Ancient Lighthouses - Part 4: The Phoenicians

by Ken Trethewey

Gravesend Cottage, Torpoint, Cornwall, PL11 2LX, UK

***Abstract**: This paper considers the Phoenician culture, well known to be expert in the art and science of navigation. The possibility that Phoenician mariners were assisted by lighted navigational aids is considered.*

Introduction

In this paper I shall develop an overview of a people and a culture generally described by the name 'Phoenician', but readers should bear in mind that there are other terms that refer to these people, the main alternatives being Sidonian, Tyrian, Carthaginian and Punic. The explanations of these terms will be provided at suitable points in the text.

It is well known that the Phoenicians were a successful race of people who became wealthy through trading across the entire Mediterranean and beyond. To achieve this success, they relied not only upon canniness with money, skillfulness at self-defence and ruthlessness in foreign policy, but also upon excellence as boat builders, seafarers and navigators. It therefore seems entirely possible that they could have been closely involved in the development of ancient lighthouses. Today, there is little discussion about this and therefore no consensus.

Objective

The objective of this chapter is:

> **To consider how the successful Phoenician trading culture was achieved and whether the pre-eminence of the Phoenicians at sea was assisted by the building or use of lighthouses or other aids to navigation.**

An Overview

It is a curious fact that most of us cannot name a single famous Phoenician. Some of us might protest that Hannibal was a famous Phoenician general, but he was actually Carthaginian, and that makes a difference. Phoenicians have left behind very little by way of textual records and most of what we know about them has been derived third hand. Yet most people have heard of the Phoenicians. Even in ancient times, the Phoenicians were recognized as having a very extensive presence not just in the 'Home Sea' that was the Mediterranean, but also far beyond it where most others would not go. Around 60 BCE, Diadorus wrote:

> *"The Phoenicians ... from ancient times were skilled in making discoveries for their own profit."*[1]

Masters of the sea, they took to exploring uncharted oceans as they looked for new sources of both raw materials and manufactured goods, as well as of grain and other foodstuffs. On the whole, they skilfully liaised between otherwise non-communicating peoples in the capacities of 'honest brokers' so as to make a profit on business transactions.

Herodotus described their methods perfectly:

> *"The Carthaginians also say that they trade with a race of men who live in a part of Libya beyond the Pillars of Hercules. On reaching this country, they unload their goods, arrange them tidily along the beach, and then, returning to their boats, raise a smoke. Seeing the smoke, the natives come down to the beach, place on the ground a certain quantity of gold in exchange for the goods, and go off again to a distance. The Carthaginians then come ashore and take a look at the gold; and if they think it represents a fair price for their wares, they collect it and go away; if, on the other hand, it seems too little, they go back aboard and wait, and the natives come and add to the gold until they are satisfied. There is perfect honesty on both sides; the Carthaginians never touch the gold until it equals in value what they have offered for sale, and the natives never touch the goods until the gold has been taken away."*[2]

In the above excerpt, Herodotus describes the trading method that was used most satisfactorily by Carthaginians - people of Phoenician descent who formed a community at Carthage in North

Fig. 4-1: Phoenicians bringing gifts to the Persian King. From a 5th c. BCE relief at Persepolis.[61]

Africa. The same methods were used by the Phoenicians for centuries. Trading for profit was their foremost aim, so they were not intrinsically a warlike people, although they could be aggressive when forced to defend their interests, particularly in the context of Greek and Roman competition. Such small ethnic groups, however, could not resist the might of great states: from 883 BCE onwards they came under the rule of Assyria, Babylon, Persia and Rome - at different points in their history. A relief presently in the museum of Persepolis shows Phoenicians paying tribute to the Persian king who ruled their lands in the 5th c. BCE, Fig. 4-1. Nevertheless, for about a thousand years, Phoenicians and other Punic people were able to travel by sea across the length and breadth of the Mediterranean and far beyond, befriending those who lived in coastal regions and indulging in trade to mutual advantage. In so doing, they absorbed all the best ideas of the cultures with which they came into contact, extending the bounds of their own culture, and becoming skilled in arts and technology.[3]

Three ancient settlements emerged on the coast of the Levant – present day Lebanon and northern Israel – called Byblos, Sidon and Tyre, their inhabitants called Biblian, Sidonian and Tyrian respectively. The settlements developed as city-states, each with a slight variation in culture on the basis that the people worshipped gods with different names, but, in time, the inhabitants of all three towns became collectively known to outsiders as Phoenicians.

