the leader of Grecian, the other of Sidonian ships."<sup>63</sup> So too does Silius Italicus, who wrote his epic poem *Punica* only a few years after Ovid's death: "By observing the stars do we navigate across these valleys, for daylight confuses the path; and over the vast fields does *Cynosura* (*Ursa Minor*), that constellation most faithful to Sidonian sailors, lead the traveler who sees himself always in the middle of the plain."<sup>64</sup> Later in the same epic, the Punic navigator Bato is described as having "great skill to contend with the fierce sea and outsail storm winds; nor could *Cynosura*, no matter how obscured its course, escape his faithful watch."<sup>65</sup>

The constellation *Orion* also has a long history in ancient Greek literature, being

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<sup>62</sup> Arat. *Phaen.* 37–44.

<sup>63</sup> Ovid Tr. 4.3.1–7; on Ovid's reliability with respect to astronomical matters, see Hannah 1997.

<sup>64</sup> Sil. *Pun.* 3.662–5.

<sup>65</sup> Sil. *Pun.* 14.453–64; see also Manilius, *Astro.* 1.294–302 and Diog. Laert. *Thal.* 1.23. Diogenes credits Thales with the discovery of *Ursa Minor* and a work on nautical astronomy, now lost.

mentioned first in Homer, but also in Hesiod's *Works and Days*.<sup>66</sup> Its different rising and setting episodes (e.g. heliacal rising, cosmical setting, etc.), along with *Arcturus* and the *Pleiades*, seems to have been used primarily as an indicator or benchmark of agricultural activity or as harbingers of the sailing season's beginning and ending.<sup>67</sup> By the third century B.C., Aratus, like his contemporary Apollonius, lists *Orion* as a navigation star: the "sailor on the open sea can mark the first bend of the *River (Eridanus)* rising from the deep, as he watches for *Orion* himself to see if he might give him any hint of the measure of the night or of his voyage."<sup>68</sup>

## NORTHING AND SOUTHING BY THE STARS

The "measure of the night" certainly speaks to the use of stars as time-keeping references. Odysseus, for example, tells his companions: "night is lifting and the dawn is nigh; the stars have moved onward, and more than two watches of the night have elapsed, and only the third remains."<sup>69</sup> Such a system of time-keeping, however unrefined, was completely reliable, for one had only to be familiar with the constellations of the zodiac and their order, and to realize that six of them, in roughly equal parts, rise and set over the course of the night. Knowing what constellation the Sun was in provided the benchmark for the entire night.<sup>70</sup>

But how could *Orion*, or any star for that matter, provide a "measure...of his

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<sup>66</sup> Hesiod *Op.* 598, 609, 615, and 619; *Orion* is also mentioned in the book of Job (9:9, 38:31) and in Amos (5:8).

<sup>67</sup> See Dicks 1970, 13, 34–8 and references there.

<sup>68</sup> Arat. *Phaen.* 728.

<sup>69</sup> Hom. *Il.* 10.251–3.

<sup>70</sup> Evans 1998, 95.

voyage”)? As several constellations and specific stars recur time and again in ancient literature, employed at times for time-keeping and calendrical maintenance, it would have been no major cognitive leap for seafarers to realize that as one traveled north, or toward the North Wind (*Boreas*), *Ursa Major* ascends higher and higher in the sky, and vice versa as one travels south;<sup>71</sup> this entire constellation, for instance, rotates above the horizon in Black Sea latitudes (fig. 5.15), while along Egypt’s Mediterranean coast it falls partly below the horizon at the bottom of its rotation (fig. 5.16). Perhaps the Phoenicians realized early on, from consistent observation and wide-spread voyaging, that *Ursa Minor* was a more-accurate indicator of the north celestial hub than its larger sibling. Strabo explicitly states that the Sidonians (i.e. Phoenicians) “are philosophers with regard to astronomy and arithmetic, having begun with practical calculations and with night-time voyaging (νυκτιπλοΐας); each a concern to the merchant and ship-owner.”<sup>72</sup> In any event, the correlation in antiquity between a star’s altitude and one’s geographic position finds reinforcement in congruent passages in the works of Herodotus, Strabo, Pliny, and Arrian.<sup>73</sup> Strabo reports that Hipparchus trusted sailors and their knowledge of celestial phenomena to confirm whether the same line of latitude

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<sup>71</sup> Adam (1966, 93–5) compares latitude sailing on the east/west routes in the Indian Ocean during the Roman era with Polynesian long-distance voyaging between Tahiti and Hawaii. In both instances, “on pense immédiatement à utiliser la hauteur de la polaire qui, actuellement, donne à peu de choses près la latitude exacte.”

<sup>72</sup> Strab. 16.2.24. A Neo-Babylonian stamp seal appears to bridge the literary gap of nautico-celestial references between Wenamun and Aratus. On it is depicted a ship with upward-curving ends carrying two figures dressed in long garments. Both face the stern, above which floats a large star (de Graeve 1981, 71 [nr. 94]; cf. 36 [nr. 32]). Perhaps this image underscores the practice of star-path steering employing stars astern (see below pp. 176–80).

<sup>73</sup> Hdt. 4.42; see also Ovid, *Tr.* 3.10.9–14; Nonnus, *Dion.* 40.284–91; and Val. Flaccus *Argon.* 1.15–20, 1.481–3, and 2.59–71.

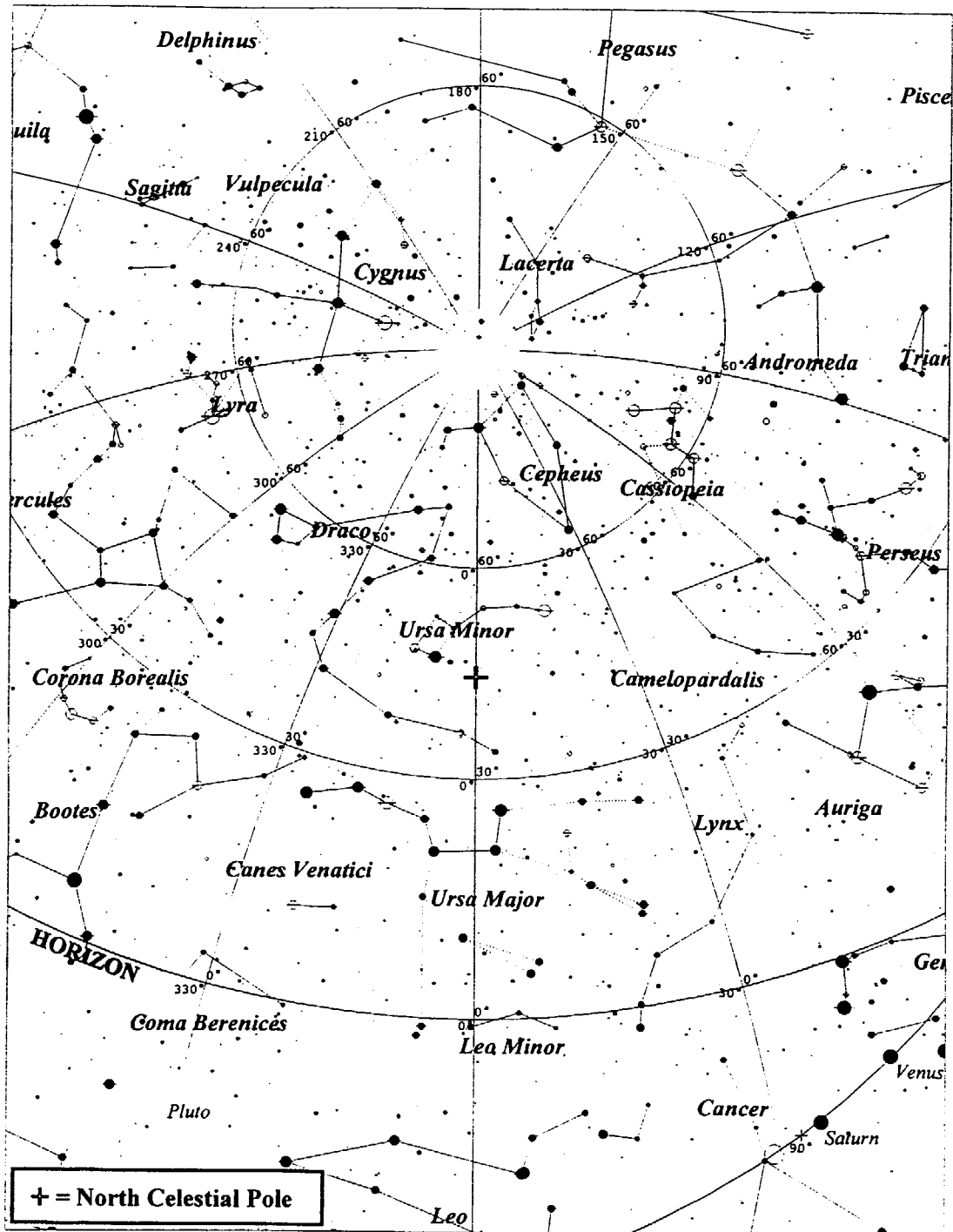


Fig. 5.15. The northern sky in 500 B.C. from the Black Sea. Note the height of the circumpolar stars and compare with fig. 5.16.

