24 Early Seafaring and Maritime Activity in the Southern Levant from Prehistory through the Third Millennium BCE[1]

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Introduction

As many of the chapters comprising this volume indicate, long-distance interaction among the contemporary cultures of the eastern Mediterranean littoral and Ancient Near East was an important facet of the rise of complex societies during the fourth and third millennia. In the fourth millennium, the two most archaeologically visible examples of such interaction are the enigmatic relations between Mesopotamia and Egypt (Moorey 1987, 1990), and the Egyptian colonial sojourn in the southern Levant (Brandl 1992). By the third millennium, Egypt's relations with the northern Levant, specifically Byblos, crystallized in a maritime trade in bulk raw materials, organic products, and finished goods (Marfoe 1987). With this rare exception, when considering the varied evidence for cross-cultural exchange, scholars have utilized maritime transport and activity as an explanation of last resort (Moorey 1990; Prag 1986), i.e., when a lack of any contiguous terrestrial evidence can be posited in the interstices, such as the lack of any Uruk finds between inland Syria and Egypt. However, no discussion has emerged regarding the physiographic parameters of maritime interaction, the evidence for this interaction, or the possible existence of a South Levantine maritime culture. The goal of the present contribution is to begin such a discussion by reviewing the evidence for maritime activity in the southeast Mediterranean Sea, and the impact it may have had on the cultures of this littoral zone.

Physiographic factors

In contrast to the great riverine civilizations, the Levant is often characterized as a fragmented landscape, devoid of a single unifying ecological feature. However, for the inhabitants of the coastal zone, the sea was just such a feature, with a physiographic makeup that affected the southern Levant, much in the same way it did all the other Mediterranean coastal regions. For seafarers, dynamic seasonal parameters such as winds, currents, visibility, and weather all affected the character of navigation. More than a century of recorded observation offers a detailed source (*Mediterranean Pilot* 1976), which analysis has shown to be a fairly reasonable reflection of conditions in the East Mediterranean as far back as the fourth century BCE (Murray 1987, 1995). As no major long-term climatic changes have occurred during the last 7000 years (Baruch 1986, 1994; Bar-Matthews *et al.* 1997: 166; Horowitz 1979: 343–4), presumably these conditions were prevalent during the periods presently under consideration, albeit with some minor short-term variations. Both human-propelled (i.e., paddling or rowing) and wind-driven propulsion were governed by these parameters, although in the absence of urgent shipping schedules, vessels could wait on land or at sea for opportune conditions.

The earliest depicted examples of human-propelled seagoing craft in the eastern Mediterranean are the Aegean island longboats and canoes of the third millennium (Agouridis 1997: 3, Fig. 4a-e; Broodbank 1989, 1995: 56–9). Utilizing a variety of archaeological and ethnographic comparanda, supported by some experimental voyaging of replicas, some inferences may be made regarding the potential performance capability of such craft (Broodbank 1995: 59–61, Table 1; McGrail 1988, 1990): a one to four-person canoe was capable of attaining a maximum speed of 5km per hour, for a sustained daily range of 20km, and a cargo capacity of 50–150kg. A longboat, with a crew perhaps greater than 25, was capable of attaining a maximum speed of 10km per hour, for a sustained daily range of 40–50km, but had a minimal cargo capacity when fully manned. Using these figures as a working hypothesis, without any longshore current, the voyage from the ancient mouth of the Pelusiac branch of the Nile to the Carmel Cape (*c.* 360km) would take eighteen days for a canoe and seven days for a longboat. Paddling with the maximum counterclockwise longshore current (*c.* 3.7km/hour) would shorten this voyage to ten days for a canoe and five days for a longboat. While a necessity in the Aegean archipelago, such craft may not have been that much more efficient than terrestrial means of transport along the eastern Mediterranean coast, although the possibility that boats were used for extended longshore voyages, bearing low bulk, high value, prestige items, is not beyond the realm of possibility.

By the mid-fourth millennium, pictorial and clay rep-

resentations indicate that humans had learned to harness the power of the wind (Bass 1972b: 12–13; Casson 1971: 12, 22, n. 6; Vinson 1994: 16). However, until the mid-second millennium ships were propelled solely by a double-boomed square sail. This type of rigging enabled a vessel to utilize a side or following wind, but not to sail close-hauled, i.e., upwind from mid-beam (Casson 1971: 273; Cotterell and Kamminga 1990: 250–1; Roberts 1991: 55–6, 1995: 308–10). The inability to trim the sail in a manner capable of sailing to windward meant that the wind direction dictated a finite range of effective courses. Classical sources and experimental replica voyaging suggest that these ships could readily sail at speeds of four to six knots (7.4 to 11.1km/hour) (Casson 1971: 282–91; Katzev 1990). Thus, a direct sail from the Nile to the Carmel Cape and back would take 32 and 48 hours, respectively. However, the sailing rig was such that most legs of eastern Mediterranean navigation were accomplished by tacking with the diurnal shift of the sea breeze, in order to zig-zag up and down the coast. The offshore breeze was particularly crucial as without it a ship could not leave port (Pryor 1988: 1–7, Table 1), or might be pushed dangerously toward the shore. The latter was a major hazard along the North Sinai coast, where offshore breezes are rare (Klein 1987: 263, Table 1, Fig. 2). Thus, ships sailing west to Egypt would have generally sought to sail sufficiently to the north to avoid this hazard, a factor that may partly explain the recurrent phenomenon of western Deltaic ports (e.g., Tell el-Fara'in/Buto and Naukratis).

Prehistoric Mediterranean voyaging and Levantine Neolithic coastal settlement

Bass's (1972a: 9) oft-repeated statement that 'before there were either farmers or shepherds there were sailors' is more of a truism today than it was over a quarter-century ago. Better use of radiometric dating methods, comparative maritime ethnography, and consideration of navigational parameters permit us to identify the 'overseas' presence of humans, or even their hominid predecessors (Bednarik 1997; Gibbons 1998), and to extrapolate technological uses for the prehistoric toolkit beyond those normally attributed to hunter-gatherers (McGrail 1991). With the demonstrable antiquity and élan of early voyagers and sea-borne migrations in the Pacific Ocean (Irwin 1992), it is not surprising that equally early crossings might have occurred during the long prehistory of the Mediterranean basin and Near East. Similarities among lithic finds in Spain and Morocco may suggest evidence for the crossing of the 10km-wide Straits of Gibraltar between 500,000 and 300,000 years ago (Dennell and Roebroeks 1996; McGrail 1991: 85, 93). Aurignacian finds at Fontana Nuova di Ragusa in Sicily certainly demonstrate that as early as 30,000 years ago the *c.*12km wide Straits of Messina was traversed (Chilardi *et al.* 1996). A Middle Paleolithic crossing of 20km to the Ionian island of Kephallinia is also suggested (Cherry 1990: 171–2). An early Pleistocene crossing of the Bab el-Mandab may also be indicated by recent discoveries in Yemen (Whalen and Schatte 1997).

No evidence of equal antiquity has been found in the Levant, but recalling Trump's (1980: 21) observation, future discoveries of deep-sea fish bones in rubbish deposits may yet indicate some sort of venturing from the shore. Marine shells appear in varying quantities throughout the southern Levantine Upper Paleolithic, Epipaleolithic, and early Neolithic sequence (Bar-Yosef and Belfer-Cohen 1989; Gilead 1995: 135; Goring-Morris 1995: 151, 153, 155, 161–2, 164; Goring-Morris *et al.* 1995: 54–5; Valla 1995: 170–2, 177, Pl. 1), which indicates some littoral foraging, but the role of fish in subsistence is unclear. The possibility of Paleolithic coastal sites now submerged as deep as −100m msl (the minimum sea level during Pleistocene glacial maximum) is worthy of consideration (Bar-Yosef and Belfer-Cohen 1989: 457), although their detectability and survivability are unknown. The most ancient submerged site found thus far in the eastern Mediterranean is the late Pre-Pottery Neolithic C (PPNC) village of Atlit-Yam. Among the lithic finds are some tools of Middle Paleolithic origin (Galili *et al.* 1993: 140), but no indication is made of their precise provenience or condition. Other Paleolithic lithics are reported at shallower depths along the Carmel Coast, where they are assumed to be the result of erosion of sites sandwiched within the coastal sandstone ridges (Raban 1983: 221), or in re-use by the later Neolithic or Chalcolithic inhabitants of these areas (Galili and Weinstein-Evron 1985: 40).

Regular water crossings are unknown prior to the appearance of Melian obsidian in Mesolithic levels (*c.* 13,000 BP) of the Peloponnesian Frankthi Cave (Cherry 1985: 14–16, 21–2; Torrence 1986; Williams-Thorpe 1995). The continuous exploitation of this source throughout the Neolithic period required island hops of at least 20km, a distance that increased with the changing seascape shaped by the Holocene rise in sea level (Agouridis 1997; Lambeck 1996a; van Andel and Schackleton 1982). At around the same time, in radiocarbon terms, the first humans reached Akrotiri-*Aetokremnos* in Cyprus where they occupied a cave or overhang and hunted the local fauna (Manning 1991; Simmons 1996; Simmons and Wigand 1994). Although the origin of this group (e.g. coastal Anatolia or the northern Levant), their intention (e.g. one-time sojourn, seasonal exploitation, or colonization), and their final disposition (e.g. extinction, intra-island migration, or abandonment of the island) are all debatable, the implications of this evidence for early seafaring acumen are quite clear. Even at the maximum sea level drop of −120m msl *c.*18,000 BP, no landbridge connected Cyprus to southwestern Asia, and the minimum water gap, between the Cilician paleo-shoreline and a now submerged island stop northeast of Cape Andreas, would have been 30–40km (Held 1992: 109–10, Fig. 3; Swiny 1988: 1–3, Fig. 1). When these hunter-gatherers first arrived at the Akrotiri peninsula, the sea-level and paleogeography indicate that the minimum water gap from the north would have increased to nearly 69km (Gomez and Pease 1992; Held 1993: 26). Then, according to Held (1992, 1993: 26–7), with the requisite navigational experience, paddling at an average speed of 2.7 knots (5km/hr), the crossing required nearly 30 hours at sea, in what may not be the best-case scenario. The physical size of the site suggests a group of no more than 15 to 20 individuals, with a distinctly portable tool-kit (Held 1992: 120). Thus, the distribution of Melian obsidian

and, for the Levantine maritime sphere, the evidence from Akrotiri-*Aetokremnos*, increases the likelihood that some Levantine hunter-gatherers had included seafaring among their repertoire of activities. The warm Mediterranean waters, the limited cargo demands (e.g. individuals, tools, fish, obsidian cores, etc.), and the technological level would have permitted a variety of small, simple, water-through, paddle-driven sea craft (McGrail 1991).