Assisted by large quantities of the natural resource known to us as Lebanese Cedar (regarded as the finest ship-building material) these peoples developed great skills in shipbuilding and seamanship, and became Masters of the Sea. Furthermore, many of them made livings as merchants and traders, using their skills to travel far and wide in search of new sources of goods that could be sold on for profit. Phoenicians grew wealthy and attracted a certain degree of envy, first by Greeks, and later by Romans.

As they went about their business, they created an extensive presence in the Mediterranean and beyond - not always with formal settlements, but often living alongside local residents in their port that was a useful Phoenician stop-over, or way-point. They certainly had armed forces both on land and at sea, and they also engaged, from time to time, in what we might call 'unethical practices' - some might describe it as piracy.

They also excelled in exploration. One of them, Himilco was a late 6th c. explorer who is considered to be the first from the Mediterranean to reach the British Isles. In the passage above, Herodotus described a place as "part of Libya beyond the Pillars of Hercules." Libya was the ancient name for Africa and the Pillars of Hercules are taken by most to be the Straits of Gibraltar. The location described was probably the ancient city of Mogador (or Mugadur) - today, the Moroccan city of Essaouira. It had been visited by another Carthaginian navigator called Hanno around 500 BCE and was later used by the Romans, as evidenced by an excavation of a Roman villa there. Hanno explored a great part of the west coast of Africa, probably as far as Gabon, before turning for home.

Probably the most remarkable voyage of all was undertaken by Phoenicians under the orders of Egyptian King Necho II. Despite dissenting views, it is now recognized that these men set sail from a northern Red Sea port and sailed in a clockwise direction entirely around Africa. They returned to Alexandria after a remarkable three-year feat of discovery which Herodotus described thus:

> *"Libya is washed on all sides by the sea except where it joins Asia, as was first demonstrated, so far as our knowledge goes, by the Egyptian King Necho II (610 to 595 BCE), who, after calling off the construction of the canal between the Nile and the Arabian gulf, sent out a fleet manned by a Phoenician crew with orders to sail west about and return to Egypt and the Mediterranean by way of the Straits of Gibraltar. The Phoenicians sailed from the Arabian Gulf into the southern ocean, and*

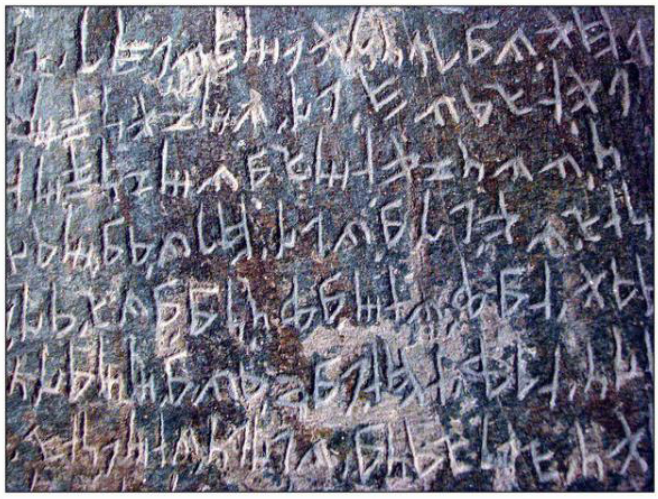


Fig. 4-2: Sample of Phoenician writing.[62]