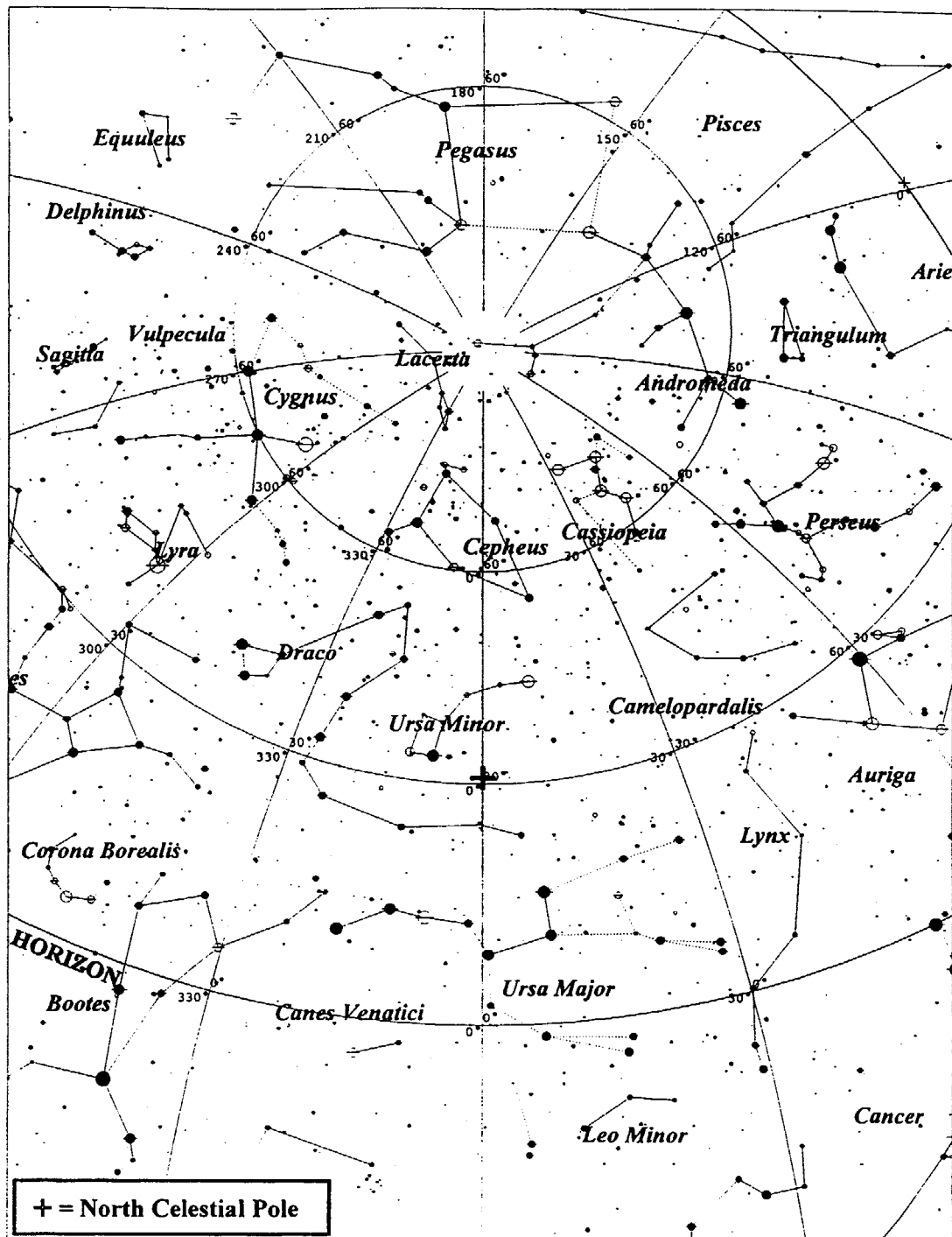


Fig. 5.16. The northern sky in 500 B.C. along Egypt's Mediterranean coast. Note the height of the circumpolar stars and compare with fig. 5.15.

passed through the Pillars of Hercules and Cilicia, and indeed it does.<sup>74</sup> Pliny relates how the envoys from India “marveled at the new sky, the Great Bear and the *Pleiades*, and they told us that in their own region...*Canopus*, a large and luminous star, shines on them at night.”<sup>75</sup> *Canopus* ( $\alpha$  *Carinae* of -0.63 magnitude) barely peaks above the southern horizon at Alexandria. In the region of Bombay, some 11 degrees further south, *Canopus* rises 18 degrees above the horizon, but is visible at night only after September. Arrian relates the same phenomenon in his description of Nearchus’ voyage to the Persian Gulf. He has Alexander the Great’s admiral state that “some of the stars they had seen in the sky up to this point were completely hidden, while others appeared low down towards the horizon; and those which had never set before were now seen both setting and immediately rising again.”<sup>76</sup>

Perhaps the most obvious reference to this method of position reckoning, however, comes from Lucan’s *Civil War*, in which a steersman tells Pompey how he intends to navigate to Syria (see figure 5.15):

The never-setting pole star (*Axis*), which does not sink beneath the waves, brightest of the twin Bears, guides the ships. When I see this one culminate and *Ursa Minor* stand above the lofty yards, then we are facing the Bosphorus and the Black Sea that curves the shores of Scythia. Whenever *Arctophylax* (*Bootes*) descends from the mast-top and *Cynosura* (*Ursa Minor*) sinks nearer to the horizon, the ship is proceeding toward the ports of Syria. After that comes *Canopus*, a star content to wander about the southern sky, fearing the North. If you keep it on the left [as you sail] past Pharos, your ship will touch Syrtis in mid-sea (*in*

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<sup>74</sup> Strab. 2.1.11; see also 2.1.19 and 10.2.12.

<sup>75</sup> Pliny *HN* 6.24.87. Posidonius of Apamea (ca. 115–51/50 B.C.), a Rhodian geographer and historian, observed that *Canopus* was just visible on the horizon at Rhodes but was higher in the sky at Alexandria (see Dilke 1998, 38).

<sup>76</sup> Arr. *Ind.* 25.4–8.

*medio aequore).*<sup>77</sup>

Northern (and sometimes southern) circumpolar stars, then, were used in antiquity as a means for determining one's orientation and crude geographic position.<sup>78</sup> The ability to gauge relative position north or south of some reference point is, in itself, significant. But aside from obtaining a rough estimate of a star's altitude on the mast-top, as in Lucan's description above, the limitations of such a technique lay in the fact that astronomical instruments were in their infancy: the astrolabe, despite hints of a second-century B.C. origin, did not proliferate until after the fourth century A.D.<sup>79</sup> Thus, during the periods covered here, there were no known instruments capable of accurately measuring the altitude of stars from a ship at sea. Nor does there appear to have been a means of demarcating an east-west position, a problem that plagued mariners until after Columbus's day. Thus, only to a certain extent could they derive their position by such techniques according to a "mental chart" of relative geographic position: a night-time arrival in the neighborhood may have been attainable, but finding the correct address was an altogether different matter.<sup>80</sup> For this a specialized knowledge of local geography was required.

## STAR-PATH STEERING

A third wayfinding technique known as star-path steering deserves exploration.

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<sup>77</sup> Luc. 8.174–85.

<sup>78</sup> The position of the sun and pole-star were paramount in Norse navigation of the Middle Ages (Marcus 1953, 120–7).

<sup>79</sup> Evans 1998, 155–6.

<sup>80</sup> For the concept of a "mental chart" in wayfinding, see McGrail 1987, 277



Ethnological studies have shown that the Polynesians developed a highly-evolved navigational system encompassing both an intimate knowledge of weather and a considerable familiarity with stars and their rising and setting azimuths.<sup>81</sup> Thus equipped, they regularly sailed without compass between 50 and 200 nautical miles on a single voyage. They knew the direction of their destination by following a series of star-risings or settings, memorized in sequence, along a particular bearing, or "star path." Destinations did not necessarily lie directly along this path, and sometimes stars abeam or astern were employed when those forward were obscured by cloud; only the most convenient and well-known stars were used. Winds and currents also affected their course, and, to compensate, they steered by keeping the guide star on either bow or quarter; the navigator, much like Lucan's helmsman above, simply used parts of the rigging to keep himself in alignment with the stars associated with his destination.<sup>82</sup>

For example, in figure 5.17, a Polynesian ship steers north by northwest, keeping the Great Bear in line with the Main Brace to starboard and *Capella* in the shrouds. Over the course of the evening, *Capella* will rise too high to be useful and the navigator will switch to another star which rises on the same or similar bearing. Evidence exists that indirectly supports the theory that ancient Mediterranean mariners understood and employed a similar system of star-path steering.

Of the constellations we have encountered so far in ancient texts, the majority lie

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<sup>81</sup> Lewis 1994, 82 ff.

<sup>82</sup> Lewis 1994, 94–7. I believe that comparisons between ancient Polynesian navigation systems and those employed in the ancient Mediterranean are relevant and productive. For while it is true that the Polynesians could sail hundreds, if not thousands, of miles over open ocean and hit their mark consistently, their inter-island voyaging was normally confined to their respective archipelagos where islands are regularly spaced between 50 and 200 nautical miles apart (see Lewis 1994, 4–6, 85–94). I find it tempting to imagine that the "guide-stars" of the Thera ships symbolized this system.