By the end of the seventh millennium, with the requisite package of floral and faunal domesticates in hand, Pre-Pottery (or Aceramic) Neolithic groups first began colonizing the east Mediterranean islands of Crete (Broodbank and Strasser 1991; Cherry 1990: 158–63; Evans 1994: 1–4) and Cyprus (Cherry 1990: 154–7; Le Brun 1989; Stanley Price 1977a, 1977b; Todd 1986). The two to three millennia gap between the initial maritime exploration of the Mediterranean islands and these first colonizations probably derives from a combination of the general inhospitableness of the island environment, which appears to have precluded successful hunter-gatherer migration, the inability to organize and transport a successful founder population, and the absence of a need or desire to risk an overseas migration to a less-than-suitable environment. These actual and perceived limitations were apparently overcome following the advent of agriculture and animal domestication, when the maritime migration of farmers may have outpaced even that of their terrestrial counterparts (Bogucki 1996: 244–5; van Andel and Runnels 1995). The scenario for the initial colonization of Crete envisioned by Broodbank and Strasser (1991) underscores the logistical complexity of such an enterprise and the type of boats and cargo requirements, i.e. 10 to 15 vessels carrying a ton or two of cargo. Presumably, similar logistical complexities faced the initial colonists to Cyprus, wherever they originated along the mainland. The numerical success of the colonization process (Cherry 1990: 154–5, Table 2) suggests that boats capable of carrying a significant cargo were not an exception along the northern Levantine coast. With this demonstrable transportation capability, it is perhaps surprising that some view the occurrence of Anatolian obsidian and carnelian, albeit solely at Khirokitia, as merely part of the initial material cultural transfer to the island (Karageorghis 1982: 25; Ronen 1995: 189; Todd 1986: 15–16).

Although Held (1993: 27) bemoans the dearth of coastal culture along the surrounding mainland north of Lebanon, from which the first Cypriots and the seafaring expertise that transported them could derive, the evidence from the southern Levant suggests that the maritime cultures he seeks may now be underwater. Atlit-Yam, the oldest and deepest submerged Mediterranean site (−12m msl), which dates to the PPNC period (cal. 7500–6200 BCE), has produced evidence for extensive fishing in addition to the usual contemporary terrestrial activities (Galili *et al.* 1988, 1993). The Atlit-Yam fishermen exploited the gray triggerfish, which inhabits the sea bottom at depths of 25–80m (Galili *et al.* 1993: 149–50; Zohar *et al.* 1994). Over 95 percent of the bones found at this site belong to this species (N=6000, MNI=83), and the treatment of the yield, particularly its limited spatial distribution, suggests specialized slaughter and, perhaps, preservation practices (Zohar 1994; Zohar *et al.* 1994). A paleogeographical reconstruction of the shoreline suggests that the choice of site location may have been motivated to some degree by a nearby protected lagoon (Galili *et al.* 1993: 152, Fig. 6). Some of the lithic artifacts may have served as weights and spearpoints, perhaps tipped by a poison derived from the seeds of *styrax officinalis*, remains of which were found at the site (Galili *et al.* 1993: 152). Human skeletal remains bear signs of maritime pursuits: auditory exotosis of the temporal bones suggests that some individuals spent time in cold water; dental attrition might be the result of holding nets and straps in their mouths; and abrasions of the elbow, together with muscle markings typical of rowers, may hint at the use of boats. Given the habitat of the gray triggerfish, fishing was clearly carried out on some sort of craft, perhaps year-round, at some distance from the shore. Galili *et al.* (1993: 153) are correct in suggesting that Atlit-Yam may contribute to our understanding of island colonization, especially as the site was inhabited just before or during the initial colonization of Cyprus. Zohar (1994: 96) notes that a large quantity of gray triggerfish was exploited at the Aceramic site of Cape Andreas, Cyprus. This suggests *a priori* that other east Mediterranean maritime groups were using similar subsistence strategies. With their seafaring abilities, these are probably the types of groups that enabled the successful transfer of a founder population to Cyprus. Their current absence in the archaeological record on the opposite shore is a lacuna, which probably derives from a combination of the rise in sea level, the progradation of the soft Cilician Coastal Plain, and the lack of excavation.

Coastal sites of the following Pottery Neolithic period have yet to provide the same extensive evidence of maritime culture (Galili and Weinstein-Evron 1985; Raban 1983). However, a hint at what may yet be found can be seen at Neve Yam, south of Atlit, where underwater survey and preliminary excavation of a Pottery Neolithic and Wadi Raba culture site has produced fish bones, net sinkers, and a pottery sherd incised with fish decorations (Galili *et al.* 1996: 56, Fig. 73; Wreschner 1977: 271*). This site and others along the coast have yielded obsidian blades (Braun and Gophna 1996: 98; Goring-Morris 1984: 81; Raban 1983: 226–8; Wreschner 1977: 270*), presumably from Anatolia (Perlman and Yellin 1980; Williams-Thorpe 1995: 232–4; Yellin and Perlman 1984), but whether they were transported by land or sea is unknown (Mellink 1993: 497; Yellin *et al.* 1996: 366). Regarding the distribution of obsidian, it is interesting to note its absence at Atlit-Yam, although it appears less than a kilometer inland at the PPNC site of Naḥal Oren (Noy 1993:1169).

Fishing and seacraft of the Chalcolithic period

Some continuation of maritime culture into the Chalcolithic period is supported by increasing evidence for the exploitation of marine resources. Indirect evidence includes part of an ichthyomorphic figurine at Besor Site E, and copper fish hooks at Tuleilat el-Ghassul and Bene Berak (Gilead 1988: 420). Direct evidence includes a quantity of bones at Qatif Y-2, where species such as shark, dolphin, and batoides (ray) were found; a single vertebra of a Mediterranean fish at Gerar 100 (Gilead 1986: 82); six bones from the Naḥal Qanah cave (Lernau

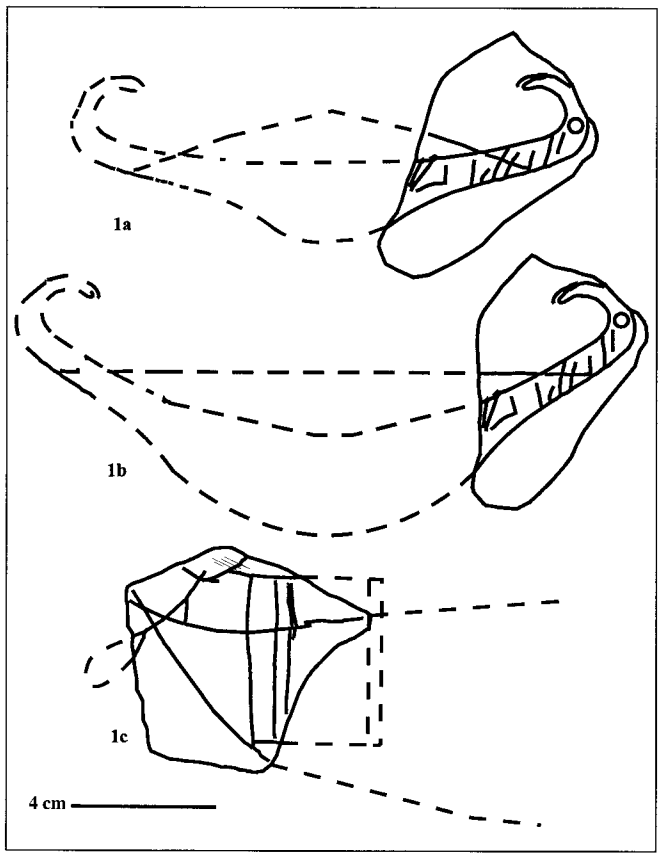

Figure 24.1 Boat representations incised in sherds from the 'Stages' area of Megiddo (after Engberg and Shipton 1934: 30, figs. 10G–10H)

1996); and fish bones at Shiqmim, some 40km inland (Grigson 1987: 221; Rosen 1986: 106, 114), although some of the latter may be from inland bodies of water. While pictorial and model representations of boats are certainly attested in Egypt by this time (Hassan 1988: 157), no definite Levantine boat depictions have been found. However, Baumgarten (1993) suggests that a high-ended vessel is painted on a Chalcolithic ossuary from Azor (Perrot 1961: Fig. 23:3, Pl. IV), which is similar to supposedly foreign types depicted in Predynastic Egypt (Basch 1987: 57–62; Casson 1971: 12, n. 5; Mark 1997: 69–87; Vinson 1994: 17). While examination of the original line drawing does support his identification, the photographic plate suggests that the roof of the ossuary is partially reconstructed with plaster, indicating that the boat was created by the erasure of a structure, perhaps a building. However, it is instructive to note that this ossuary's cover is decorated by a star or sun (Perrot 1961: Fig. 34:1), which is a motif known from the contemporary iconographic repertoire (Elliot 1977: 11–12), but often occurs among seafaring cultures in juxtaposition with maritime motifs (Broodbank 1989: 335, 1993: 327). Apart from this possible depiction and the evidence for fishing, maritime activity during this period remains largely unexplored, which is a possible consequence of the rarity of excavated habitation sites in the Coastal Plain (Gilead 1988: 412; Gophna and Portugali 1988), or of the relevant sites being submerged (Galili and Weinstein-Evron 1985; Raban 1983; Raban and Galili 1985).

Boat representations and longshore traffic during the EB I period

Despite the evidence for long-distance interaction during the EB I period, including theorized seaborne contacts between the northern Levant and the Delta, whatever maritime activity occurred along the southern Levantine coast has left few remains, although some have suggested a possible intermediary role for the settlements along the southern Coastal Plain (Gophna and Liphschitz 1996; Gophna this volume; Ilan this volume). Some boat representations and underwater finds may lend support to this suggestion.

In her discussion of EBA art, Beck (1995: 11–12, Fig. 7b) identifies a number of possible EB I boat representations from among the incised sherds of the 'Stages' V area of Megiddo, including the prow of a vessel (Engberg and Shipton 1934: 30, Fig. 10H; Kempinski 1989: 24). Her identification is much more convincing than the 'scorpion or crab tail, or elephant tusk' which is suggested by the excavators (Engberg and Shipton 1934: 30). The 'tail' appears very similar to the termination of a reed boat, with the lines crossing the width of the 'tail' being the ropes that tie the reed bundles together. Two possible reconstructions are offered here (Fig. 24.1a–b). One relies on the top of the bundle being the gunwale and thus the lone skewed line might represent some sort of mast stay—it seems premature to see this line as some sort of hogging truss for longitudinal support (Casson 1971: 20–1; Wachsmann 1998: 12–15). The alternate reconstruction sees this lone line as the gunwale, with a significant change in the sheer of the hull. Either reconstruction is supported by parallels (Basch 1987: Figs 101, 105; Berger 1992: *passim*; Vinson 1994: Fig. 3).

An additional boat from the same published plate (Engberg and Shipton 1934: 30, Fig. 10G), to date unnoticed, is herewith presented (Fig. 24.1c). This incised decoration recalls the stern end of a riverine boat, complete with a steering oar supported by a stanchion, a possible tiller, and part of what is termed, in Egyptian boat depictions, a cabin or kiosk. Although more detailed comparative analysis of this boat is needed, a partial reconstruction is offered, the form and components of which may be found in numerous models and pictorial depictions of this, and later, periods (Berger 1992: Fig. 72e; Jones 1995: Figs 23–25, 38; Vinson 1994). There are no clear criteria for determining whether this is a papyrus or wooden vessel, but a wooden vessel seems more likely as the hull does not get thinner toward the stern. The height of the steering oar above the bottom of the hull would indicate a vessel with a deeper draft. Another maritime motif that is depicted among these sherds is the middle part of a fish, complete with dorsal fin (Engberg and Shipton 1934: 30, Fig. 10F).

Beck (1995: 11, Fig. 7a) also identifies two more boats from the incised stone pavement (L.4008) of the Stratum XIX temple. Her interpretation, however, is far from convincing, even alongside the parallels she reproduces. Apart from the upper arc, which, presumably, she interprets as

the gunwale, there is nothing to mark these objects as boats. The ends do not conform to any bow or stern from Predynastic Egypt or later (Basch 1987: 58, Fig. 97). The oars are similarly unconvincing in that they share none of the traits generally associated with paddles or oars (Basch 1987: 52, Fig. 86).