> *every autumn put in at some convenient spot on the Libyan coast, sowed a patch of ground, and waited for next year's harvest. Then, having got in their grain, they put to sea again, and after two full years rounded the Pillars of Heracles in the course of the third, and returned to Egypt. These men made a statement which I do not myself believe, though others may, to the effect that as they sailed on a westerly course round the southern end of Libya, they had the sun on their right - to northward of them. This is how Libya was first discovered to be surrounded by sea."*[4]

With such a heritage of exploration, it is hardly surprising that the Phoenicians made a big impact across thousands of square miles of ocean. The magnificent north African city of Carthage was founded by Phoenicians in 814 BCE, and likewise developed its own identity, described as Punic, a word derived from the Latin name for the Phoenicians and applied by the Romans to those they most often encountered.[5] In current use, Punic is applied to anything of Carthaginian origin, whilst the name Phoenician is generally used for people who originated from any of the settlements under the direct influence of Byblos, Sidon or Tyre in the Levant.

Phoenicians played a large part in the development of the first alphabet using abstract symbols rather than pictographs as used in Egyptian and Babylonian writing. An early tablet of around 1200 BCE discovered in Byblos carried some 52 different symbols from a known total of 120. They were shown to be syllabic in nature and many of these developed into the symbols used in Latin and Greek and from thence into the alphabets we use today.[6] A sample of Carthaginian writing in shown in Fig. 4-2.

It was Pliny the Elder who attributed the creation of the alphabet to the Phoenicians.[7] This is not entirely true, although the Phoenicians were responsible for the spread of the ideas and practices of modern writing. Writing comes about via the need to communicate from one person to another when speech is not possible. It can be summed up as the successful conveyance of ideas through graphic art. The Egyptians were the first to develop symbols to represent ideas. As Fischer[8] writes: "Once symbol became sign around 3700 BCE, graphic art began to 'talk'." All complete writing expresses utterances in a given language; however, complete writing cannot convey all ideas in a language.

Starting in the Sumer language of Mesopotamia, various stages were passed through until the system of hieroglyphs typical of consonantal Egyptian writing became commonplace. Next came the transition from a pictorial language to an abstract, symbolic form of writing where graphic symbols represented sounds. It was in Egypt where a progression to consonantal sounds was made. Here writing stabilized for a long period into three kinds of writing: (1) the familiar hieroglyphic script for monumental or ceremonial usage in stone and other hard surfaces (2) hieratic and (3) demotic scripts that were both cursive for writing in ink on papyrus. Cuneiform writing was a further development from the Sumerian beginnings that ensued outside of Egypt and was focused on the portrayal of sounds at the expense of pictograph usage. Signs that had been pictorial were now simplified into combinations of short, wedge-shaped lines unrelated to the original form. Invented by the Sumerians, the language had both consonants and vowels. It was in the early centuries of the second millennium that a new form of cuneiform was invented in Byblos. It showed both Cretan and Egyptian influences

It would seem that the need for writing, especially in cuneiform, was particularly acute in the conduct of business where record-keeping is essential. By 2200 BCE, the ruling Akkadians in Mesopotamia were beginning to lose their powers over vassal peoples who began to acquire new freedoms. By now, 'complete writing' was