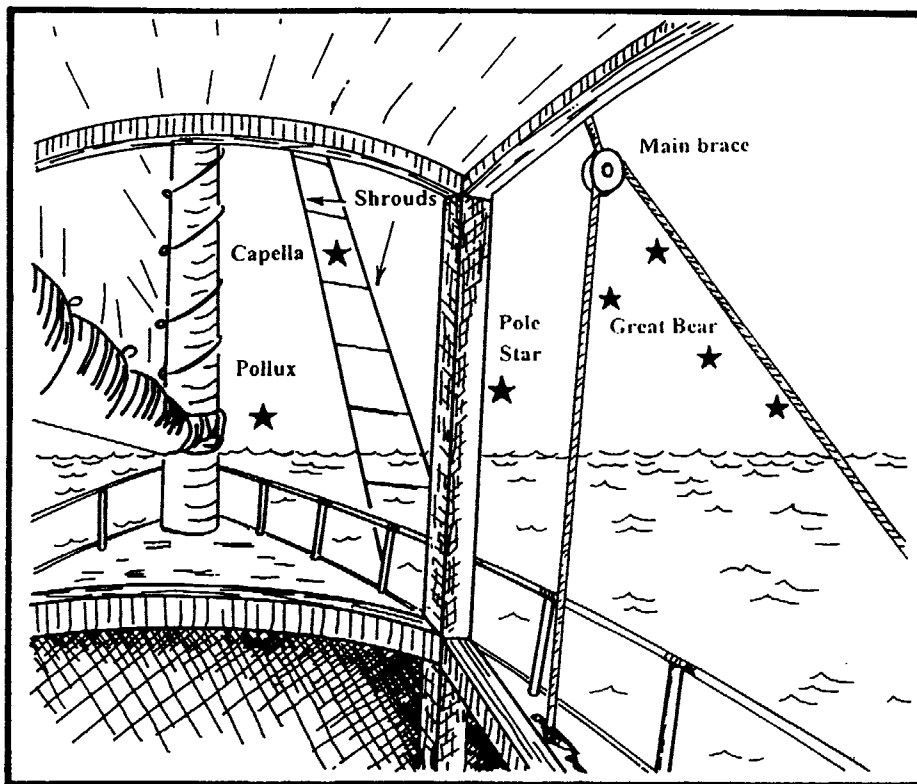


Fig. 5.17. A Polynesian ship steering north by northwest, keeping the Great Bear in line with the Main Brace to starboard and *Capella* in the shrouds. (After Lewis 1994, 91 fig. 14)

in the north: *Ursa Major*, *Ursa Minor* and *Bootes*. *Orion* and the *Pleiades*, however, are different. Because their rising and setting azimuths in Mediterranean latitudes lie at due east and west respectively, their zenith altitudes change imperceptibly with changes in latitude. Therefore, when Aratus says that "he watches for *Orion* himself to see if he might give him any hint of the measure of the night or of his voyage," he meant that *Orion*'s stars, being so prominent in the night sky, were used to steer by, especially when they were close to the horizon.<sup>83</sup> By keeping the northern stars on his left, Odysseus was steering eastward toward *Orion*, the object of *Ursa*'s gaze, and the *Pleiades*.<sup>84</sup> And indeed these constellations fit the model of a Polynesian "star path." For along an approximate bearing of 090° (due east) rose a series of high-magnitude stars, one after the other, throughout the night during the months of summer (figs. 5.18, 5.19, and 5.20):<sup>85</sup>

1. *Altair* in *Aquila* (mag. 0.76)
2. *Deneb* in *Cygnus* (mag. 1.25)
3. *Alpheratz* in *Pegasus* (mag. 2.07)
4. *Pleiades* (mag. 1.2) (cluster of 100 stars)
5. *Aldebaran* in *Taurus* (mag. 0.87)

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<sup>83</sup> In Ovid's *Ars Amatoriae* (2.55–6), Daedalus warns Icarus, while fleeing King Minos, not to "look toward the Tegean maid (*Callisto*, the Great Bear) nor sword-bearing *Orion*, companion of *Bootes*." Similarly, when Medea prepares to bid Jason goodbye, she asks: "what part of the sky I may look to, what star to reckon by to direct my gaze toward your native land" (Val. Flaccus *Argon.* 7.538–40).

<sup>84</sup> *Orion* begins its heliacal rising toward the end of June, rising earlier and earlier each morning until it is high in the midnight sky by October.

<sup>85</sup> In addition to this convenient alignment, there are others that correspond to known sea routes in antiquity—namely those between Egypt and Cyprus, which would require using circumpolar stars (forward and reverse bearings), and between Crete and North Africa using constellations along the ecliptic (although cf. Lucan 8.172–6).

6. *Betelgeuse* in *Orion* (mag. 0.45)
7. *Procyon* in *Canis Minor* (mag. 0.40)
8. *Regulus* in *Leo* (after September 1) (mag. 1.36)

For *Orion* and the others to be used effectively as guides on this “star path,” however, required not only a knowledge of their rising and setting bearing, but also a realization that they rise obliquely to the horizon; within two hours of *Orion*’s rising, for instance, it ascends 30 degrees and shifts 30 degrees south of east. Thus, in order for the navigator to steer a true easterly course, he would have been forced to transfer his reference from star to star along that path once they reached a certain altitude. (The Polynesian practice was to shift to another star once it rose approximately 15° above the horizon, although east-west constellations, such as those listed above, could be used much longer.<sup>86</sup>)

While these stars served to indicate due east, they also denoted west by their reverse (or back) bearing, much as landmarks were certainly used upon departure. Thus were all four quarters of the sky represented, sufficient enough for the seafarer to steer more oblique courses by maintaining a star’s position in relation to the ship’s rigging, as in figure 5.17.

The whole question of the use of stars for nocturnal navigation in antiquity hinges on two considerations. Did that culture have a history of stellar observation, and if so, can any other evidence be found that links this celestial knowledge with seafaring? During

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<sup>86</sup> Lewis 1972, 97–8.

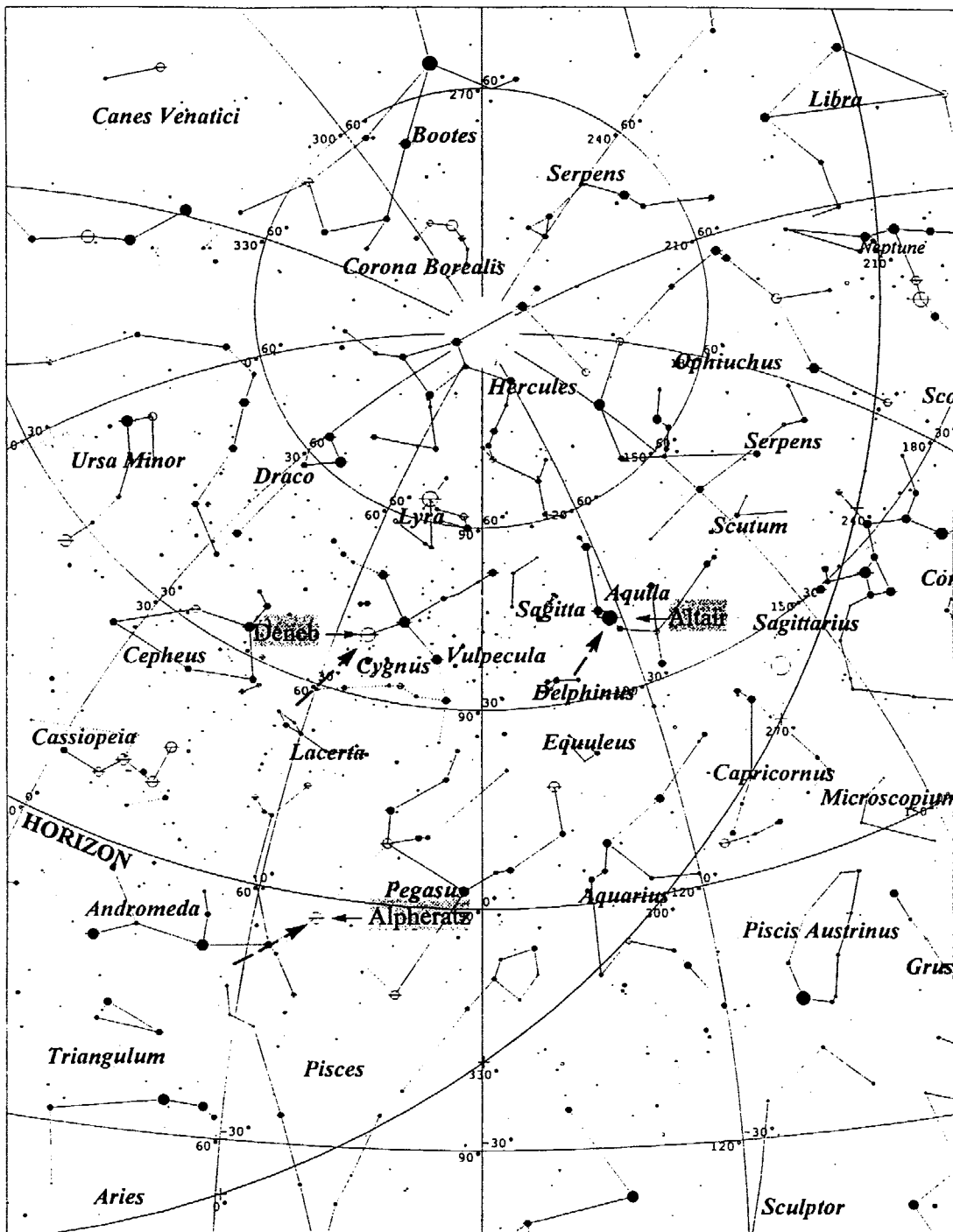


Fig. 5.18. Prominent stars that rise on a bearing of 090 degrees (due east) over the course of a summer evening in the region of Crete, ca. 500 B.C.