Lastly, a miniature clay model boat was found at Tel Erani, which is interpreted by B. Brandl (lecture given at the Egyptian–Canaan Interaction Conference, Hebrew Union College, Jerusalem, April 14–15, 1998) as a token or marker within a local Egyptian administration. The lack of any apparent structural details in the representation precludes any determination of the material from which its original was made, although the object requires further study. Furthermore, given the administrative role ascribed to these miniature objects, the depiction of a boat might reflect a means of transportation or a maritime shipment.

These representations suggest that the inhabitants of the southern Levant may have been familiar with at least two different types of boat: a papyrus or reed craft and a somewhat larger, probably wooden, vessel with a greater draft. However, it is impossible at this stage of the research to determine whether these depictions were inspired by Egyptian Nilotic or local craft. Beck suggests that the depictions reflect the activities of local people, although, as Amiran (1992) suggests for the incised pavement stones, they could be the work of Egyptian artists as well. Local inhabitants could have copied depictions of Egyptian boats that may have arrived on imported pottery, such as the lone example of 'D-ware' from Taur Ikhbeineh (Oren and Yekutieli 1992: 369, Fig. 8:12, Pl. 8).

If these depictions represent local sea craft, nothing is known about their construction. While it is assumed that wood is a natural choice of construction material in the timber-rich regions of the Levant, the possibility of reed-built boats should also be considered, perhaps alongside other reed-built structures. For example, the numerous Chalcolithic cemeteries in the Coastal Plain, which contain ceramic ossuaries, often occur with no nearby evidence of habitation. Although some objection has been raised to the notion that these burial containers are models of the typical Chalcolithic house (Porath 1992: 46–8), there is no reason not to view the shape as one type of house. Much as it is supposed that many bone piles represent decomposed ossuaries made of wood and other organic material (Porath 1992: 46), some of the 'houses' that they are meant to evoke may have been constructed of perishable material, including reeds. A preliminary working hypothesis is that reed construction techniques for domestic architecture were transferred to nautical construction. An ethnographic study of reed construction techniques has been carried out in southern Iraq (Ochsenschlager 1992), where both reed boats and buildings are known to have been used for millennia, and are even in use today (Roaf 1990: 51, 122–3). Reed boats were still seen on Lake Hula in the early part of the twentieth century (Karmon 1990: 38, 50–3).

Although no remains of EB I seafaring have yet been found in nearshore underwater surveys (Galili and Weinstein-Evron 1985), two rare deep water finds suggest that ships were plying the shores during this period. The first is an EB I cup, which is now in a collection at Kibbutz Sdot Yam (Barag 1963: 18, Pl. 5a: 1). The second is an Egyptian drop-shaped vessel that is reported to have been found off the coast of Gaza and is now in a collection at Kibbutz Saar (Gophna this volume). Both were found in the nets of trawlers that typically work in depths greater than 20m. Although the context of these finds is unknown, the fact that both Egyptian and Canaanite ceramics were found in deep waters, far from any terrestrial context along the shore, suggests that ships were one means of transport for the pottery trade, in both directions, during the Egyptian colonial period. Given the quantities of imported Canaanite storage jars in Egypt (Dreyer 1992a, 1992b; Hartung this volume), the possibility that they were transported by sea should not be excluded. Nothing is known of the type and size of such ships, but they were probably propelled by sail, which was certainly in use by this time (Bass 1972b: 12–13; Casson 1971: 12, 22, n. 6; Vinson 1994: 16).

The involvement of the southern Coastal Plain in the contemporary longshore traffic is only beginning to attract attention (Brandl 1992: 448; Gophna and Liphschitz 1996, Gophna, this volume; Ilan, this volume). While the main demographic centers during this period were along the inner trough of the Coastal Plain, terrestrial and underwater surveys demonstrate the existence of settlement from the shallow waters of the modern shoreline and further inshore, particularly along coastal troughs and river basins, where their inhabitants may have been involved in maritime pursuits (Gophna 1974: 22–3, 70, Pls 24–5, 1997; Gophna and Liphschitz 1996; Gophna and Portugali 1988: 13–15, Figs 2–3; Ronen and Olami 1978: 2–4, 1*). However, such activity is still undocumented, apart from some marine shells at the Halif Terrace (Alon and Yekutieli 1995: 181, Fig. 1:1). The location of sites at or near modern sea level suggests that the sea did not inundate the Coastal Plain during this period. The lack of any detailed geomorphological study renders any attempt to reconstruct the EB I paleogeography premature, but, most likely, small bays, lagoons, and river mouths served as havens.

Early Dynastic and Old Kingdom seafaring and South Levantine EB II–III ports

The end of the EB I period is accompanied by the cessation of an Egyptian presence in the southern Coastal Plain, and a conspicuous decrease in Egyptian finds throughout the southern Levant during the EB II–III periods. Continued commercial interests, particularly with northern Canaan during the EB II period, is indicated by numerous imported storage jars (Esse 1991: 103–16; Kantor 1992: 17–21; Porat 1989: 63–5, appendix 5b; Stager 1992: 37–9), and may have been overseen by a limited official presence (Greenberg and Eisenberg, this volume). Many scholars have seen this trend as a result of the increasing Egyptian utilization of maritime transport, which culminates in claims of state-sponsored ventures and intimate cultural relations with Byblos (Ben-Tor 1982, 1986; Brandl 1992: 448; Marfoe 1987; Saghieh 1983; Ward 1963; Wright 1988). This maritime network is reflected in increasingly substantial archaeological, textual, and pictorial evidence for the technology and size of seagoing vessels. The dominant role of seafaring in long-distance contact is

complemented by the abandonment of the North Sinai terrestrial route (Oren 1973: 204; Yekutieli, this volume), and its replacement by ports at the gateways of dendritic land routes.

Textual references

The earliest textual reference to seagoing ships is the claim of the first ruler of the Fourth Dynasty, Sneferu, to have brought 40 ships filled with *ʿš* wood (Breasted 1906: §146–8; Meiggs 1982: 63; Smith 1971: 167; Wilson 1950: 227). The Sixth Dynasty seaborne raid of Weni to the southern Levant (Breasted 1906: §311, §313–15; Lichtheim 1973: 18–23; Wilson 1950: 227–8) relied on seagoing ships capable of carrying soldiers. In addition, among his many diverse royal projects, Weni was also put in charge of the construction of river boats, which were made of acacia wood cut by foreign chiefs, a term often used to describe Asiatics (Breasted 1906: §324; Lichtheim 1973: 22–3), a point that may hint at foreign shipwrights in Egypt. Lastly, Pepinakht, who lived during the reign of Pepi II, mentions going to the land of the Asiatics, perhaps the Red Sea, where a 'Byblos ship' was being built for a journey to Punt (Breasted 1906: §360; Säve-Söderbergh 1946: 48).

Pictorial depictions

With all the limitations of the artistic medium, pictorial representations provide the only details for seagoing ships of this period. The two most notable examples are depicted at the temple of Sahure at Abusir and the causeway of Unas at Saqarra, both of the Fifth Dynasty (Esse 1991: 105; Gaballa 1976: 24; Hassan 1955; Kantor 1992: 20–1, Fig. 6:2; Smith 1965: Figs 6–7). The Sahure relief is a narrative scene showing parts of four departing and eight returning ships, the latter depicting Asiatics and their children aboard ship; a shipment of Levantine jugs and tethered bears appears on other relief fragments. The structural details depicted on the vessels include a partly sewn planked structure; a bipodal mast that is forward of midship; oars for propulsion and steering; and, most importantly, a hogging truss to give the vessel longitudinal strength for sea voyages (Casson 1971: 20–1; Wachsmann 1998: 12–15). Although the sail and yards are not depicted, and the mast is lowered, it seems likely that this vessel could sail in a side and following wind. The complement of at least seven oars to a side suggests a large crew, which would have taken up space otherwise used for cargo. Estimating size based on artistic depictions is difficult, but it seems likely that these are vessels of significant size. The Unas relief depicts another pair of similar ships with Asiatics aboard (Hassan 1955; Wachsmann 1998: 15–18). Although Peltenburg (1995: n. 38) warns against applying the term 'Byblos ship' to these depictions, it seems reasonable to assume that the role of this ship type and its capabilities were not unlike those of the depicted vessels.

Archaeological evidence

No remains of seagoing craft have yet been found from this period, but the size and construction techniques of riverine craft illustrate the capabilities and technologies that were probably employed in their maritime counterparts. The earliest evidence for large (*c.*18m long) plank-built vessels are the 12 First Dynasty boats buried in pits at Abydos (Haldane 1992; O'Connor 1991, 1992; Vinson 1994: 17–18). As these are still unexcavated, nothing can be said about the method of construction or the origin of the wood, but they will undoubtedly fill the gap left by the poor hull remains from the complementary boat pits at Saqqara and Helwan (Vinson 1994: 18), all of which attest to the availability of long woods and shipbuilding technology. A number of graves from Tarkhan appear to contain re-used mortised boat planks (Vinson 1994: 18), but their identification is not universally accepted (Wachsmann 1998: 218–19). The best preserved and oldest excavated boat is the Fourth Dynasty royal funeral barge of Cheops, which is nearly 44m in length (Jenkins 1980; Steffy 1994: 23–9). This luxurious riverine vessel was built principally of imported cedar, by rope-lashed, unpegged, mortise-and-tenon joinery, but lacks a keel or any other sufficient form of longitudinal support to make it suitable for sea travel (Steffy 1994: 25–9). Nonetheless, this vessel presupposes beamier, deeper, and structurally stronger seagoing ships capable of transporting at least 50 tons of timber, from which planks as long as 23m were fashioned (Steffy 1994: 25–8).

Early Bronze Age anchors and *shfifonim*

The hewn stone anchor, which is an important indicator of maritime activity, makes its appearance during this period in pictorial representations and in specialized terrestrial contexts—the latter a phenomenon that continues throughout the Bronze Age (Brody 1996; Frost 1969: 437, 1991). Pictorial depictions are found on both the Sahure and Unas reliefs (Basch 1985: 454–5, Figs 1–2; Frost 1979: 139, Pl. 1). The earliest example of a stone anchor in Egypt is apparently the symbolic boulder at the prow of the interred First Dynasty Abydos boats (O'Connor 1991: 11–12, Fig. 13). Triangular stone anchors were used in the construction of a Fifth Dynasty tomb at Abusir and implanted in the floor of a Sixth Dynasty tomb at Saqqara, where other possible fragmentary anchors were found (Frost 1979: 141–4, 146–7). A group of six chalk anchor replicas of non-uniform shape and size was used in the construction of a step leading up to the EBA Tower Temple at Byblos (Frost 1969: 429–30, Figs 23–8, Pl. III; 1970: 384–5, Pl. 2A). Apart from these few dated examples, no other anchors are included in this brief survey. The small sample of datable anchors and their varying morphological characteristics render any typological attributions of other non-contextualized anchors suspect.