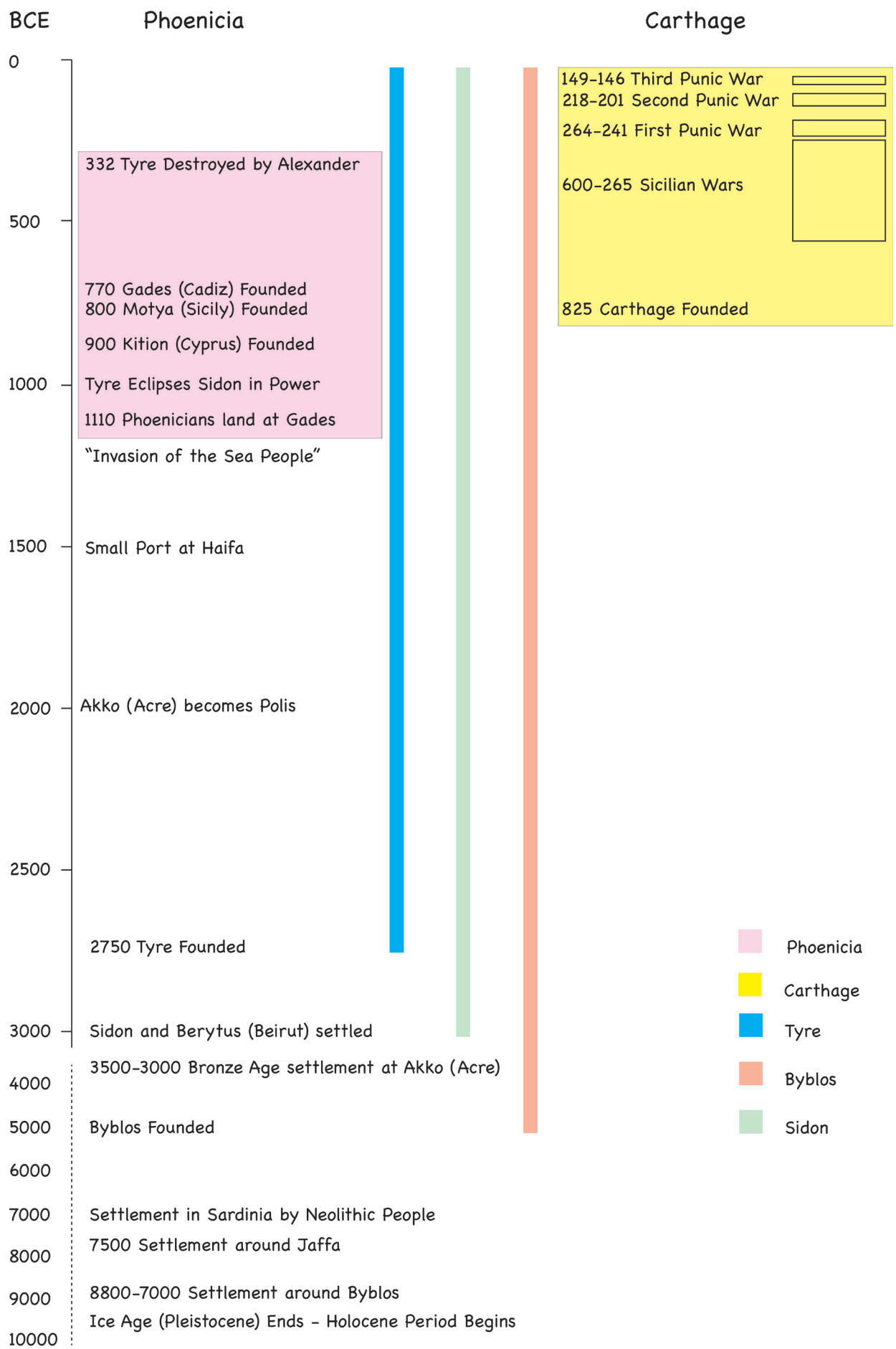


Fig 4-3: Approximate Time-Line of Phoenician and Carthaginian History.

acknowledged as the pathway to prosperity and wisdom, and was actively promoted by the Semitic peoples of Western Mesopotamia who were starting to focus their new activities as seafarers and traders. This is the deep stimulus to the so-called Phoenician alphabet. A Semitic, alphabetic, graphic system was created in Palestine which made abundant use of Egyptian signs but with Phoenician values. The process seems to have been complete by 1500 BCE and evidence of it in use in 1400 BCE was found in Ugarit. By 11th c. it had been reduced to 22 signs and could be described as Canaanite, if not Phoenician. Current opinion favours the transfer of this alphabet to ancient Greeks around 1000-900 BCE, who then developed it further. Whether the purveyors of this new tool were Phoenician, Syrian, Canaanite or Philistine remains a matter of debate.[9] It is likely they all played a role.