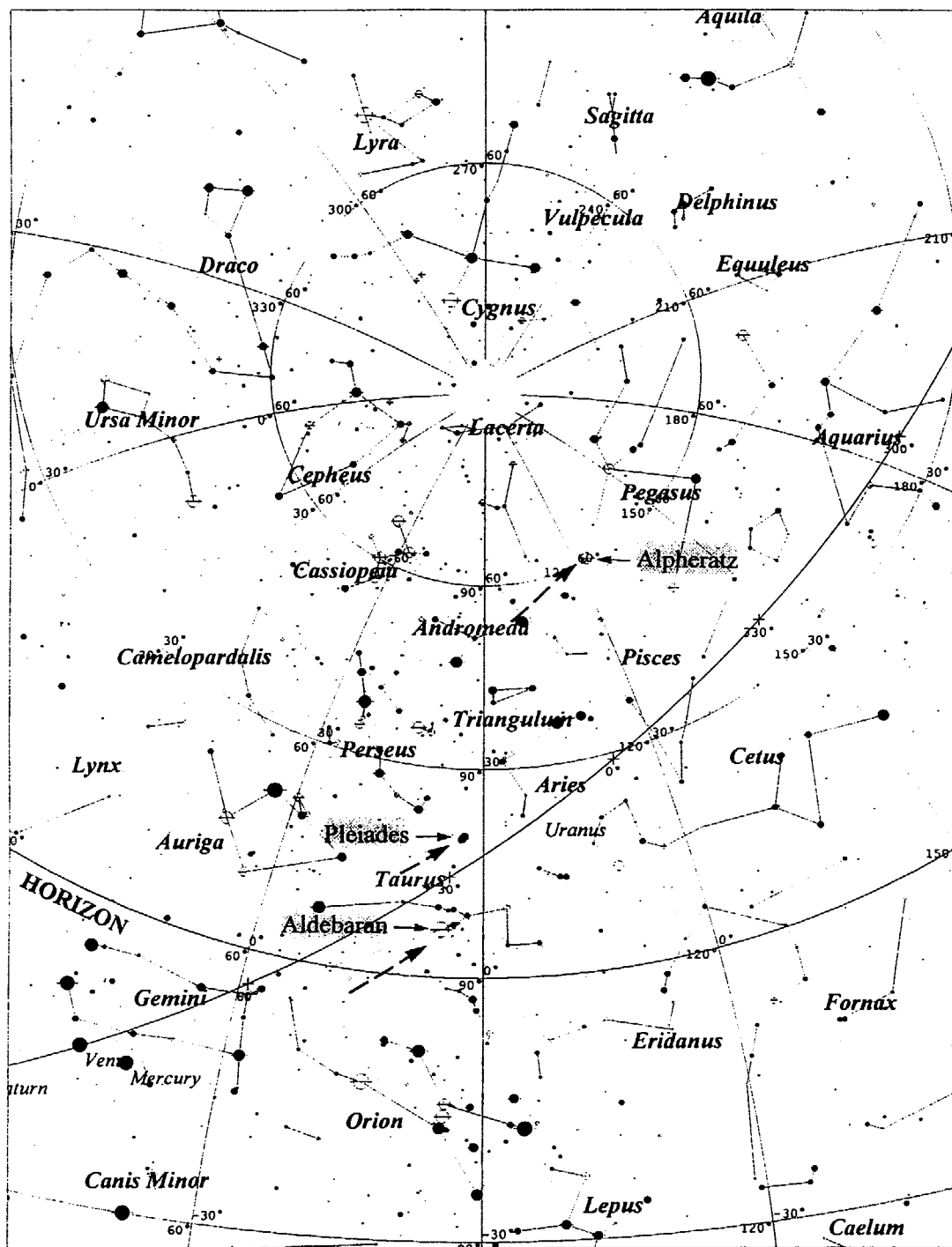


Fig. 5.19. Prominent stars that rise on a bearing of 090 degrees (due east) around midnight in the region of Crete, ca. 500 B.C.

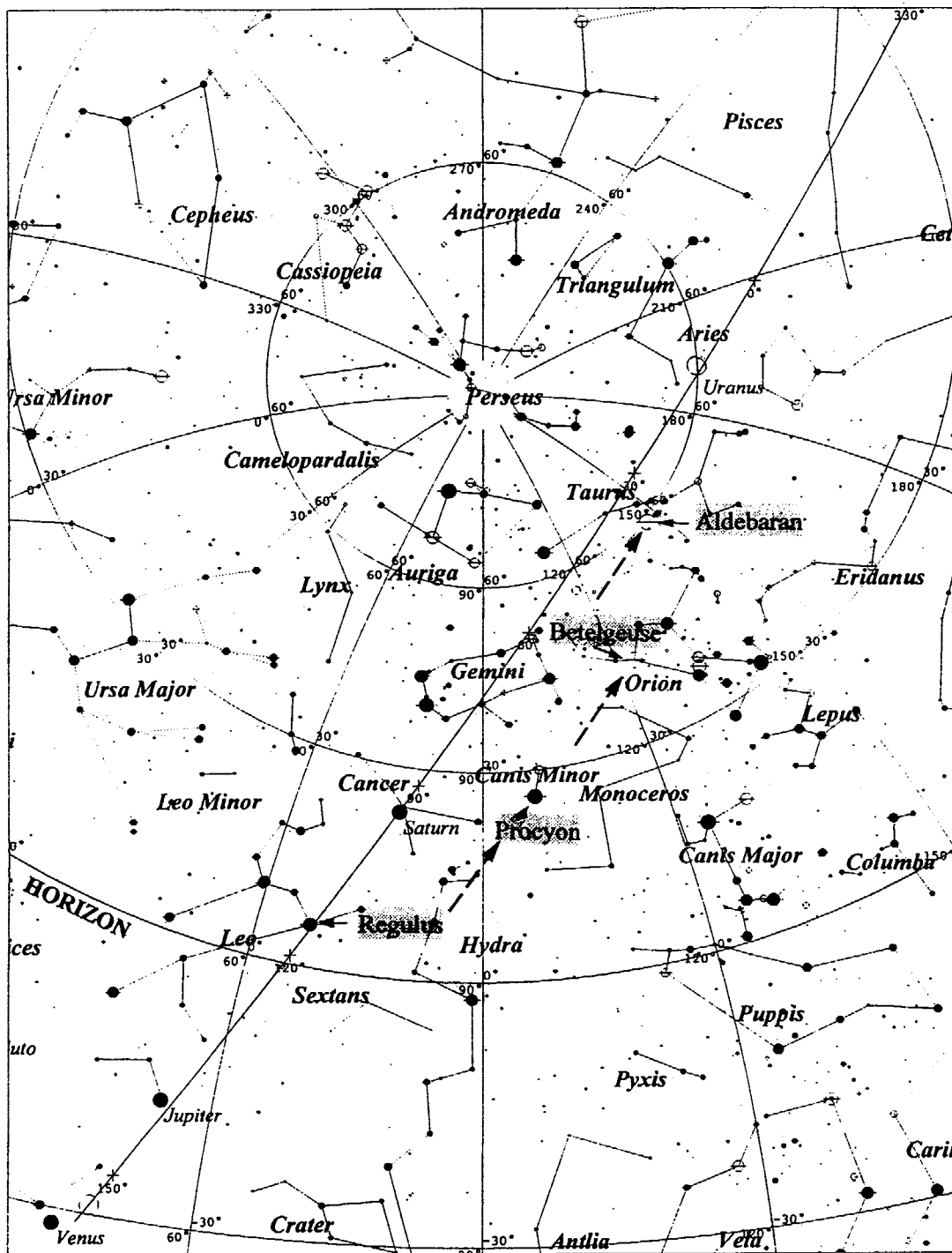


Fig. 5.20. Prominent stars that rise on a bearing of 090 degrees (due east) during the early morning in the region of Crete, ca. 500 B.C.

the Bronze Age, Egypt and her Levantine neighbors offer very little affirmation.

However, in the case of Cycladic islanders, Minoans, and Mycenaeans, the answer to both questions can be answered, at least tentatively, in the positive. Celestial and nautico-celestial motifs on the Thera frescos, Minoan and Mycenaean seals and signet rings—in concert with archaeoastronomical evidence—demonstrate their preoccupation with seafaring and the night sky. Indeed the constellations themselves appear to have been invented (by farmers or by seafarers?) in the Aegean during the Bronze Age. The cycles of the heavens were well understood by priestly castes and farmers who used risings and settings of certain stars to foretell periods of reaping and sowing, as is well-documented in later periods. And it is likely that this common wisdom spilled over into the realm of seafaring. In both the Aegean and the Eastern Mediterranean, geography and weather played no minor role in compelling overnight voyages, voluntary or otherwise, on the longer routes—especially before the advent of sail and the resulting expansion of trade connections. Whether coasting or on the open-sea, stars provided one of the very few means for accurate course steering. The later Phoenician practice of measuring the height of the pole star to determine a north/south position likely had its beginning during the Late Bronze Age, when ships were criss-crossing the Eastern Mediterranean in greater numbers.

After the Late Bronze Age, any reservations as to the extent of nocturnal voyaging dissolve. For during the Graeco-Roman period, literature abounds in such references, offering incontrovertible proof that Phoenicians, Greeks, Romans, and their contemporaries not only made frequent overnight voyages, but also utilized certain stars to find their way in the darkness. Exactly *how* they employed stars in wayfinding,



however, is open to debate, and there may have existed several systems of celestial navigation. Many ancient sources attest to the usage of circumpolar stars for orientation. By the Hellenistic period, if not earlier, Phoenicians and Greeks measured the altitude of circumpolar stars to determine their north/south positions, the former favoring *Ursa Minor*, the latter *Ursa Major*. In addition to orientation and nothing/ southing practices, I propose that seafarers from those regions under discussion also employed stars in ways similar to Polynesian "star-path steering" practices. *Orion* and the *Pleiades*, for example, both constellations that rise due eastward at night during summer, have no place in orientation, nor do they reveal north/south positions. However, the fact that they rise and set on the eastern and western horizons suggests their use as guide-stars. Other, less well-known stars and constellations rising and setting in and outside the zodiac may have been used as well.