Although found inland at sites along the southern shores of Lake Kinneret, anchor-like objects, called locally *shfifon* (pl. *shfifonim*), are an enigmatic artifact that has received only limited attention (Wachsmann 1985, 1998: 262–5). Much as their contemporary Mediterranean counterparts, the *shfifonim* have a very heterogeneous morphology, which hampers reliable dating. One example, found outside an EB II gate at Bet Yerah, shows some similarity to other examples from the Kinneret region and even later BA Mediterranean examples (Wachsmann 1985: 395–6, figs 3–5). Unfortunately most of the *shfifonim* seem

unfinished and lack any stratigraphic context. None were found underwater, a point that Wachsmann (1985: 399) ascribes to the absence of sport diving in this lake, although sediment coverage of the lake bottom might also be a factor in their distribution and recovery. Although the symbolic use of these objects is clearly established, some utilitarian role should be explored.

In functional terms, it is not immediately clear why lake boats would carry such large anchors, although stone anchors weighing over 100kg were used in the Dead Sea during the Hellenistic period (Hadas 1992, 1993). Perhaps the occasionally powerful winds demanded such large anchors, or the *shfifonim* were used as mooring stones that were buried in the muddy shore, which would explain their unfinished lower half. In any event, the use of boats would have been essential at Bet Yerah, a site that may have been nearly an island during the Early Bronze Age (Esse 1991: 36–7). Thus, boats may have been used for fishing, for transportation in an inhospitable fording zone, and, perhaps, for shipping goods in a bi-polar lacustrine transportation network between the port of Bet Yerah and other contemporary sites, such as Tel Kinnerot or et-Tell (Bethsaida) (Epstein and Gutman 1972: site 111; Esse 1991: Fig. 27, site 66; Fritz 1993: 193–5), the latter of which may have been on a small bay as late as the Roman period (Arav 1990: 178).

Nilotic anchorages and the first ports of the Levant

Just as riverine traffic along the storm-less Nile brought the need for more sophisticated riverine ports and anchorages, such as the Old Kingdom basins at Giza and Saqarra (Goyon 1971: Figs 2–5; Hassan 1997: 63), presumably contemporary seafaring involved havens and port facilities along the Levantine shores as well. Given the geographical conditions in the eastern Mediterranean, a number of potential types of natural anchorages may be suggested, including a rivermouth, an offshore island, a protruding mountain ridge, a peninsula, a delta, or a lagoon (Flemming 1980; Stanley, this volume). Unfortunately, geomorphological changes in the coastline, such as erosion, siltation, and lithification of sediments, may have obscured the paleogeography to an extent that impairs any attempt at reconstruction. For example, the anchorage of Byblos, the principal partner port of Egypt, presents little more than a small fishing anchorage (Jidejian 1971: 1, Fig. opp., Pls 1, 25 and 131), although the indented sandy beach to the south of the tell may have been larger and deeper in antiquity. In contrast, the island of Arwad, or the paleoislands of Tyre and Akko (Frost 1995; Inbar and Sivan 1984; Sivan 1981) would have made superb natural havens, although only Tyre has archaeological remains of this period (Bikai 1978: 5–6, 69–71, Pls 57–8, 69, 72).

Along the southern Levant, remains contemporary with the 'Byblos run' are so rare that a total abandonment of the coast has been suggested (Raban 1985: 14). To date, only Ashkelon has produced EB II–III ceramics (Stager 1993), although there is as yet no indication of any contemporary architecture, or any evidence for the anchorage during this, or any other, period. In lieu of a proper haven, it is possible that this site functioned in fair weather, using small boats called lighters in order to transfer goods to and from ships anchored in open waters, much as was done along the coast of California during the mid-nineteenth century (Casson 1971: 361). However, two other contemporary sites, Tel Gerisa and Khirbet Kurdaneh, on the Yarkon and Naʿaman rivers, respectively, may have served as inland ports on navigable waterways. In the case of Tel Gerisa, the area served as an anchorage for boats as late as 1917 (Herzog 1993: 480; Khalidi 1992: 246, photo), although was deemed unsuitable some twenty years later (Shepstone 1937: 266). Apart from surveys and salvage excavations (Esse 1991:181, site 87; Maisler 1939), landlocked Khirbet Kurdane is still unexplored. However, given the distribution of Metallic Ware as far west as Qiryat Ata (Greenberg and Porat 1996: 11–12, 19, Fig. 5), either Khirbet Kurdaneh or Tyre, or both, could have served as a hypothetical gateway for the maritime trade in this ceramic container.

A final caveat regarding the search for further ports is in order. In general, the paleogeography of the southern Levant and the location of the shoreline during this period are unclear. Recent indications of a eustatic (global) sea level rise on the order of 2.5m msl (Lambeck 1996b: 49) may radically alter our view of the geographical history of the Coastal Plain. Thus, some seemingly inland sites may be more 'maritime' than previously supposed. While little is known about the maritime culture of the few coastal sites, it seems that a spatial relationship exists between these suggested ports and Fargo's (1979) dendritic network of inland sites. Among the limited evidence for maritime subsistence is a possible marine fish bone from Tel Dalit (Horwitz *et al.* 1996: 197, 204–6), and the bone of a dolphin found at ʿAi (Wapnish 1995: 264), although the precise EBA phase is not indicated.

The small number of EB II–III ports should not lead to a complete disregard of the role of the southern Levant in the 'Byblos run.' In this regard, Stager's (1990) evocation of the concept of EBA 'port power' is an important step forward in understanding the interface between latitudinal routes and maritime networks. A safe haven or port to serve ships engaged in the longshore traffic between Egypt and Byblos was always preferred, if not essential. This is best illustrated by way of analogy with the Roman period, when ships relied on small lighterage ports, apart from the deeper harbors at Caesarea and Akko. If, during the centuries of *Pax Romana*, when maritime trade flourished and the scope of traffic required no more than two substantial ports along the southern Levant, then, *a minori ad majus*, such could be the case during the Old Kingdom period, when traffic was certainly lesser in scope. Thus, the fact that no more than three possible ports-of-call may have been identified is in no way a reflection of the scope of longshore traffic. Rather, it is a reflection of the socio-economic organization and orientation of the inhabitants of the southern Levant, who relied on a limited number of specific ports.

The beginning of the commercial maritime container

Potters, like any other craftsmen, respond to the needs of their consumers, pushing the limits of the ceramic

medium to create desired form and maximize function. Nowhere is this relationship more apparent than in the development of the commercial maritime container—a storage vessel capable of safely delivering an organic bulk cargo long distances by sea. Although not the first to recognize its particular distinctiveness (Amiran 1969a: 140–1; Grace 1956, 1979; Parr 1973; Zemer 1977), Raban (1980: 1–8) has succinctly outlined the ideal characteristics of this particular jar: it should be simple and inexpensive to produce in large numbers, so not to affect negatively the cost of the commodity it contains; it should be of standard dimensions and shape, in order that the volume (and often the commodity) should be easily recognizable to a potential customer and to maximize the capacity of a ship's cargo hold; and it must be adapted for rugged transport at sea, and easily carried. Although many relatively light materials (e.g. leather, metal, plastered or asphalt sealed baskets) might serve as possible containers on land, for long periods of time at sea organic cargoes required sealed, airtight containers made of materials that would not react with the contents or allow it to be spoiled by the constant presence of sea spray and bilge water (Marcus 1995: 601; Raban 1980: 3–4). The cumbersome, heavy ceramic container was the only solution until the introduction of the wooden stave barrel, perhaps sometime in the eleventh to twelfth centuries CE (Pryor 1988: 82–3).

In order to achieve the desired characteristics in a ceramic form, a number of attributes evolved (Parr 1973: 176–7; Raban 1980: 1–8, *passim*): an increasingly streamlined, standardized, elongated shape that enlarged the amount of surface area in contact between two adjoining vessels, which helped prevent breakage by distributing the force of impact; a gradually smaller, thicker base to prevent breakage at one of the vessel's primary weak points, and, ultimately, to serve as a third handle; strong, firmly attached loop handles to enable ease of conveyance, again streamlined to prevent sharp knocks on an adjoining vessel wall, and standardized for ease of lashing; shoulder strength to enable the placement of a second or third stack in a ship's hold; a relatively narrow, standardized neck and shaped rim that would enable a 'cork' and clay lump to be firmly attached and the vessel stopped; and, lastly, overall vessel strength and reduced permeability, either by production method (i.e. choice of paste and firing technique) or by the use of a sealant.

Since Raban's (1980) seminal study, no other works have dealt with the early development of the commercial storage jar in the Bronze Age. A full consideration of this topic is beyond the scope of the present work, but a number of salient trends should be indicated. While the optimum ceramic form may have only been achieved by the Classical amphora, and even then in countless typological and functional permutations, already at the beginning of the Early Bronze Age potters began to experiment with various attributes of the storage jar in order to adapt it for the rigors of transport. Clearly, EB I ledge-handle and loop-handle jars were capable of making the arduous journey from the southern Levant to Egypt and arriving complete with their contents (Porat 1989; Hartung, this volume). By EB II, the loop handle replaced the ledge handle on all the storage jars imported into Egypt; and many of the attributes outlined above (i.e., thickened walls and base, profiled rim, elongated body, etc.) began to become more widespread in the EB III/Old Kingdom periods. The development of these EB II–III storage jars, and many of the jug types, are seen by many as a result of the demands of sea-borne trade during this period (Esse 1991: 115–16; Raban 1980: 57–62; Stager 1985: 179, 1992: 37–9). Esse's (1991: 115, Fig. 21) study of the height of Levantine vessels found in Egypt shows a chronological trend from relatively small Light Faced Painted Ware (LFPW) jugs and juglets, to larger Red Polished Ware (RPW) jugs, to even larger Combed Ware (CW) jars. This most certainly echoes the increasing carrying capacity of the means of transport, from relatively small boats or donkeys to increasingly larger sailing ships (Esse 1991: 115–16). Unnoticed by him, the bell curves of Esse's histogram also demonstrate greater standardization among RPW and CW vessels than among LFPW types, with the steepest curve attained by the CW vessels. Moreover, the identification of Metallic Ware production centers in northern Canaan (EB II) and, probably, the northern coastal Levant (EB III) demonstrates that many of the so-called RPW and CW vessels were being mass produced with particular typological and petrographic characteristics (i.e., high-firing, less permeability, and strong, but light weight), which made them ideal for transport and easily packed (Greenberg and Porat 1996). In EB III, after its floruit, Metallic Ware continues to be used solely in the production of storage jars and *pithoi*, while other forms are made of different fabrics (Greenberg and Porat 1996: 12). This continuity strengthens the notion that potters had found an optimum matching of vessel type and function with fabric, an achievement that consumers were loathe to give up. Note that these are the only Metallic Ware closed vessel types found at Byblos, Tyre, and Lebea, although those at Byblos appear in much greater variation—which suggests an additional production center (Greenberg 1996: 137).

Regarding commercial recognizability, depictions of jars appear on wooden labels and ivory inlays in the First Dynasty (Amiran 1969b) and in the Old Kingdom, where the contents are indicated to be sweet oil (Kantor 1992: 20, Fig. 6:3). Imported jugs are depicted on a Second Dynasty tomb and on a relief from the time of the Fifth Dynasty king Sahure (Esse 1991: 105; Kantor 1992: 20, Fig. 6: 2). These jugs were a sufficiently recognizable material idiom to be copied in stone by the reign of Qa in the First Dynasty, and to have become a determinative in an offering list by the Third (Kantor 1992: 20). Although not immortalized pictorially, the decoration of the LFPW vessels of the Early Dynastic/EB II period may indicate some form of botanical decoration that indicated its contents (e.g., resin, fruit juice, wine, etc.).