Others envied their wealth, power and influence, so the Phoenicians made plenty of enemies as well as profits. The Greeks became fearsome rivals, and by the 5th and 4th centuries BCE, many sources said how they despised Phoenicians and Carthaginians, branding them as pirates who had introduced the despicable sins of greed and luxury into Greek culture. They were often described in disparaging terms and made out to be violent, unruly and immoral people. Amongst many Phoenician colonies established in the Mediterranean, Strabo wrote this about Ebusus (Ibiza):

> *"And it is on account of the fertility of these regions that the inhabitants are peaceable, as is also the case with the people on the island of Ebusus. But merely because a few criminals among them had formed partnerships with the pirates of the high seas, they were all cast into disrepute, and an over-sea expedition was made against them by Metellus, surnamed Balearicus, who is the man that founded their cities."*[10]

These kinds of comments were made possibly out of jealousy for what they had achieved. However, we know that the Greeks considered trading to be a lowly profession, incompatible with the aristocratic aspirations and ethics of the Greek culture.

Only rarely was admiration expressed. Strabo balanced his description of the Phoenician inhabitants of Ibiza by reporting how they were the first to clothe the islanders, and how much they excelled with the sling-shot. Apparently, they trained their children with this weapon from an early age and didn't give a child any bread until he had hit a target with a stone from a sling-shot.[10]

Finally admitting that Phoenicians had at least some good qualities, Roman scholar and geographer Pomponius Mela wrote:

> *"The Phoenicians were an intelligent people who prospered both in peace and in war. They were outstanding in literature and other arts, in mercantile and military navigation, and in the government of an empire."*[11]

The number of direct sources of information about Phoenician and Punic history is small - one explanation for why we know so few names of famous Phoenicians. How much more we would have known about them had not Carthage been almost completely destroyed by Roman anger?

An approximate time-line of Phoenician and Punic history is shown in Figure 4-3.

Origins of the Phoenicians

The first historian, Herodotus, begins his remarkable work by describing how Phoenicians came to be at loggerheads with Greeks. Of course, it originated in a dispute about women. Persian scholars adjudicated that the Phoenicians had started it. It would seem that a Phoenician ship had called at Argos in the Peloponnese to sell goods, but the sale ended with the Phoenicians kidnapping the Greek king's beautiful daughter, Io, and escaping to Egypt. This abominable act necessitated revenge that was extracted by a group of Cretans who sailed into the Phoenician port of Tyre and stole their king's daughter, Europa, whom they took back to Crete. There, she not only gave birth to a child who grew up to be King Minos, creator of the Minoan civilization, but also inspired the naming of the entire continent. So some good came out of these bad deeds. For centuries afterwards, this tale seems to have been the basis (or perhaps an excuse?) for a great deal of serious competition and, indeed, violence between the two peoples.

We read earlier about the Minoans and their 'Palace civilization' centred on the ancient Cretan city of Knossos. Whilst we must not take the tale reported by Herodotus as truth, there is nevertheless a point to be made by the story which concerns the Phoenicians at a very early point in histo-

ry. Inspection of the potted histories of Phoenician cities on p103 shows that Phoenicians - perhaps better described here as Canaanites - were active in the eastern Mediterranean from around the 4th millennium BCE probably before the Minoans whose civilization emerged in the 3rd millennium BCE (Fig. 3-1 and Fig. 4-3).