## CHAPTER VI

### ANCIENT NAVIGATIONAL SYSTEMS: A SYNTHESIS OF THE EVIDENCE

#### INTRODUCTION

As we have seen, the Eastern Mediterranean did not necessarily lend itself to simple navigation. Even routine voyages were fraught with unknowns, and only a seafarer's mastery of navigational knowledge—including geography, the behavior of winds, waves, currents and the vessels reaction to them, and restrictions often placed on visibility—served to make maritime travel more feasible and desirable than travel by land and its accompanying worries. That there was a general concern for safe and effective navigation in the ancient world is manifest in the invention of instruments, the recognition and erection of external aids, and the utilization of celestial phenomena. As difficult as it may be to interpret the disparate evidence in terms of navigational systems, that is *how these aids were used in concert during any one voyage, during any one age*, it is nevertheless worth the attempt. For how else are we to know *by what means* Aegean civilizations communicated with Egypt during the Bronze Age, or Cyprus with Phoenicia during the Iron Age, or Egypt with Rome during the Roman era? This chapter is an attempt, albeit a tentative one, to construct navigation systems, age by age, from the available evidence.

## IMAGINING ANCIENT SYSTEMS OF NAVIGATION: A MODERN VIEW

In nineteenth- and twentieth-century scholarship, a view of ancient seafaring developed which portrayed ancient seafarers as fearful and superstitious, incapable of sailing the open sea safely, or even at all; they kept the coast in sight at all times as they sailed headland to headland within the limits of daylight, unable to sail more than a day without beaching or dropping anchor.<sup>1</sup> This pervasive notion was perhaps best reflected in A. Thomazi's *Histoire de la navigation* (1947):

Ancient peoples were mediocre sailors who were so afraid of the sea that they took every possible opportunity to travel by land. They would never sail at night unless they absolutely had to. As a general rule, as soon as the sun went down they returned to the closest shore, beached their ships, and would not set out again until the next morning; thus they had no experience in plying the open seas.<sup>2</sup>

Three years later, A. Furumark, in discussing Aegean trade with Egypt during the Late Bronze Age, stated:

[A]ncient sailors did not, if they could possibly avoid it, cross the open sea, but kept to the coasts. All traffic between Crete and Egypt must, consequently, have gone *via* the Asiatic coast, and it is, *per se*, quite conceivable (*sic*) that Cretan ships never went further than to Phoenicia

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<sup>1</sup> Semple 1931, 584–5.

<sup>2</sup> Thomazi 1947, 23; cf. Rougé 1981, 12.

and that connexions with Egypt were indirect.<sup>3</sup>

In 1976, the views of both Thomazi and Furumark could still be found in the *Oxford*

*Companion to Ships & the Sea:*

So far as it is possible to reconstruct the distant past, all the earliest navigation was purely coastal, ships relying entirely on visual contact with the shore. For several thousands of years after man first ventured to sail on the sea there were no aids to his navigation; no compass or other navigational instruments, no chart or map, no means of measuring distance at sea. The ships of this earliest period crept around the coasts, and if they were blown out to sea by storms, or hidden from the sight of the shore by fog, they were lost until again they sighted the coast.<sup>4</sup>

As we have seen, their deductions were at once anachronistic and uninformed. If it is possible to trace the pathways to their conclusions we might infer (a) that open-sea navigation in antiquity was impossible due to the absence of instruments absolutely essential to today's navigator, such as the compass, chart, and log, and (b) that ancient records describe only coastal navigation. If we were to read Strabo, Pliny and the authors of numerous *periploi*, we would find the former view heavily buttressed by the latter. Yet, as has been shown in the preceding chapters, it is dangerous to base the navigational skills of ancient peoples on geographies and *periploi* alone, for their purpose was not necessarily to illuminate navigational practices, but rather to describe known and unknown lands along the seacoast and the distances between cities and headlands in order to construct a comprehensive scheme of the known world. In this sense they were more a gazetteer than a sailing guide.

Other scholars dared to look beyond the anachronisms, anecdotes, and

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<sup>3</sup> Furumark 1950, 223.

<sup>4</sup> Kemp 1976, 577.

monochrome estimations. For instance, open-sea and night-time sailing and wayfinding methods as practiced by Greeks and Phoenicians are a topic of extended discussion in E.G.R. Taylor's *The Haven-Finding Art* (1971). And J. Rougé, in his work *Ships and Fleets of the Ancient Mediterranean* (1981), states:

During the classical period sailing was done by night as well as by day...The common modern conception comes from an inaccurate generalization about certain passages in the *Odyssey* and from the operations of warships. A careful reading of Homer's poem reveals that ships are not systematically beached and that, when this is done, they are unloaded before being hauled up on land, which makes it necessary to reload them once they are refloated. In other words, that can only have been done for small craft, and not with large, heavily loaded ships. Even though what may be a whole series of Phoenician ports of call along the Magreb coast, about a day's sailing distance apart, have by chance been discovered, this does not mean that the Phoenicians navigated these coasts exclusively in consecutive, one-day stages.<sup>5</sup>

While the ideas of Taylor and Rougé have withstood scholarly scrutiny, theirs is a quiet voice in a sea of persistent and inaccurate anecdotes. More than a decade after their studies, P. Johnstone, in *Sea-craft of Prehistory* (1988), spoke for the whole of prehistory when he stated: "the usual practice [of navigation] was to beach the ship at night. This is confirmed by the absence of any means of cooking aboard the fourth century BC Kyrenia merchant ship excavated from the seabed off Cyprus."<sup>6</sup> Most recently, A.B. Knapp followed the *Oxford Companion*, stating that "meteorological conditions combined with the technological limitations of ancient-Medieval merchant ships meant that the preferred shipping routes were always situated along the coast and chains of

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<sup>5</sup> Rougé 1981, 14–15.

<sup>6</sup> Johnstone 1988, 81; this was echoed the same year by Clayton (1988, 147) in his description of the primary use of the Pharos's light. He states that the flame was needed more during the day than at night "since sailing at night was avoided in antiquity."

islands in the north Mediterranean.”<sup>7</sup> And yet the evidence for open-sea and night-time sailing in antiquity was there all along in offhand comments in the pages of Thucydides, and in the poetry of Ovid and the satires of Lucian.<sup>8</sup> Even Homer, the source used most often on the subject, wrote on these topics.<sup>9</sup> Furthermore, Johnstone’s negative archaeological evidence should be called into question on account of the recent discovery of butchered meat remains, presumably salted for preservation, stored in amphoras aboard the fifth-century B.C. shipwreck at Tektaş Burnu.<sup>10</sup> This clearly demonstrates that food storage was a concern on multi-day voyages. Perhaps, then, we should calibrate our ideas of maritime space and navigation to the archaeological and literary evidence compiled in the preceding chapters. How did ancient seafarers envision and manage their maritime environment? What systems of navigation did they employ and when?

## IMAGINING ANCIENT SYSTEMS OF NAVIGATION: A VIEW FROM ANTIQUITY

### The Neolithic System

Navigating the Neolithic Mediterranean was, in general, dependent on two factors: cumulative navigation knowledge (acquired through natural observation and experience) and the sturdiness of Neolithic vessels. Evidence for the former is wholly absent as there are no data even for the volume of Neolithic maritime traffic; and we have absolutely no

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<sup>7</sup> Knapp 1997, 155.

<sup>8</sup> On literary evidence for night-time sailing in antiquity, see pp. 165–7, esp. n. 54.

<sup>9</sup> On Homer and night-time sailing, see above p. 168–9.

<sup>10</sup> Carlson 1999, 7–8, fig. 13.

evidence of the latter. Even so, the geographical parameters of inter-island travel and the evidence from foreign finds allow for some general observations and deductions. If we accept Tzalas's informed theory that the vessels of the Neolithic were likely composed of papyrus reeds and other primitive materials (the product of a Neolithic toolkit), then we may safely infer that they were rowed or paddled;<sup>11</sup> some had to have been able to handle heavy cargoes of domesticated animals, especially in colonizing efforts as Broodbank has shown.<sup>12</sup> Sailing with the coast and its familiar natural features in view, otherwise known as piloting, was certainly preferred, but coastal piloting was not always a choice in the case of insular destinations. If the intended destination (an island, mountain peak, or headland) was in sight at the departure point, then progress could be easily ascertained (adequate visibility permitting) and the course corrected for leeway caused by winds. The point of departure would have been noted, and a near constant check of a back-bearings would have proven a useful gauge for course maintenance. Although Mediterranean currents are often considered negligible, it is well to note that Neolithic paddled craft, at their slow rate of travel, would have been affected greatly by even slight currents.<sup>13</sup> And thus adjustments had to be made even when transiting from point to point over short stretches. When faced with an open-sea crossing in the Aegean or Levantine basin, Neolithic seafarers were at a distinct disadvantage if inclement weather or even moderate winds and seas developed, for their craft apparently lacked sails for convenient directional control and likely retained a low freeboard.

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<sup>11</sup> Tzalas 1995.

<sup>12</sup> See p. 45, notes 11–12.

<sup>13</sup> Tzalas 1995, 451–3; Broodbank 1989, 333; Broodbank and Strasser 1991, 241.

If the destination was a low-lying one, such as the shores of North Africa or Gaza, the presence of seabirds that never stray far from land would have provided a directional indicator, or at least a sign of land's proximity. Other directional indicators could be read from swell and wave direction, and the angle at which they encountered the hull. Considering the slow speed of paddled and rowed craft, it is reasonable to infer that some voyages required more than the span of a day's light to complete, even in the Aegean. Crete for example, which was one of the first islands colonized in the Neolithic period, lies between 16 and 26 nautical miles respectively from its western and eastern neighbors. Thera, the closest Cycladic island from Crete, lies nearly 50 nautical miles distant: a journey from here in the Neolithic period would have hugged the margins of daylight or mandated at least one night of voyaging.