Thus, while in quantifiable terms there is a relatively limited amount of evidence for the involvement of the southern Levant in the export of organic products to Egypt during the EB II, and especially EB III, the emergence of a specialized commercial container that was produced in specific workshops may be an indication of a reorientation by potters to the necessities of trade. The true Metallic Ware jars, and jugs that were produced in northern Canaan and reached Egypt during the Early Dynastic/EB II period, are only part of a much broader socio-economic ceramic phenomenon, only hinted at by

the examples found in Egypt. However, the wide distribution and occurrence of Metallic Ware at sites in northern Canaan means that the containers cannot be used to pinpoint the origin of the organic products (e.g., oils, resins, wine, etc.) that were shipped to Egypt. These vessels were produced in one specific area and may have been filled anywhere within their extensive distribution area, to be exported from a coastal zone (e.g., the Lebanese coast or the Akko Plain). The broader significance of this phenomenon is, perhaps, best expressed by what might be described as a hypothesis from a list of Raban's general 'expectations' from the study of the commercial maritime jar:

> The presence, in the ceramic repertoire of a particular culture, of a distinctive type of storage jar, which is significantly different from the remaining jar types in that it is better suited to being carried and shipped, is evidence of the flourishing of long distance maritime trade. The absence of this distinctive type provides the opposite evidence. (Raban 1980: translated from the Hebrew)

A possible corollary is that the production, adoption, and utilization (implementation in the maritime network) of such a vessel reflects the economic orientation of said culture toward long-distance maritime trade. Whether these hypotheses can be proven or not will require further synchronic and diachronic study, but note Mazzoni's (1987: 150–1) observation of the predominantly coastal distribution of CW jars in Syria compared to inland areas, which strengthens the maritime role ascribed to this vessel.

Conclusions and thoughts for future research

As the preceding discussion has sought to demonstrate, there is clear evidence for increasingly sophisticated maritime transport in the fourth and third millennia, which was no doubt a response to the increasing demands of the core civilizations. A comparison between Egypt and southern Mesopotamia (de Miroschedji, this volume) suggests that, given the requisite seafaring skills (perhaps an amalgam of homegrown and imported traditions), early Near Eastern civilizations that possessed amenable outlets to the sea emerged from their terrestrial expansionary stage (Algaze 1993) as centralized states that invested in and relied heavily on maritime transport for exchange and the projection of power. As a function of time and rate of movement, the notion of distance is reduced considerably by seafaring expertise, and may result in punctuated, site-specific manifestations of power, influence, and involvement by the core in the affairs of the periphery (e.g., Buto, Byblos, etc.). In this manner, it seems that the ancients succeeded in overcoming Bairoch's terrestrial 'Tyranny of distance' (1988: 11–12) by turning to the sea. Thus, it seems only fitting that any explanatory model seeking to go beyond the limits of terrestrial forms of interaction, and explain broader east Mediterranean cross-cultural phenomena, must incorporate maritime activity as a factor.

For the southern Levant, two provisional phases of 'maritime history' may be discerned. The first is the prehistoric phase (Neolithic–Chalcolithic), when there is increasing evidence for sophisticated maritime subsistence strategies that augmented traditional terrestrial ones. This development should probably be seen as a long-term phenomenon associated with the gradual loss of a 10–15km wide strip of Coastal Plain, and its associated resources, which occurred from glacial maximum to *c.*8000 years BP, and whose impact may not always be fully appreciated (Bar-Yosef and Belfer-Cohen 1989: 454). The second phase accompanies increasing Egyptian involvement in the southern Levant, which served, initially, as a primary and then an ancillary source of raw materials. During this phase the littoral zone also functioned, initially, as a terrestrial-maritime and then, finally, a solely maritime nexus within the 'Byblos run' of the Old Kingdom. Apart from inferences that may be drawn from the parameters of seafaring, settlement pattern, and certain aspects of material culture, the state of research into maritime activity along the southern Levant is wanting, but does suggest avenues of inquiry to be pursued.

Lastly, the rise of seafaring technology and acumen, from prehistoric exploration and colonization to the levels encountered in the Old Kingdom period, is still lacking a general explanatory model, if one is possible or heuristically viable. In rejecting the notion of a Levantine counterpart for Irwin's (1989, 1990, 1992) Pacific Ocean 'voyaging nursery,' Held (1993: 27) may have been both overcautious and deficient in not providing an alternate mechanism for early voyaging, other than what he describes as 'haphazard, sporadic, and maybe even predominantly one-directional' seafaring. While a Pacific comparison is certainly inapplicable because of differences in environment and scale (Broodbank 1995: 44–5, 61–6, Fig. 2.1; Cherry 1981: 41–2), many of the parameters were probably the same at a lower level. These parameters include a large marine biomass, island-studded waters, wind and current changes, and coastal culture. Although Held notes the current low marine biomass of the eastern Mediterranean, the exclusive utilization of the gray triggerfish at Atlit-Yam and Cape Andreas is instructive as this species is not well-represented among the modern marine fauna (Zohar 1994). This disparity, along with other evidence, may indicate oceanographic changes in the eastern Mediterranean since the early Holocene (Stanley and Galili 1996). Although relatively island-less, chains of small offshore islands do exist both in the southern and northern Levant, although many paleo-islands are now submerged. Some, like Tyre and Arwad, were large enough to be eventually settled. Smaller islands were, as today, breeding grounds for birds, which certainly would have attracted the attention of hunters. Other nearshore islands may have had freshwater springs, like the examples at Dor and Jaffa (Wachsmann and Raveh 1984: 232, n. 8). The rocky sea bottom around these islands would also have provided shelter for fish—a phenomenon that would not have escaped the notice of prehistoric fishermen. Moreover, the largest Levantine island, Cyprus, would not have been ignored by fishermen out at sea, despite its being out of sight from the continental shores (Held 1993: 26). Wind changes in the region are regular, such that mariners could rely on returning safely to shore following experimental voyages (Irwin 1989: 174–5, 1990). Regarding the prehistoric coastal culture involved in these pursuits, the current lacuna is a reflection of the state of research,

which might be radically altered by a serendipitous underwater discovery like Atlit-Yam and the submerged entrance to the Cosquer cave in southern France (Clottes and Courtin 1996). Although still premature, any model seeking to explain early Levantine seafaring should not be capriciously imported *in toto*, but should be constructed locally, considering local East Mediterranean physiographic conditions, and incorporating evidence for diachronic changes in sea level, paleogeography, coastal carrying capacity, and the role of marine subsistence strategies. Such a model would contribute greatly toward understanding the Levantine background to the seafaring acumen that may have been a part of the cross-cultural interactions of the fourth and third millennia.

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References

Agouridis, C. (1997) Sea routes and navigation in the third millennium Aegean. *Oxford Journal of Archaeology* 16(1): 1–24.

Algaze, G. (1993) Expansionary dynamics of some early pristine states. *American Anthropologist* 95(2): 304–33.

Alon, D. and Yekutieli, Y. (1995) The Tel Halif Terrace 'Silo Site' and its implications for the Early Bronze Age I. *'Atiqot* 27: 149–89.

Amiran, R. (1969a) *Ancient Pottery of the Holy Land: From Its Beginnings in the Neolithic Period to the End of the Iron Age.* Jerusalem: Massada Press Ltd.

Amiran, R. (1969b) Canaanite jars depicted on Egyptian First Dynasty wooden labels and ivory inlays. In *Eretz Israel 9 (Albright Volume).* Jerusalem: Israel Exploration Society, pp. 119–21 (in Hebrew, English abstract, p. 137).

Amiran, R. (1992) An Egyptian artist from Megiddo and a local Canaanite artist from Tell Farah (N), both from the Early Bronze Age I. In *Eighteenth Archaeological Conference in Israel, 12–13 February, 1992* (Abstracts). Jerusalem: Israel Exploration Society, p.31 (in Hebrew).

Arav, R. (1990) Bethsaida. *Excavations and Surveys in Israel* 7–8: 177–8.

Bairoch, P. (1988) *Cities and Economic Development: From the Dawn of History to the Present* (trans. C. Braider). Chicago: Chicago University Press.

Barag, D. (1963) A survey of pottery recovered from the sea off the coast of Israel. *Israel Exploration Journal* 13: 13–19.

Bar-Matthews, M., Ayalon, A. and Kaufman, A. (1997) Late Quaternary paleoclimate in the Eastern Mediterranean region from stable isotope analysis of speleothems at Soreq Cave, Israel. *Quaternary Research* 47: 155–68.

Baruch, U. (1986) Late Holocene vegetational history of Lake Kinneret, Israel. *Paléorient* 12(1): 37–48.

Baruch, U. (1994) The Late Quaternary pollen record of the Near East. In *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean,* edited by O. Bar-Yosef and R. S. Kra. Tucson: *Radiocarbon Special Issue,* pp. 103–19.

Bar-Yosef, O. and Belfer-Cohen, A. (1989) The origins of sedentism and farming communities in the Levant. *Journal of World Prehistory* 3(4): 447–98.

Basch, L. (1985) Anchors in Egypt. *Mariner's Mirror* 71: 453–67.

Basch, L. (1987) *Le Musée imaginaire de la marine antique.* Athens: Institut Hellénique pour la préservation de la tradition nautique.

Bass, G. F. (1972a) (ed.) Introduction. In *A History of Seafaring Based on Underwater Archaeology.* London: Thames and Hudson, pp. 9–10.

Bass, G. F. (1972b) (ed.) The earliest seafarers in the Mediterranean and the Near East. In *A History of Seafaring Based on Underwater Archaeology.* London: Thames and Hudson, pp. 12–36.

Baumgarten, Y. (1993) Evidence for ships in the Eastern Mediterranean during the Chalcolithic Period. In *Nineteenth Archaeological Conference in Israel, 25–26 March, 1993* (Abstracts). Jerusalem: Israel Exploration Society, pp. 9–10 (in Hebrew).

Beck, P. (1995) Issues in the history of Early Bronze Age art in Eretz Israel. *Cathedra* 76: 3–33 (in Hebrew, English abstract, p. 199).

Bednarik, R. G. (1997) The earliest evidence of ocean navigation. *International Journal of Nautical Archaeology* 26(3): 183–91.

Ben-Tor, A. (1982) The relations between Egypt and the Land of Canaan during the third millennium BC. *Journal of Jewish Studies* 33: 3–18.

Ben-Tor, A. (1986) The trade relations of Palestine in the Early Bronze Age. *Journal of the Economic and Social History of the Orient* 29: 1–27.

Berger, M. A. (1992) Predynastic animal-headed boats from Hierakonpolis and Southern Egypt. In *The Followers of Horus: Studies Dedicated to Michael Allen Hoffman,* edited by R. Friedman and B. Adams. Egyptian Studies Association Publication, No. 2. Oxford: Oxbow Books, pp. 107–20.

Bikai, P. M. (1978) *The Pottery of Tyre.* Warminster: Aris & Phillips.

Bogucki, P. (1996) The spread of early farming in Europe. *American Scientist* 84: 242–53.

Brandl, B. (1992) Evidence for Egyptian colonization in the Southern Coastal Plain and Lowlands of Canaan during the EB I Period. In *The Nile Delta in Transition: 4th–3rd Millennium BC.* Proceedings of the seminar held in Cairo, October 21–24 1990, at the Netherlands Institute of Archaeology and Arabic Studies, edited by E. C. M. van den Brink. Tel Aviv, pp. 441–77.

Braun, E. and Gophna, R. (1996) Ashqelon, Afridar. *Excavations and Surveys in Israel* 15: 97–8.