It was the Greeks, apparently, who gave the Phoenicians their name. One interpretation of the origins of the word Phoenician is that it derives from the Greek p(h)oinix (singular) or poiniki (plural) used to describe people who lived in Canaan. Equally credible is that it originates from a word for the colour purple or purple-red (Greek, phoinos) and that the Greeks applied the name to people who traditionally dyed their textiles in that colour.[12] The two theories are quite compatible since people from Canaan were clearly skilled in making purple dye. The name of the land more precisely describes the whole of the Syro-Palestinian area - a larger area than the Phoenicians occupied, as shown in Fig. 4-4. Nevertheless, the term Canaanites is generally applied to them, but could include non-Phoenicians. On the other hand, the second common description of them as Sidonians – people of Sidon - is too narrow, for they inhabited a region larger than the city of Sidon in present-day Lebanon. Despite the measure of uncertainty that remains attached to the term 'Phoenician', I propose to use it in reference to the group of peoples who claim their origins to be from the city states that developed along that part of the narrow strip of Syro-Palestinian coastline centred on cities shown in Fig. 4-4. But where did *these* people come from?

The precise ancestral and geographic origins of the Phoenicians remain uncertain. A common, if simplistic, definition is:

> *"The Phoenicians came to the shores of Lebanon from … Africa, tens of thousands of years ago, and from the stock that remained here, the Phoenician culture developed."*[13]

In the opening sentences of Herodotus's History he refers to the Phoenicians having come originally from the Erythraean Sea. Written c. 440 BCE his account refers to the squabbles over Io and Europa:

> *"According to the Persians best informed in history, the Phoenicians began the quarrel. These people, who had formerly dwelt on the shores of the Erythraean Sea, having migrated to the Mediterranean and settled in the parts which they now inhabit, began at once, they say, to adventure on long voyages, freighting their vessels with the wares of Egypt and Assyria ..."*[14]

Herodotus believed that the Phoenicians originated from Bahrain, and Strabo believed the same. This theory was accepted by the 19th-century German classicist Arnold Heeren who said that:

> *"In the Greek geographers, for instance, we read of two islands, named Tyrus or Tylos, and Arad, Bahrain, which boasted that they were the mother country of the Phoenicians, and exhibited relics of Phoenician temples."*[15]

In the Bronze Age, Bahrain was part of a bigger land that was home to the Dilmun people, and it was from here, during the period of the Mesopotamian civilization, that the ancestors of the Phoenicians were thought to originate. Their migration to the Lebanon took place over a long period and probably included time spent in what we call Sinai. The people of Tyre in South Lebanon, in particular, have long maintained Persian Gulf origins. However, there is little evidence of occupation at all in Bahrain during the time when such migration had supposedly taken place.[16] Most agree that there is no simple definition of what it was to be Phoenician. There seems no doubt that they were of Semitic origin, and that they did indeed migrate from the east. Some argue that Phoenician identity began in the 2nd or 3rd millennium BCE in the Levant. However, others have described how there seemed to be a distinct transition of culture from around 1200 BCE - after the invasion of the so-called 'Sea People'.[17] People of Canaan who had until then not shown great interest in sea travel suddenly began a long and successful relationship with the sea and the final ingredient in the rendering of a Phoenician had somehow been put in place. Moscati writes that there was an integration of 'Sea People' into the Phoenician society through which Phoenicians acquired new skills in ship building and seamanship. Perhaps there were displaced Greeks amongst the refugees who brought their skills of the sea to the Phoenician culture. The theory seems extremely credible.