Rock art from Naxos, which depicts recognizable constellations, demonstrates that Neolithic peoples of the Aegean grouped together certain stars that lie along the ecliptic, forming, in effect, the earliest signs of the zodiac; these star-groups were likely memorized and employed as orientation devices at sea on longer voyages. Similarly, the easily-recognizable circumpolar stars were likely used as a night-time constant by which all other directions were measured. In the summer, the rising and setting sun would have proven useful. In the evening, Venus would have proven useful as well, especially toward fall when it trails the setting sun for approximately one hour, thereby offering somewhat of a constant before the other stars are bright enough to identify.

### **The Bronze Age System**

Although there is more evidence from foreign trade for wide-spread voyaging during the



Bronze Age, identifying the actual wayfinding techniques of the age proves nearly as difficult as the Neolithic period. As in the Neolithic, however, we may apply meteorological parameters to ships that were certainly an improvement over their Neolithic forerunners, an observation borne out by the numerous iconographic depictions of ships in the Aegean area, Egypt, and along the Levantine coast. While we find sophistication in the paddled (if not oared) vessels of the Early Cycladic II period, as represented on “frying pans,” the sail’s invention toward the very end of the Early Bronze Age, and even earlier in Egypt’s Nile valley, marked the watershed event that led to larger vessels making longer voyages with smaller crews at less expenditure of energy for motive power. Soon after its invention came the crow’s nest, which makes its debut, perhaps on Syro-Canaanite ships, as a navigational instrument. Pilots of coastal sailing vessels began to sniff the offshore breezes, learning quickly which prevailing and diurnal winds, in addition to the sailing characteristics of ships, helped to demarcate the safer sea lanes. The *Etesians* ensured that southward sailing was simple and painless. Seafarers making the return trip could take in morning and evening breezes, which often blow in the opposite direction of prevailing winds, or they could resort to oars until shelter could be found or until the wind shifted.<sup>14</sup> In the open Levantine basin, the longer distances between landfalls ensured that seafarers would take advantage of, and indeed be subject to, prevailing winds.

The route between Crete and Egypt’s Nile Delta, a seemingly routine one after the Middle Minoan period, was perhaps the most demanding. Although *Etesians* would

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<sup>14</sup> Watrous 1992, 178.

have been used for the entire voyage, the inordinate distance of about 350 nautical miles prescribed at least four days and nights of non-stop voyaging out of sight of land—or longer if caught in a calm. This is the point at which piloting, that is steering by coastal aids, becomes navigation—the art of wayfinding on an open sea, out of sight of land. On this route,<sup>15</sup> a number of navigational aids and informed guess-work (otherwise known as dead-reckoning<sup>16</sup>) must come into play: course maintenance by day was achieved by vectoring at a prescribed angle to the prevailing northerly winds. As winds shifted from northerly to westerly over the course of the voyage, notice of their change was taken from other external clues—position of the mid-day sun and its relation to swell direction—and the course adjusted accordingly. At night, in the absolute absence of useful light and when the wind abated, the helmsman must have been adept at feeling the pitch and roll of the ship in the peaks and troughs of swells in order to continue maintaining a course at the prescribed angle to them. Stars and constellations provided convenient orientation and, on this and other routes, likely served as markers for star-path sailing. At all times, lest he miss his mark by several miles, the seafarer had to account for leeward drift caused both by wind acting on his ship's sail area and by minor currents: ships of the Bronze Age, insofar as we know, had little or no projecting keel to counteract these forces, and yet the management of and compensation for set and drift played a crucial role in the ability of ancient craft to sail effectively over large expanses.<sup>17</sup>

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<sup>15</sup> See pp. 59–63.

<sup>16</sup> The term “dead-reckoning” is derived from “deduced reckoning” and is the method used to determine geographical position when out of sight of land by accounting for known or estimated speed, course bearing (direction), and elapsed time.

<sup>17</sup> Pulak 1999; Wachsmann 1998, 52–3, 241–3; Hocker 1998.

The shores of North Africa would have been sighted only some ten nautical miles out on a clear day (or less depending on the height of the mast or crow's nest). If landfall occurred at night, the position of the pole-star, growing steadily lower in the sky as one journeys south, may have indicated the approach of shoal water; soundings would then confirm or contradict suspicions. Once landfall was achieved, a knowledge of local geography and birds would have been indispensable for determining position east or west of the Nile Delta. The discoloration of the sea caused by the silt-laden outfall of the Nile would have served as a positive indication of geographic position, and so too would the presence of local fishing and trading vessels. If landfall was achieved too far to the west, however, a ship could count on very few anchorages. By the Late Bronze Age, one trading depot west of the Nile Delta, that at Bates's Island near Marsa Matruh, served as a revictualizing and minor trading station for just such traffic. Setting out for the Delta from here was simply a matter of heading for open sea where the prevailing westerlies, onshore/offshore winds, and an eastward-setting current could be harnessed for the trip toward the Nile's brown waters and green shores.

### ***EXCURSUS: CLOCKWISE OR COUNTER***

#### **CLOCKWISE IN THE LATE BRONZE AGE?**

Exactly how a ship returned to the Aegean from Libya and Egypt has been a matter of controversy in studies of Bronze Age trade. It is commonly believed that seafarers of this period were forced by weather patterns and by the limitations of the period's sailing rigs to sail a counter-clockwise route between the Aegean, Egypt and the Levant. From iconography we know that seagoing ships from each region boasted a clumsy, boom-

footed sail, whose rigging did not allow the sail to be shaped geometrically, as was the case later in the Iron Age when ship designers dispensed with the boom and invented the brailed, loose-footed sailing rig: in this case shortening or shaping the sail simply required pulling a certain number of brailing lines that fronted the sail. Taking in sail on a boom-footed rig of the Late Bronze Age, on the other hand, would have entailed *lowering the yard* and allowing slack canvas to pile up loosely atop the boom—a highly improbable scenario, if not an impossibility.<sup>18</sup> Rather, if less sail area were required (due to increased wind speed for instance), the large sail was exchanged for a smaller one, as an Egyptian tomb painting at Beni Hassan demonstrates.<sup>19</sup> The Bronze Age rig, with its limited-weather capability, made it difficult to sail even on reaches, especially since these hulls appear to have had very little wetted surface area to prevent leeward drift. Thus, sailing directly from Egypt to the Aegean in the teeth of the *Etesians* appears to have been unlikely if not impossible. The more likely return route, and one that seems more feasible with such a rig, was one that, like the Mediterranean's general current, proceeded toward the Levantine coast, skirted Cyprus, paralleled the coast of southern Asia Minor, terminating finally in the eastern Aegean near Rhodes—a route commonly attested from Homer forward.<sup>20</sup>

This “traditional view” has remained unchallenged until recently when L.V. Watrous posited that a clockwise route could and did exist in the Bronze Age.<sup>21</sup> Among the reasons that led Watrous to this conclusion were the presence of a number of

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<sup>18</sup> Contra Georgiou 1991, 66–9, fig. 23.

<sup>19</sup> Casson 1995, 21; Wachsmann 1998, 248–9, fig. 11.3; 2000, 808–9, fig. 4.

<sup>20</sup> Hom. *Od.* 14.285–300; discussed also in Bass 1967, 163–8; 1973; McCaslin 1980, 102–7; Wachsmann 2000, 813–15.

<sup>21</sup> Watrous 1992, 177–8.

Egyptian artifacts found at Kommos, a Middle to Late Minoan port city in south-central Crete, the so-called presence around Crete of a predominant southwest wind, the *Livas* (ancient *Lips*) in September, and relatively recent reports of sailing ships transiting this route.

To Watrous's first point I would simply reiterate that pottery cannot conclusively provide an accurate vector of trade.<sup>22</sup> Kommos could just as easily have received Egyptian goods from ships transiting the counter-clockwise route via Cyprus; the Uluburun shipwreck, bound presumably for the Aegean, provides evidence of such a route with its multinational cargo, including trinkets from Egypt.<sup>23</sup> Watrous's second point is not borne out by a century of weather data collected (at sea!) by the U.S. Naval Weather Service Command. In fact, as discussed above, northerlies dominate the Central Levantine Basin from March to December; only in April, May and October do southerlies vie with northerlies, and even then for only a few days at a time.<sup>24</sup>

His third point deserves more attention. Watrous cites B. Randolph, a seventeenth-century traveler, as a relevant source to bolster his view of a direct route between Egypt and Crete. Randolph writes: "for while I was there [at Ierapetra], they carried away a *Saike* which came from Alexandria."<sup>25</sup> Watrous first assumes that the *saike* sailed *directly* from Alexandria, for he states in his argument that an "A.D. seventeenth century account...records the arrival of a ship at Ierapetra...which had sailed there from Alexandria."<sup>26</sup> But Randolph's statement can be interpreted in two ways.

<sup>22</sup> See above pp. 41–3.

<sup>23</sup> See above pp. 69–70.

<sup>24</sup> U.S. Naval Weather Service Command 1970, 8, 200, table 9; see above pp. 18–22.

<sup>25</sup> Randolph 1983 [1687], 74.

<sup>26</sup> Watrous 1992, 178.

First, if we agree with Watrous that our observer's statement reflected an Alexandria-to-Crete route, then we should examine further the uses and abilities of a *saike*, about which some facts are known. Or, second, we assume that Randolph was referring to a ship of Alexandrian type, not a route, one that traded in the Eastern Mediterranean and had somehow found its way to the south shore of Crete, probably via the counter-clockwise route from Egypt.