Breasted, J. H. (1906) *Ancient Records of Egypt: Historical Documents from the Earliest Times to the Persian Conquest, Volume 1.* Chicago: Chicago University Press.

Brody, A. J. (1996) Maritime Religion of the Canaanites and Phoenicians: Aspects of the Specialized Sacral Beliefs and Practices of Levantine Seafarers. Unpublished Ph.D. dissertation, Harvard University.

Broodbank, C. (1989) The longboat and society in the Cyclades in the Keros-Syros culture. *American Journal of Archaeology* 93: 319–37.

Broodbank, C. (1993) Ulysses without sails: trade, distance, knowledge and power in the Early Cyclades. *World Archaeology* 24(3): 315–31.

Broodbank, C. (1995) This Small World the Great: An Island

Archaeology of the Early Cyclades. Unpublished doctoral thesis, University of Cambridge.
Broodbank, C. and Strasser, T. F. (1991) Migrant farmers and the Neolithic colonization of Crete. *Antiquity* 65: 233–45.
Casson, L. (1971) *Ships and Seamanship in the Ancient World.* Princeton: Princeton University Press.
Cherry, J. F. (1981) Pattern and process in the earliest colonization of the Mediterranean Islands. *Proceedings of the Prehistoric Society* 47: 41–68.
Cherry, J. F. (1985) Islands out of stream: isolation and interaction in early east Mediterranean insular prehistory. In *Production and Exchange in Aegean and Mediterranean Prehistory,* edited by A. Knapp and T. Stech. UCLA Institute of Archaeology Monographs. Los Angeles: UCLA, pp. 12–29.
Cherry, J. F. (1990) The first colonization of the Mediterranean islands: a review of recent research. *Journal of Mediterranean Archaeology* 3(2): 145–221.
Chilardi, S., Frayer, D., Gioia, P., Macchiarelli, R. and Mussi, M. (1996) Fontana Nuova di Ragusa (Sicily, Italy): southernmost Aurignacian site in Europe. *Antiquity* 70: 553–63.
Clottes, J. and Courtin, J. (1996) *The Cave Beneath the Sea: Paleolithic Images at Cosquer.* New York: Harry N. Abrams, Inc.
Cotterell, B. and Kamminga, J. (1990) *Mechanics of Pre-Industrial Technology.* Cambridge: Cambridge University Press.
Dennell, R. and Roebroeks, W. (1996) The earliest colonization of Europe: the short chronology revisited. *Antiquity* 70: 535–42.
Dreyer, G. (1992a) Recent discoveries at Abydos Cemetery U. In *The Nile Delta in Transition: 4th–3rd Millennium BC.* Proceedings of the seminar held in Cairo, October 21–24 1990, at the Netherlands Institute of Archaeology and Arabic Studies, edited by E. C. M. van den Brink. Tel Aviv, pp. 293–9.
Dreyer, G. (1992b) The Royal Tombs of Abydos. In *The Near East in Antiquity, Vol. III* (German contributions to the archaeology of Jordan, Palestine, Syria, Lebanon and Egypt), edited by S. Kerner. Amman: Al Kutba; Goethe-Institut; German Protestant Institute for Archaeology, pp. 55–67.
Elliot, C. (1977) The religious beliefs of the Ghassulians *c.*4000–3100 BC. *Palestine Exploration Quarterly* 109: 3–25.
Engberg, R. M. and Shipton, G. (1934) *Notes on the Chalcolithic and Early Bronze Age Pottery of Megiddo.* Studies in Ancient Oriental Civilization, No. 10. Chicago: The Oriental Institute of the University of Chicago.
Epstein, C. and Gutman, S. (1972) The Golan. In *Judea, Samaria and the Golan: Archaeological Survey 1967–1968,* edited by M. Kochavi. Jerusalem: The Archaeological Survey of Israel; Carta, pp. 244–95.
Esse, D. L. (1991) *Subsistence, Trade, and Social Change in Early Bronze Age Palestine.* Studies in Ancient Oriental Civilization, No. 50. Chicago: The Oriental Institute of the University of Chicago.
Evans, J. (1994) The early millennia: continuity and change in a farming settlement. In *Knossos: A Labyrinth of History* (Papers presented in honour of Sinclair Hood), edited by D. Evely, H. Hughes-Brock and N. Momigliano. Oxford: The British School of Athens, pp. 1–20.
Fargo, V. (1979) Settlement in Southern Palestine During the Early Bronze III. Unpublished Ph.D. dissertation, University of Chicago.
Flemming, N. C. (1980) Cities under the Mediterranean. In *Archaeology under Water: An Atlas of the World's Submerged Sites,* edited by K. Muckelroy. New York: McGraw-Hill, pp. 162–3.
Fritz, V. (1993) Excavations at Tell el-ʿOreimeh (Tel Kinrot) 1982–1985 seasons. *Tel Aviv* 20(2): 187–215.
Frost, H. (1969) The stone-anchors of Byblos. *Mélanges de l'Université Saint Joseph* 45: 426–42.
Frost, H. (1970) Bronze Age stone-anchors from the Eastern Mediterranean. *Mariner's Mirror* 56: 377–94.
Frost, H. (1979) Egypt and stone-anchors: some recent discoveries. *Mariner's Mirror* 65: 137–61.
Frost, H. (1991) Anchors sacred and profane: Ugarit–Ras Shamra, 1986; the stone anchors revised and compared. In *Arts et industries de la pierre, Ras Shamra–Ougarit VI,* edited by M. Yon. *Éditions Recherchés sur les Civilisations.* Paris, pp. 355–410.
Frost, H. (1995) Harbours and proto-harbours; early Levantine engineering. In *Cyprus and the Sea: Proceedings of the International Symposium,* edited by V. Karageorghis and D. Michaelides. Nicosia: University of Cyprus, pp. 1–22.
Gaballa, G. (1976) *Narrative in Egyptian Art.* Mainz am Rhein: Philipp von Zabern.
Galili, E. and Weinstein-Evron, M. (1985) Prehistory and paleoenvironments of submerged sites along the Carmel Coast in Israel. *Paléorient* 11(1): 37–52.
Galili, E., Kaufman, D. and Weinstein-Evron, M. (1988) 8000 years under the sea. *Archaeology* 41: 66–7.
Galili, E., Sharvit, Y. and Nagar, A. (1996) Neve Yam—underwater survey. *Hadashot Arkheologiyot* 106: 54–6 (in Hebrew).
Galili, E., Weinstein-Evron, M., Hershkovitz, I., Gopher, A., Kislev, M., Lernau, O., Kolska-Horowitz, L. and Lernau, H. (1993) Atlit-Yam: a prehistoric site on the sea floor off the Israeli coast. *Journal of Field Archaeology* 20: 133–57.
Gibbons, A. (1998) Ancient island tools suggest *Homo Erectus* was a seafarer. *Science* 279: 1635–7.
Gilead, I. (1986) Gerar 100: the Chalcolithic site. In *Preliminary Reports of ASOR-Sponsored Excavations 1980–1984,* edited by W. E. Rast. Bulletin of the American Schools of Oriental Research Supplement, no. 24. Baltimore: Johns Hopkins University Press, pp. 75–87.
Gilead, I. (1988) The Chalcolithic Period in the Levant. *Journal of World Prehistory* 2(4): 397–443.
Gilead, I. (1995) The foragers of the Upper Paleolithic Period. In *The Archaeology of Society in the Holy Land,* edited by T. E. Levy. London: Leicester University Press, pp. 124–40.
Gomez, B. and Pease, P. P. (1992) Early Holocene Cypriot coastal palaeogeography. *Report of the Department of Antiquities of Cyprus,* Nicosia.
Gophna, R. (1974) The Settlement of the Coastal Plain of Eretz Israel During the Early Bronze Age. Unpublished Ph.D. dissertation, Tel Aviv University (in Hebrew with English summary).
Gophna, R. (1997) The Southern Coastal Troughs as EB I subsistence areas. *Israel Exploration Journal* 47(3–4): 155–61.
Gophna, R. and Liphschitz, N. (1996) The Ashkelon Trough settlements in the Early Bronze Age I: new evidence of maritime trade. *Tel Aviv* 23: 143–53.
Gophna, R. and Portugali, Y. (1988) Settlement and demographic processes in Israel's coastal plain from the Chalcolithic to the Middle Bronze Age. *Bulletin of the American Schools of Oriental Research* 269: 11–28.

Goring-Morris, A. N. (1984) The lithic assemblages from Tel Mevorakh. In *Excavations at Tel Mevorakh (1973–1976), Part Two: The Bronze Age*, edited by E. Stern. Qedem, Vol. 18. Jerusalem: The Institute of Archaeology, The Hebrew University, pp. 81–6.

Goring-Morris, A. N. (1995) Complex hunter/gatherers at the end of the Paleolithic (20,000–10,000 BP). In *The Archaeology of Society in the Holy Land*, edited by T. E. Levy. London: Leicester University Press, pp. 141–68.

Goring-Morris, A. N., Goren, Y., Horwitz, L. K., Bar-Yosef, D. and Hershkowitz, I. (1995) Investigations at an early Neolithic settlement in the Lower Galilee: results of the 1991 season at Kefar HaHoresh. *ʿAtiqot* 27: 37–62.

Goyon, G. (1971) Les ports des pyramides et le Grand Canal de Memphis. *Revue d'Égyptologie* 23: 137–53.

Grace, V. R. (1956) The canaanite jar. In *The Aegean and the Near East: Studies Presented to Hetty Goldman*, edited by S. Weinberg. Locust Valley, pp. 80–109.

Grace, V. R. (1979) *Amphoras and the Ancient Wine Trade*, rev. edn. Excavations of the Athenian Agora picture book, No. 6. Princeton: American School of Classical Studies at Athens.

Greenberg, R. (1996) The Early Bronze Age levels. In *Dan I: A Chronicle of the Excavations, the Pottery Neolithic, the Early Bronze Age and the Middle Bronze Age Tombs*, edited by A. Biran, D. Ilan and R. Greenberg. Annual of the Nelson Glueck School of Biblical Archaeology, Hebrew Union College–Jewish Institute of Religion. Jerusalem, pp. 85–160.

Greenberg, R. and Porat, N. (1996) A third millennium Levantine pottery production center: typology, petrography, and provenance of the Metallic Ware of Northern Israel and adjacent regions. *Bulletin of the American Schools of Oriental Research* 301: 5–24.

Grigson, C. (1987) Shiqmim: pastoralism and other aspects of animal management in the Chalcolithic of the Northern Negev. In *Shiqmim I* (Studies concerning Chalcolithic societies in the northern Negev Desert, Israel [1982–1984]), edited by T. E. Levy. Oxford: BAR International Series, No. 356i, pp. 219–41.

Hadas, G. (1992) Stone anchors from the Dead Sea. *ʿAtiqot* 21: 55–7.

Hadas, G. (1993) A stone anchor from the Dead Sea. *International Journal of Nautical Archaeology* 22(1): 89–90.

Haldane, C. (1992) 'A Pharaoh's Fleet': early dynastic hulls from Abydos. *The INA Quarterly* 19(2): 12–13.

Hassan, F. A. (1988) The Predynastic of Egypt. *Journal of World Prehistory* 2(2): 135–85.

Hassan, F. A. (1997) The dynamics of a riverine civilization: a geoarchaeological perspective on the Nile Valley, Egypt. *World Archaeology* 29(1): 51–74.

Hassan, S. (1955) The causeway of Unas at Sakkara. *Zeitschrift für Ägyptische Sprache und Altertumskunde* 80: 136–9.

Held, S. O. (1992) Colonization and extinction on Early Prehistoric Cyprus. In *Acta Cypria, Part 2*. Acts of an international congress on Cypriot archaeology held in Göteborg on August 22–24, 1991. Studies in Mediterranean Archaeology and Literature, pocket book, No. 120. Paul Åströms Förlag, pp. 104–64.

Held, S. O. (1993) Insularity as a modifier of cultural change: the case of prehistoric Cyprus. *Bulletin of the American Schools of Oriental Research* 292: 25–33.

Herzog, Z. (1993) Gerisa. In *The New Encyclopedia of Archaeological Excavations in the Holy Land*, edited by E. Stern, A. Lewinson-Gilboa and J. Aviram. Jerusalem: Israel Exploration Society, pp. 480–4.

Horowitz, A. (1979) *The Quaternary of Israel*. New York: Academic Press.

Horwitz, L. K., Hellwing, S. and Tchernov, E. (1996) Patterns of animal exploitation at Early Bronze Age Tel Dalit. In *Excavations at Tel Dalit: An Early Bronze Age Walled Town in Central Israel*, edited by R. Gophna. Tel Aviv: Ramot Publishing House, Tel Aviv University, pp. 193–216.

Inbar, M. and Sivan, D. (1984) Paleo-urban development and late Quaternary environmental change in the Akko Area. *Paléorient* 9: 85–91.

Irwin, G. (1989) Against, across and down the wind: a case for the systematic exploration of the remote Pacific. *Journal of the Polynesian Society* 98: 167–206.

Irwin, G. (1990) Human colonisation and change in the remote Pacific. *Current Anthropology* 31 (1 Feb.): 90–4.

Irwin, G. (1992) *The Prehistoric Exploration and Colonisation of the Pacific*. Cambridge: Cambridge University Press.

Jenkins, N. (1980) *The Boat Beneath the Pyramid: King Cheops' Royal Ship*. London: Thames and Hudson.

Jidejian, N. (1971) *Byblos Through the Ages*. Beirut: Dar el-Machreq Publishers.

Jones, D. (1995) *Boats*. London: British Museum Press.

Kantor, H. J. (1992) The relative chronology of Egypt and its foreign correlations before the First Intermediate Period. In *Chronologies in Old World Archaeology*, edited by R. W. Ehrich. 3rd edn. Chicago: Chicago University Press, pp. 3–21.

Karageorghis, V. (1982) *Cyprus from the Stone Age to the Romans*. London: Thames and Hudson.

Karmon, Y. (1990) The History of the Hula Valley. In *The Hula Valley and Its Environs*. Ariel, No. s. Jerusalem, pp. 37–63 (in Hebrew).

Katzev, M. L. (1990) An analysis of the experimental voyages of Kyrenia II. In *2nd International Symposium on Ship Construction in Antiquity, Proceedings*, edited by H. Tzalas. Tropis II. Piraeus: Hellenic Institute for the Preservation of Nautical Tradition, pp. 245–56.

Kempinski, A. (1989) *Megiddo, A City-State and Royal Centre in North Israel*. Materialien zur Allgemeinen und Vergleichende Archäologie, Vol. 40. Munich: C. H. Beck.

Khalidi, W. (1992) (ed.) *All That Remains: The Palestinian Villages Occupied and Depopulated by Israel in 1948*. Washington, D.C.: Institute for Palestine Studies.

Klein, M. (1987) Dynamics of the morphological changes in the openings of the Bardawil Lagoon. In *Sinai*, edited by G. Gvirtzman, A. Shmueli, Y. Gradus, I. Beit Arieh and M. Har-El. Eretz geographic research and publications. Tel Aviv: Ministry of Defence, pp. 263–73 (in Hebrew).

Lambeck, K. (1996a) Sea-level change and shoreline evolution in Aegean Greece since Upper Paleolithic time. *Antiquity* 70(269): 588–611.

Lambeck, K. (1996b) Shoreline reconstructions for the Persian Gulf since the last glacial maximum. *Earth and Planetary Science Letter* 142: 43–57.

Le Brun, A. (1989) Le néolithique de Chypre et sa relation avec le PPNB du Levant. *Paléorient* 15(1): 161–7.

Lernau, O. (1996) Appendix: fish bones from the Naḥal Qanah cave. In *The Naḥal Qanah Cave: Earliest Gold in the Southern Levant*, edited by A. Gopher. Monograph series of the Institute of Archaeology, No. 12. Tel Aviv: Institute of Archaeology of Tel Aviv University, pp. 200–1.

Lichtheim, M. (1973) *Ancient Egyptian Literature, Vol. 1. The Old and Middle Kingdoms*. Berkeley: University of California Press.

Maisler (Mazar), B. (1939) Tell Kurdane (Aphek?) in the

Plain of Acre. *Bulletin of the Israel Exploration Society* 6: 151–8 (in Hebrew).

Manning, S. W. (1991) Approximate calendar date for the first human settlement of Cyprus? *Antiquity* 65: 870–8.

Marcus, E. S. (1995) A petrographic analysis of storage jars from Tel Nami, Israel: ceramic production and trade networks of the Middle Bronze IIa period (*c.*2000–1750 BC). In *Materials Research in Art and Archaeology IV*, edited by P. B. Vandiver, J. R. Druzik, J. L. Galvan Madrid, I. C. Freestone and G. S. Wheeler. Materials Research Society Symposium Proceedings, No. 352. Pittsburgh: Materials Research Society, pp. 597–603.

Marfoe, L. (1987) Cedar forest to silver mountain: social change and the development of long-distance trade in early Near Eastern societies. In *Centre and Periphery in the Ancient World*, edited by M. Rowlands, M. Larsen and K. Kristiansen. New Directions in Archaeology. Cambridge: Cambridge University Press, pp. 25–35.

Mark, S. (1997) *From Egypt to Mesopotamia: A Study of Predynastic Trade Routes*. Studies in Nautical Archaeology, No. 4. College Station: Texas A & M University Press.

Mazzoni, S. (1987) The diffusion of the Palestinian combed jars. In *Studies in the History and Archaeology of Palestine II*. Proceedings of the first International Symposium on Palestine Antiquities. Aleppo: Aleppo University Press, pp. 145–58.

McGrail, S. (1988) Assessing the performance of an ancient boat: the Hasholme Logboat. *Oxford Journal of Archaeology* 7(1): 35–46.

McGrail, S. (1990) The theoretical performance of a hypothetical reconstruction of the Clapton Logboat. *International Journal of Nautical Archaeology* 19(2): 129–33.

McGrail, S. (1991) Early sea voyages. *International Journal of Nautical Archaeology* 20(2): 85–93.

Mediterranean Pilot (1976) United Kingdom: Hydrographer of the Navy.

Meiggs, R. (1982) *Trees and Timber in the Ancient Mediterranean World*. Oxford: Clarendon Press.

Mellink, M. (1993) The Anatolian south coast in the Early Bronze Age: the Cilician perspective. In *Between the Rivers and the Mountains: Archeologica Anatolica et Mesopotamica Alba Palmieri Dedicata*, edited by M. Frangipane, H. Hauptman, M. Liverani, P. Matthiae and M. Mellink. Rome: Departimento di scienze storice archeologiche e anthropologiche dell'antichà, Università di Roma, pp. 495–508.

Moorey, P. (1987) On tracking cultural transfers in prehistory: the case of Egypt and Lower Mesopotamia in the fourth millennium BC. In *Centre and Periphery in the Ancient World*, edited by M. Rowlands, M. Larsen and K. Kristiansen. New Directions in Archaeology. Cambridge: Cambridge University Press, pp. 36–46.

Moorey, P. (1990) From Gulf to Delta in the fourth millennium BCE: the Syrian connection. In *Eretz Israel 21 (Amiran Volume)*. Jerusalem, pp. 62*–69*.

Murray, W. M. (1987) Do modern winds equal ancient winds? *Mediterranean Historical Review* 2: 139–67.

Murray, W. M. (1995) Ancient sailing winds in the Eastern Mediterranean: the case for Cyprus. In *Cyprus and the Sea: Proceedings of the International Symposium*, edited by V. Karageorghis and D. Michaelides. Nicosia: University of Cyprus, pp. 33–44.

Noy, T. (1993) Nahal Oren. In *The New Encyclopedia of Archaeological Excavations in the Holy Land*, edited by E. Stern, A. Lewinson-Gilboa and J. Aviram. Jerusalem: Israel Exploration Society, pp. 1166–70.

Ochsenschlager, E. (1992) Ethnographic evidence for wood, boats, bitumen and reeds in southern Iraq. Ethnoarchaeology at al-Hilba. *Bulletin on Sumerian Agriculture* 6: 47–78.

O'Connor, D. (1991) Boat graves and pyramid origins. *Expedition* 33(3): 5–17.

O'Connor, D. (1992) Newsbriefs: Egyptian fleet found. *Archaeology* 45 (September–October): 24.

Oren, E. (1973) The overland route between Egypt and Canaan in the Early Bronze Age. *Israel Exploration Journal* 23(4): 198–205.

Oren, E. and Yekutieli, Y. (1992) Taur Ikhbeineh: earliest evidence for Egyptian interconnections, collaborators R. Gophna, Y. Goren, I. Gilead and O. Marder. In *The Nile Delta in Transition: 4th–3rd Millennium BC*. Proceedings of the seminar held in Cairo, October 21–24 1990, at the Netherlands Institute of Archaeology and Arabic Studies, edited by E. C. M. van den Brink. Tel Aviv, pp. 361–84.

Parr, P. J. (1973) The origin of the Canaanite jar. In *Archaeological Theory and Practice*, edited by D. Strong. London: Seminar Press, pp. 173–81.

Peltenburg, E. (1995) Kissonerga in Cyprus and the appearance of faience in the East Mediterranean. In *Trade, Contact, and the Movement of People in the Eastern Mediterranean: Studies in Honour of J. Basil Hennessy*, edited by S. J. Bourke and J.-P. Descoudres. Mediterranean Archaeological Supplement, No. 3. Sydney: Meditarch, pp. 31–41.

Perlman, I. and Yellin, J. (1980) The provenience of obsidian from Neolithic sites in Israel. *Israel Exploration Journal* 30(1–2): 83–8.

Perrot, J. (1961) Une tombe à ossuaires du IV^{e} millénaire à Azor près de Tel Aviv: rapport préliminaire. *'Atiqot* 3: 1–83.

Porat, N. (1989) Composition of Pottery—Application to the Study of the Interrelations Between Canaan and Egypt During the 3rd Millennium BC. Unpublished Ph.D. dissertation, Hebrew University of Jerusalem.

Porath, Y. (1992) Domestic architecture of the Chalcolithic period. In *The Architecture of Ancient Israel from the Prehistoric to the Persian Periods*, edited by A. Kempinski and R. Reich. Jerusalem: Israel Exploration Society, pp. 40–8.

Prag, K. (1986) Byblos and Egypt in the fourth millennium BC. *Levant* 18: 59–74.

Pryor, J. H. (1988) *Geography, Technology and War: Studies in the Maritime History of the Mediterranean, 649–1571*. Cambridge: Cambridge University Press.

Raban, A. (1980) The Commercial Jar in the Ancient Near East: Its Evidence for Interconnections Amongst the Biblical Lands. Unpublished Ph.D. dissertation, Hebrew University, Jerusalem (in Hebrew with English summary).