Most naval historians would, like Watrous, rule out the latter suggestion because the so-called *saike* (or *saic*) was a highly maneuverable ketch common in the Eastern Mediterranean between the seventeenth and nineteenth centuries. These fore-and-aft rigged vessels consisted of two masts (a main and a mizzen) and a short bowsprit with two or more head sails, enabling it to sail in almost any direction it pleased. It, unlike its Atlantic counterpart the *caïque*, lacked a top-gallant and mizzen-top-sail, thereby limiting its driving speed without affecting its maneuverability. Thus the question of whether or not it came directly from Alexandria to Crete is irrelevant. A description by Glanville in 1625 clarifies its abilities: "Catches, being short and round built, [are] very apt to turn up and down [in relation to the wind] and useful to go to and fro, and to carry messages between ship and shore *almost with any wind*."<sup>27</sup>

Is the corollary, then, that Watrous proposed between Bronze Age ships and those of the seventeenth century A.D. an apt one, even with the limited knowledge we have of the former? Should we remodel our theories concerning direction of contact in the Eastern Mediterranean of the Late Bronze Age without taking into account questions

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<sup>27</sup> Kemp 1976, 447 (my italics).

of weather and seafaring technology? Clearly the answer is no, although, in point of fact, others followed Watrous on this line of reasoning, accepting *prima facie* that if sailing ships of the recent past could sail the direct route between Egypt and Crete, so too could Bronze Age ships.<sup>28</sup> In reality, however, as Casson, Murray, and Wachsmann have shown, the *Etesians* prevented ancient, square-rigged ships from sailing certain routes.<sup>29</sup> That sea routes were geographically regulated by the whim of wind and wave finds no dearth of parallels throughout history: witness, for example, the Age of Discovery and its dependence on trans-Atlantic wind regimes.

Dropping the question of sailing technology and weather patterns for a moment, let us consider the possibility, as Watrous did, that merchant ships of the Late Bronze Age simply rowed directly between Egypt and Crete, thereby bypassing the Levantine coast and Cyprus and saving countless miles and days of travel.<sup>30</sup> While there is little doubt that the larger merchant vessels of the period possessed oars for limited maneuvering near shore and in harbors, the actual expenditure of energy to move a ship filled with several tons of cargo any significant distance, against a constant, ten-knot headwind, is difficult to imagine:<sup>31</sup> moreover, the direct route from Egypt to Crete spans nearly 350 nautical miles and cannot be compared to a system of rowing in the Aegean, where distances are certainly more manageable and rest-stops more readily available.<sup>32</sup>

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<sup>28</sup> Warren 1995, 10; Cline 1994, 91.

<sup>29</sup> Casson 1995, 270–8; Murray 1987, 139–40; Wachsmann 1998, 371, n. 35; see also Pryor 1995.

<sup>30</sup> Watrous 1992, 178.

<sup>31</sup> Vercoutter 1954, 16; McCaslin 1980, 103.

<sup>32</sup> Pulak (1999, 210) estimates the tonnage of the Uluburun ship (ca. 1300 B.C.) at about 20 tons, and Bass (1999, 22–3) believes that the Cape Gelidonya shipwreck (ca. 1200 B.C.) was of similar length, although it was carrying only a little over a ton of cargo, mostly metals, when it sank.

The use of rowed vessels certainly cannot account for the volume of internationally traded goods during the Late Bronze Age. In further defense of the “traditional view,” we need look no further than parallels from the Graeco-Roman period, when ships with sailing rigs and hull shapes much-improved over their Bronze Age forerunners nevertheless opted, more often than not, for the counter-clockwise route from Egypt to the Aegean—not out of any necessity to hug the coast, but because weather and currents combined to make this route much more safe and less damaging to the ship and its equipment.<sup>33</sup>

### **The Iron Age System and Its Successor**

With the advent of the Iron Age, improved sailing rigs, in concert with ever deepening keels, allowed ships to sail closer to the wind than ever before, thus opening up a profusion of sea routes heretofore inactive.<sup>34</sup> At this time direct transits between Egypt and North Africa, an unfrequented route during the Bronze Age, were made much easier, as witnessed by the colonization of Cyrene by Therans.<sup>35</sup> Nevertheless, the counter-clockwise route of the former period remained active throughout the ancient period and into the Medieval period.

By the seventh century B.C., if not earlier, Greeks were sailing to and from Egypt

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<sup>33</sup> E.g., Lucian *Nav.* 7–9.

<sup>34</sup> With regard to new Iron-Age routes, Wachsmann (1998, 331, n. 1; 2000, 809–10) draws attention to the acute observation made by Liverani (1987, 70), who states: “As for sailing techniques, I personally am not aware of precise innovative elements introduced about 1200 B.C. which could be said to characterize Iron Age I shipping in contrast to Late Bronze Age navigation. However, I am strongly inclined to postulate some such innovation, since we get the impression of a sudden widening of sea routes and of a technical and operative freedom.” This innovation was the brailed rig, which perhaps forced the evolution of the wine-glass shaped hull as ships headed more and more into the wind and tried to prevent the “new” problem of leeward drift.

<sup>35</sup> Hdt. 4.151–62.



and the Levant with some regularity and had acquired a comprehensive knowledge of the basin's geography. Thus we find early in their history that the Greeks distinguished between *pelagos*, a semi-enclosed sea, and *thalassa*, the open main.<sup>36</sup> Sailing the *pelagos* entailed voyages between islands or from coast to coast in such areas as the Aegean, the Adriatic, or the waters north and east of Cyprus. Though these seas were relatively small in area compared to the *thalassa*, land could and did fall out of sight due to poor visibility.<sup>37</sup> Shelter from quickly-developing weather rarely lay far away, although certain areas within the *pelagos* were notoriously fierce at certain times of year.<sup>38</sup> The relatively minor Icarian Sea north of the Cyclades, for example, received in epic poetry some recognition for its fickle winds and waves.<sup>39</sup> In this and other areas, inclement weather could disrupt passages normally accomplished within the hours of daylight. In an age nearly devoid of lighthouses, or indeed of candlepower of sufficient luminosity to be seen from any distance at sea, these coast-to-coast routes, especially on moonless nights, could only have been completed with some knowledge of the stars, even if only the circumpolar constellations for orientation.<sup>40</sup> Local traffic around the shores of the *pelagos* included naval ships, fishermen, ferrymen, and local merchants, among others.<sup>41</sup>

Thalassic seafarers, on the other hand, wind and weather allowing, routinely set

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<sup>36</sup> Bartoloni 1988, 72; the name "Mediterranean" occurs first in the pages of Solinus from the third century A.D. (Warmington 1934, xx, n. 1); in antiquity the open main was referred to simply as "the Inner Sea" or "Our Sea" (Strabo 2.5.18).

<sup>37</sup> On visibility in the Eastern Mediterranean, see above pp. 24–31.

<sup>38</sup> Hom. *Il.* 2.144–6; Hom. *Od.* 3.299–300; Hdt. 4.152; Thuc. 7.50; Alciphron *Letters to Fishermen* 10.3.

<sup>39</sup> See for example Antiphon, *On the Murder of Herodes* 20–1.

<sup>40</sup> See above pp. 140–2, 168–76; cf. Green 1997, 356–7 and Lucian *Nav.* 7.

<sup>41</sup> The Tektaş shipwreck was carrying mostly Pseudo-Samian amphoras and other local pottery shapes when it slammed into the cliffs and sank at Tektaş Burnu in western Asia Minor (see above p. 53).

out across blue water on longer trading voyages, often preferring to save time and effort by taking the direct route, rather than subjecting themselves and their ships to prolonged journeys and the accompanying pitfalls of coasting. As we have seen already, evidence for thalassic routes exists as early as the Neolithic in some parts of the Mediterranean, and extends well into the Roman period when Alexandrian grain ships struck out across open water between Ostia and Alexandria.<sup>42</sup>

Navigating thalassic routes clearly required more knowledge than for pelagic routes: for the former a commanding knowledge of both pelagic and thalassic routes, wind-regimes, currents, and coastal geography was required in order to navigate safely in both areas. Iron Age systems of navigation, then, concern both categories, and indeed contemporary literature makes it abundantly clear that the more hazardous components of navigation—sailing at night, in inclement weather, and during winter—took place in both spheres, and often by one and the same ship during a single voyage.<sup>43</sup>

As in the Neolithic and Bronze Ages, seafarers of the Iron Age and its successor harnessed as many clues from the maritime environment as possible. To this end, we first read of “navigational instruments.” The sounding lead finds its first literary mention. For the first time man-made aids to navigation, attested both in literature and in archaeology, were erected to provide navigational guidance along well-trafficked routes. Crow’s nests, a Bronze Age invention, continue in use as lookout and weapons platforms. Testimony of wayfinding concepts appears in a body of sea lore and various offhand mentions from the fourth and third centuries B.C. onward. Some authors treated

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<sup>42</sup> See Casson 1995, 297–9

<sup>43</sup> *Acts* 27; Lucian *Nav.* 7.

the behavior of birds as harbingers of good or bad weather and the appearances of certain stars/constellations as signs of seasonal change. Certain stars find employment in open-sea orientation and course-steering. The lateral-view of coastal geography eventually changed into plan-views as geographers, aided by well-traveled seafarers, began to create charts and sailing-directions (*periploi*).<sup>44</sup> Strabo, for example, tells us that Sicily (Gr. Σικελία) was formerly known as *Trinacria* (Gr. Τρινακρία), or Three Capes, and describes the island as “triangular in shape.”<sup>45</sup> A series of fourth-century B.C. coins from Ionia represent in relief the city of Ephesus and its hinterland from a bird’s eye view.<sup>46</sup> Whether seafarers had access to nautical charts or maps representing significant areas of coastline has not been established, nor if they had carried anything similar on board. The notion, however, is not outside of the realm of consideration.