Raban, A. (1983) Submerged prehistoric sites off the Mediterranean coast of Israel. In *Quaternary Coastlines and Marine Archaeology: Towards the Prehistory of Land Bridges and Continental Shelves*, edited by P. Masters and N. Flemming. London: Academic Press, pp. 215–32.

Raban, A. (1985) The ancient harbours of Israel in Biblical times. In *Harbour Archaeology: Proceedings of the First International Workshop on Ancient Mediterranean Harbours, Caesarea Maritima 24–28.6.83*, edited by A. Raban. Oxford: BAR International Series, No. 257, pp. 11–44.

Raban, A. and Galili, E. (1985) Recent maritime archaeological research in Israel—a preliminary report. *International Journal of Nautical Archaeology* 14: 321–56.

Roaf, M. (1990) *Cultural Atlas of Mesopotamia*. New York: Facts on File.

Roberts, O. T. (1991) The development of the brail into a viable sail control for Aegean boats of the Bronze Age. In *Thalassa: l'egée préhistorique et la mer* (Actes de la troisième Rencontre égéenne internationale de l'Université de Liège, Station de recherches sous-marine et océanographiques [StaReSo], Calvi, Corse, [23–25 avril, 1990]), edited by R. Laffinueur and L. Basch. Aegaeum, Annales d'archéologie égéenne de l'Université de Liège, No. 7. Liège, pp. 55–60.

Roberts, O. T. (1995) An explanation of ancient windward sailing: some other considerations. *International Journal of Nautical Archaeology* 24(4): 307–15.

Ronen, A. (1995) Core, periphery and ideology in Aceramic Cyprus. *Quartär* 45–46: 177–206.

Ronen, A. and Olami, Y. (1978) *'Atlit Map. Archaeological Survey of Israel*, vol. 1. Jerusalem (in Hebrew, English summary).

Rosen, A. M. (1986) *Cities of Clay: The Geoarcheology of Israel.* Prehistoric Archeology and Ecology Series. Chicago: University of Chicago.

Saghieh, M. (1983) *Byblos in the Third Millennium* BC. Warminster: Aris & Phillips Ltd.

Säve-Söderbergh, T. (1946) *The Navy of the Eighteenth Egyptian Dynasty.* Uppsala Universitets Ärsskrift, No. 6. Uppsala: A.-B. Lundequistska Bokhandeln.

Shepstone, H. J. (1937) Palestine's new lighterage ports. *Palestine Exploration Quarterly* 69: 263–7.

Simmons, A. H. (1996) Whose myth? Archaeological data, interpretations, and implications for the human association with extinct Pleistocene fauna at Akrotiri. *Journal of Mediterranean Archaeology* 9(1): 97–105.

Simmons, A. H. and Wigand, P. E. (1994) Assessing the radiocarbon determinations from Akrotiri *Aetokremnos*, Cyprus. In *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*, edited by O. Bar-Yosef and R. S. Kra. Tucson: Radiocarbon, pp. 247–64.

Sivan, D. (1981) Paleogeography of Akko Area in the Holocene Period. Unpublished M.A. thesis, Haifa University (Hebrew with English abstract).

Smith, W. S. (1965) *Interconnections in the Ancient Near East: A Study of the Relationships Between the Arts of Egypt, the Aegean, and Western Asia.* New Haven, CT: Yale University Press.

Smith, W. S. (1971) The Old Kingdom in Egypt and the beginning of the First Intermediate Period. In *The Cambridge Ancient History, Vol. 1, Part 2. Early History of the Middle East*, edited by I. Edwards, C. Gadd and N. Hammond. Cambridge: Cambridge University Press, pp. 145–207.

Stager, L. E. (1985) The first fruits of civilization. In *Palestine in the Bronze and Iron Ages, Papers in Honor of Olga Tufnell*, edited by J. Tubb. Institute of Archaeology Occasional Publication, No. 11. London, pp. 172–88.

Stager, L. E. (1990) Port Power: The Organization of Maritime Trade and Hinterland Production. Lecture at the international congress on Biblical Archaeology, Jerusalem, 24 June–4 July 1990.

Stager, L. E. (1992) The periodization of Palestine from Neolithic through Early Bronze times. In *Chronologies in Old World Archaeology*, edited by R. W. Ehrich. 3rd edn. Chicago: Chicago University Press, pp. 22–41.

Stager, L. E. (1993) Ashkelon. In *The New Encyclopedia of Archaeological Excavations in the Holy Land*, edited by E. Stern, A. Lewinson-Gilboa and J. Aviram. Jerusalem: Israel Exploration Society, pp. 103–12.

Stanley, D. J. and Galili, E. (1996) Sediment dispersal along Northern Israel coast during the Holocene: geological and archaeological evidence. *Marine Geology* 130: 11–17.

Stanley Price, N. (1977a) Colonization and continuity in the early prehistory of Cyprus. *World Archaeology* 9(1): 26–41.

Stanley Price, N. (1977b) Khirokitia and the initial settlement of Cyprus. *Levant* 9: 66–89.

Steffy, J. R. (1994) *Wooden Ship Building and the Interpretation of Shipwrecks.* College Station: Texas A & M University.

Swiny, S. (1988) The Pleistocene fauna of Cyprus and recent discoveries on the Akrotiri peninsula. *Report of the Department of Antiquities of Cyprus*, Nicosia.

Todd, I. A. (1986) The foreign relations of Cyprus in the Neolithic/Chalcolithic periods: new evidence from the Vasilikos Valley. In *Acts of the International Archaeological Symposium 'Cyprus Between the Orient and the Occident' Nicosia, 8–14 September 1985*, edited by V. Karageorghis. Nicosia: Department of Antiquities, pp. 12–28.

Torrence, R. (1986) *Production and Exchange of Stone Tools: Prehistoric Obsidian in the Aegean.* New Studies in Archaeology. Cambridge: Cambridge University Press.

Trump, D. H. (1980) *The Prehistory of the Mediterranean.* London: Allen Lane.

Valla, F. (1995) The first settled societies—Natufian (12,500–10,200 BP). In *The Archaeology of Society in the Holy Land*, edited by T. E. Levy. London: Leicester University Press, pp. 169–87.

van Andel, T. H. and Runnels, C. N. (1995) The earliest farmers in Europe. *Antiquity* 69: 481–500.

van Andel, T. H. and Schackleton, J. C. (1982) Late Paleolithic and Mesolithic coastlines of Greece and the Aegean World. *Journal of Field Archaeology* 9: 445–54.

Vinson, S. (1994) *Egyptian Boats and Ships.* Shire Egyptology Series, No. 20. Aylesbury, Buckinghamshire: Shire Publications.

Wachsmann, S. (1985) *Shfifons*—Early Bronze Age anchor shaped cult stones from the Sea of Galilee region. *Thracia Pontica* 3: 395–403.

Wachsmann, S. (1998) *Seagoing Ships and Seamanship in the Bronze Age Levant.* College Station: Texas A & M University Press.

Wachsmann, S. and Raveh, K. (1984) A concise nautical history of Dor/Tantura. *International Journal of Nautical Archaeology* 13(3): 223–41.

Wapnish, P. (1995) Towards establishing a conceptual basis for animal categories in archaeology. In *Methods in the Mediterranean: Historical and Archaeological Views on Texts and Archaeology*, edited by D. B. Small. Leiden: E. J. Brill, pp. 232–73.

Ward, W. A. (1963) Egypt and the East Mediterranean from Predynastic times to the end of the Old Kingdom. *Journal of the Economic and Social History of the Orient* 6: 1–57.

Whalen, N. and Schatte, K. (1997) Pleistocene sites in Southern Yemen. *Arabian Archaeology and Epigraphy* 8. 1–10.

Williams-Thorpe, O. (1995) Obsidian in the Mediterranean and the Near East: a provenancing success story (Review article). *Archaeometry* 37: 217–48.

Wilson, J. A. (1950) Egyptian historical texts. In *Ancient Near Eastern Texts Relating to the Old Testament*, edited by J. B. Pritchard. Princeton: Princeton University Press, pp. 227–64.

Wreschner, E. E. (1977) Newe Yam—a submerged Late Neo-

lithic settlement near Mount Carmel. In *Eretz Israel 13 (Stekelis Memorial Volume)*: 260*–71*.

Wright, M. (1988) Contacts between Egypt and Syro-Palestine during the Old Kingdom. *Biblical Archaeologist* 51(3): 143–61.

Yellin, J. and Perlman, I. (1984) Provenance of three obsidian finds from Tel Mevorakh. In *Excavations at Tel Mevorakh (1973–1976), Part Two: The Bronze Age*, edited by E. Stern. Qedem, vol. 18. Jerusalem: The Institute of Archaeology. The Hebrew University, pp. 101–5.

Yellin, J., Levy, T. E. and Rowan, Y. M. (1996) New evidence on prehistoric trade routes: the obsidian evidence from Gilat, Israel. *Journal of Field Archaeology* 23: 361–8.

Zemer, A. (1977) *Storage Jars in Ancient Sea Trade*. Haifa: The National Maritime Museum.

Zohar, I. (1994) Exploitation of Marine Resources by the Neolithic Inhabitants of Atlit Yam, Israel: A Multivariate Analysis Based on Gray Triggerfish (*Balistes Carolinensis*) Remains. Unpublished Master's thesis, University of Haifa (in Hebrew with English abstract).

Zohar, I., Dayan, T., Spanier, E., Galili, E. and Lernau, O. (1994) Exploitation of grey triggerfish (*Balistes Carolinensis*) by the prehistoric inhabitants of Atlit-Yam, Israel: a preliminary report. In *Fish Exploitation in the Past: Proceedings of the 7th Meeting of the ICAZ Fish Remains Working Group*, edited by W. van Neer. Annales du Musée Royal de l'Afrique Centrale, Sciences Zoologiques, No. 274. Tervuren, pp. 231–7.

Addendum

Since this work was submitted a number of relevant publications have appeared. Among these are: A. J. Brody (1998) *'Each man cried out to his God': The Specialized Religion of Canaanite and Phoenician Seafarers*. Harvard Semitic Monographs 58, Atlanta: Scholars Press; C. Broodbank (2000) *An Island Archaeology of the Early Cyclades*. Cambridge: Cambridge University Press; E. Peltenburg *et al.* (2000) Agro-pastoralist colonization of Cyprus in the 10th millennium BP. *Antiquity* 74: 844–53; Alan H. Simmons (1999) *Faunal Extinction in an Island Society: Pygmy Hippopotamus Hunters of Cyprus*. New York: Kluwer Academic/Plenum; Lawrence E. Stager (2001) Port power in the Early and Middle Bronze Age: the organization of maritime trade and hinterland production. *Studies in the Archaeology of Israel and Neighboring Lands in Memory of Douglas L. Esse*, edited by S. Wolff. Studies in Ancient Oriental Civilization 59, ASOR Books No. 5. Chicago, Atlanta, pp. 625–38. Regarding the possible impact of the 2.5-m sea-level reise during the third millennium BCE alluded to above, recent research suggests that sea-level along the Israeli coast remained below its present level during the period in question. See D. Sivan *et al.* (2001) Holocene sea-level changes along the Mediterranean coast of Israel, based on archaeological observations and numerical models. *Palaeography, Palaeoclimatology, Palaeoecology* 167: 101–17. I thank D. Sivan for clarifying this point.

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