Nocturnal sailing took place on both short and lengthy voyages. Seafarers of each region developed celestial navigation systems or continued the Late Bronze Age system. Each region benefitted from a growing tradition of astronomy as a branch of philosophy. Whether Phoenician, Greek, and Roman navigators pooled their astronomical knowledge is difficult to ascertain. It is apparent from the literary record, however, that seafarers from these regions used either *Ursa Major* or *Ursa Minor* for orientation and as indicators of north and south. Although our evidence for star-path sailing comes primarily from Greek sources, it is likely that all seafaring cultures of the Iron Age and

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<sup>44</sup> Although ancient charts remain elusive, maps have existed since before the Late Bronze Age. The Turin Papyrus from Egypt (ca. 1150 B.C.), for example, accurately depicts the topography and geology of the Wadi Hammat area (Harrell and Brown 1992, 3–18); two actors exchange dialogue about a world-map (γῆς περίοδος πάσης) in a fifth-century B.C. play by Aristophanes (*Nub.* 201–16).

<sup>45</sup> Strab. 6.2.1; cf. Agouridis 1997, 17.

<sup>46</sup> Johnston 1967, 86–94.

subsequent periods practiced it.

The evidence for distinctive systems of navigation in antiquity is, in truth, quite meager. The spotty nature of the evidence, sprinkled here and there among the pages of ancient literature and in the iconography of each age, allows only occasional glimpses into the navigator's *modus operandi*. It is this lack of source cohesion that has perpetuated erroneous assumptions and monochrome descriptions of ancient wayfinding practices. Nevertheless, through a thorough study of ancient sources (mainstream and peripheral), and through useful parallels and informed deductions, a tentative reconstruction of these systems is made possible. To be sure, the development of wayfinding skills throughout antiquity has been inexorably linked with the acquisition and maintenance of geographical knowledge—without both of which any proposed system falls apart. That seafarers of each succeeding age built upon the knowledge of the former, just as in any other skill, is manifest in the evidence presented here.

## CHAPTER VII

### CONCLUSION

The evolution of seafaring and seafaring technology in the ancient Eastern Mediterranean is inexorably connected to the advances made in wayfinding knowledge and practices. Only by acquiring, retaining, and expanding upon an understanding of the forces of the natural world could ancient seafarers gain the confidence to operate in and increase their maritime environment. And indeed the seasonal weather and bold relief of the eastern basin facilitated the establishment of sea routes very early. As J. Pryor states in his study on the maritime history of the medieval Mediterranean: "To a very large degree the secrets of successful navigation never changed. They always remained in avoiding voyages against unfavourable conditions and in utilizing seasonal variations and localized meteorological phenomena to make one's way as much as possible in harmony with the forces of geography and meteorology."<sup>1</sup> While geographical determinism neglects variation in human behavior, it is clear that the Mediterranean Sea not only divided one region or island from another, but also brought them together, enabling far-flung communication, trade, and, inevitably, warfare.

In these studies, I have focused on the parameters that compose the ancient maritime environment and *how* ancient seafarers sailed between landfalls. Whereas

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<sup>1</sup> Pryor 1988, 198.

currents influenced the routes of early paddled and oared craft, it was the many periodical winds—the *Etesians*, *Lips*, *Scirocco*, and *Khamsin*—that played the largest role in demarcating specific sea lanes. During the Bronze Age, when ships boasted a clumsy, boom-footed sail, the trans-regional route ran clockwise, Aegean-to-Egypt-to-Cyprus-to-Aegean. With the invention of the brailed sail ca. 1200 B.C., routes became increasingly less dependent on predominant winds. The Libya-to-Aegean route opened up, and we find Phoenician ships ranging all over the Mediterranean. Clear skies are often attributed to aiding coastal navigation in the eastern basin. However, as synoptic weather observations have revealed, several regions harbor areas with severely-reduced visibilities, due mostly to dusty hazes, especially in the Aegean and off the Syro-Canaanite coast. The ancient sailing season appears to have been more flexible in antiquity than acknowledged in current scholarship. Clearly the majority of ships sailed from early March to November. However, the numerous references to winter sailings in literary references (e.g. the *Ahiqar* scroll) beginning in the fifth century B.C. argue against the supposition that most or all ships remained in port during the “off” season. Indeed, we read more exceptions to the rule than mentions of the rule itself.

The invention and utilization of several wayfinding instruments and aids attest to the seafarer’s concern for accurate position finding. Shore-sighting birds pointed toward land when a deduced position remained doubtful, and the observation of sea and shore birds revealed land’s proximity and direction. Crow’s nests, a Bronze Age invention that endured into the Iron Age, offered lookouts a convenient perch to extend the visible horizon and, when transiting through shoals, an excellent vantage point to sight dangers immediately before the ship. Evidence for the erection of seamarks is rare. Landmarks,

however, both natural (prominent headlands, mountains, conspicuous natural features) and man-made (shrines, temples, towers, lighthouses), acted as sign-posts and served perhaps as the most wide-spread wayfinding aid.

Sailing past sunset was a common practice after the Late Bronze Age due to the length of certain routes, such as that between the Aegean and Egypt (350 nautical miles), or Egypt and Cyprus (250 nautical miles). The northern stars find prominence in the Homeric epics, and, by the fourth-century B.C., Phoenicians and Greeks utilized different northern, circumpolar constellation to determine their position north or south of their respective regions. References to stars that rise and set due east and west respectively suggest the usage of star-path steering, a practice long known to Polynesians whereby a helmsman associates a series of rising/setting stars with his destination and uses them as a guide to steer by.

Like many other aspects of the ancient world, a comprehension of ancient wayfinding has suffered from a deficiency of evidence. Ancient geographers (Strabo, Pliny, *inter alia*) and the authors of numerous *periploi* primarily describe the distances between landmarks, heavily suggesting that most sailings were coastal, crews at all times maintaining in view conspicuous headlands and islands. However common coasting may have been in antiquity, we know that it was only one means of transiting from point A to point B. Often an open-sea route was more desirable and practical, whether to avoid lee shores, to save time, or simply owing to a ship's sailing limitations. But with that acknowledgment comes a host of other questions: how did they maintain a course by day out of sight of land? How did stars help them reach their destination? What transpired when visibility dropped below three or four nautical miles? Rare as it occurs,

what alternative was left when the sky filled up with clouds?

Seldom, if ever, have these questions been asked, let alone addressed. Close analyses of the evidence, however, when paralleled with Polynesian or Viking practices, produce fruitful, if tentative, solutions. A statement from R. Drew's *The End of the Bronze Age: Changes in Warfare and the Catastrophe ca. 1200 B.C.* suits this study equally well: "On many questions, one can only guess, and since guessing seems unprofessional historians do as little of it as possible. The result, however, is that for a lack of evidence one of the most important things about the preclassical world is largely ignored."<sup>2</sup> Why does it matter? Why is it necessary to reconstruct ancient wayfinding practices and systems? Two reasons come immediately to mind. First, Mediterranean specialists are increasingly attempting to validate the foreign finds they uncover in their excavations by delineating this or that sea route, often with no consideration of the sailing capabilities of ships of that period or the meteorological parameters to which those ships would have been subject. In one aspect, this study is for them. On a different level, however, reconstructions of past navigational systems may offer more and better clues in the search for ancient shipwrecks, especially in the open basins, away from looters and trawlers. And indeed these wrecks are slowly coming to light as we extend our eyes into the Mediterranean's deeper waters. A swath of seabed between Crete and Egypt, for instance, undoubtedly holds the remains of Minoan, Cypriot, Syro-Canaanite, Egyptian, Greek, and Roman hulls. While modern forensics may not be able to resolve the reasons for their demise, a study of their find-spots, cargos, hull, tackle,

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<sup>2</sup> Drews 1993, 98.



and crew's possessions will certainly begin to fill in the gaps of our *lacunae*, in addition to providing volumes of new information and fuel for new questions.

## WORKS CITED

## ABBREVIATIONS

<i>AJA</i>	American Journal of Archaeology. The Journal of the Archaeological Institute of America
<i>AOAT</i>	Alter Orient und Altes Testament
<i>BCH</i>	Bulletin de correspondance hellénique
<i>BASOR</i>	Bulletin of the American School of Oriental Research
<i>BICS</i>	Bulletin of the Institute of Classical Studies of the University of London
<i>BSA</i>	Annual of the British School at Athens
<i>CAH</i>	Cambridge Ancient History
<i>Franchthi</i>	Excavations at Franchthi Cave, Greece
<i>IGRR</i>	Inscriptiones graecae ad res romanas pertinentes
<i>IJNA</i>	International Journal of Nautical Archaeology and Underwater Exploration
<i>JAOS</i>	Journal of the American Oriental Society
<i>JARCE</i>	Journal of the American Research Center in Egypt
<i>JEA</i>	Journal of Egyptian Archaeology
<i>JHS</i>	Journal of Hellenic Studies
<i>JNES</i>	Journal of Near Eastern Studies
<i>OCD</i> <sup>3</sup>	S. Hornblower and A. Spawforth, eds., <i>The Oxford Classical Dictionary</i> , 3rd ed. (Oxford 1996)
<i>OpAth</i>	Opuscula atheniensia

<i>OJA</i>	Oxford Journal of Archaeology
<i>OpArch</i>	Opuscula archaeologica
<i>PM</i>	Arthur Evans, <i>Palace of Minos</i> (London 1921–1935)
<i>RBibl</i>	Review biblique
<i>SEG</i>	Supplementum epigraphicum graecum
<i>TAPA</i>	Transactions of the American Philological Association
<i>WorldArch</i>	World Archaeology

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