Sex	Roman	Greek	Ancient Israelite	Byblos	Sidon	Tyre	Carthage	Alternatives
M	Jupiter	Zeus[12]	Yahweh; El Elyon	El[1]	Baal[4]	Melqart[8] (Also Baal)		Eliun, Hypsistos
F	Venus	Aphrodite[10]	Ashtoret[6]	Baalat[2]	Astarte[5]		Tanit	Ashtart (Semitic), Ishtar[17] (Mesopotamian), Asratu(m) (Akkadian), Isis (Egyptian), Aserdu(s) / Asertu(s) (Hittite), Atirat (Ugaritic)
M		Asklepios		Adonis[3]	Eshmun[7]		Eshmun[7]	Dumuzi (Sumerian), Tammuz[17] (Babylonian), Tammuz (Assyrian), Osiris / Amun (Egyptian), Telipinu (Hittite), Baal (Ugaritic)
M	Hercules	Heracles[9]	Baal			Melqart		
F	Juno	Hera[11]						
M	Saturn	Kronos					Baal Hammon[13]	
M	Apollo[14]	Apollo[18]		Resheph[15]	Resheph[15]	Resheph[15]	Resheph[15]	Resheph (Egyptian)
M				Dagon[16]	Dagon[16]	Dagon[16]		Dagon[16] (Babylonian), Dagon[16] (Assyria)

Notes:

1 Male lead god; Fundamental to Canaanites. One of the Phoenician triad of deities.

2 Female lead god. One of the Phoenician triad of deities.

3 Named by Greeks but is Semitic; He is a young hunter loved by Aphrodite. He dies, but rises from the dead. One of the Phoenician triad of deities.

4 Masculine form of Baalat; means 'Lord' in Ugarit.

5 A general name for a female Canaanite deity. Astarte gives way to Tanit in Carthage. The temple at Eryx on Sicily was dedicated to Astarte and Venus Erycina.

6 Ashtoret is a Biblical reference where it is the identified as the deity of the Sidonians and implies for all Phoenicians.

7 Eshmun, the Phoenician god of healing, is only found in Phoenician culture but has temples built for him, most notably at Carthage.

8 Melqart appears from 1000 BCE.

9 Greek mythology has Iolaus-Eshmun resurrected byHeracles-Melqart, son of Astoria (Astarte) and Zeus. Heracles-Melqart are commonly viewed as the same.

10 Aphrodite is daughter of Zeus.

11 Daughter of Cronos (Kronos) and Rhea. Married to her brother, Zeus.

12 Son of Cronos (Kronos) and Rhea. Married to Hera and others.

13 Married to Tanit.

14 Son of Zeus and Leto, brother of Heracles.

15 Identified with Apollo through his association with fire and lightning. Adopted as an Egyptian deity also.

16 Son of El; the fish god.

17 Ishtar and Tammuz were married.

18 When followed by Archêgetês, it denotes a cult of the deity recognized as the leader or founder of the site.

Table 4-1: A list of ancient deities relevant to the discussions in this book. The focus is on Phoenician and Punic deities and their relationships to deities of other cultures. There were many deities who played roles across the different cultures of polytheistic pre-Christian civilizations. The table attempts to relate the complex set of names, but is subject to different interpretations and should be taken only as a guide. In particular, we note the most important Phoenician deities, of which there were three. The male lead god was El or Baal; the lead female was Astarte or Baalat. The third member of the triad of Phoenician deities was Eshmun or Adonis. From around 1000 BCE Baal was renamed Melqart. We also note that different names were used in different locations, whether it was derived from Byblos, Sidon, Tyre or Carthage.

Phoenicia

The starting point for the Phoenicians as an identifiable sociological group was the coast of the Levant, shown in Fig. 4-4. A number of city-states (polities or poleis) developed with distinct identities but common cultural features, in the same way as states of the USA might be considered today, except that no federation was involved. The page opposite Fig. 4-4 lists the main poleis regarded as Phoenician and stretched from Aradus in the north to Jaffa in the south. Farther north, Ugarit and Laodicea are often treated like Phoenician cities, but tend to be excluded from Phoenicia by other influential scholars.

The region that came to be called Phoenicia was focused on the major centres of population called Byblos, Sidon and especially Tyre, an important trading port founded in 2750 BCE.[18] It was only from 1200 BCE that so-called Phoenician city-states emerged as independent entities with a clear identity. Before that, ancient relations between the people of Egypt and those of the near East had existed for centuries, but the application of the term Phoenician to the people involved is not normally considered acceptable.

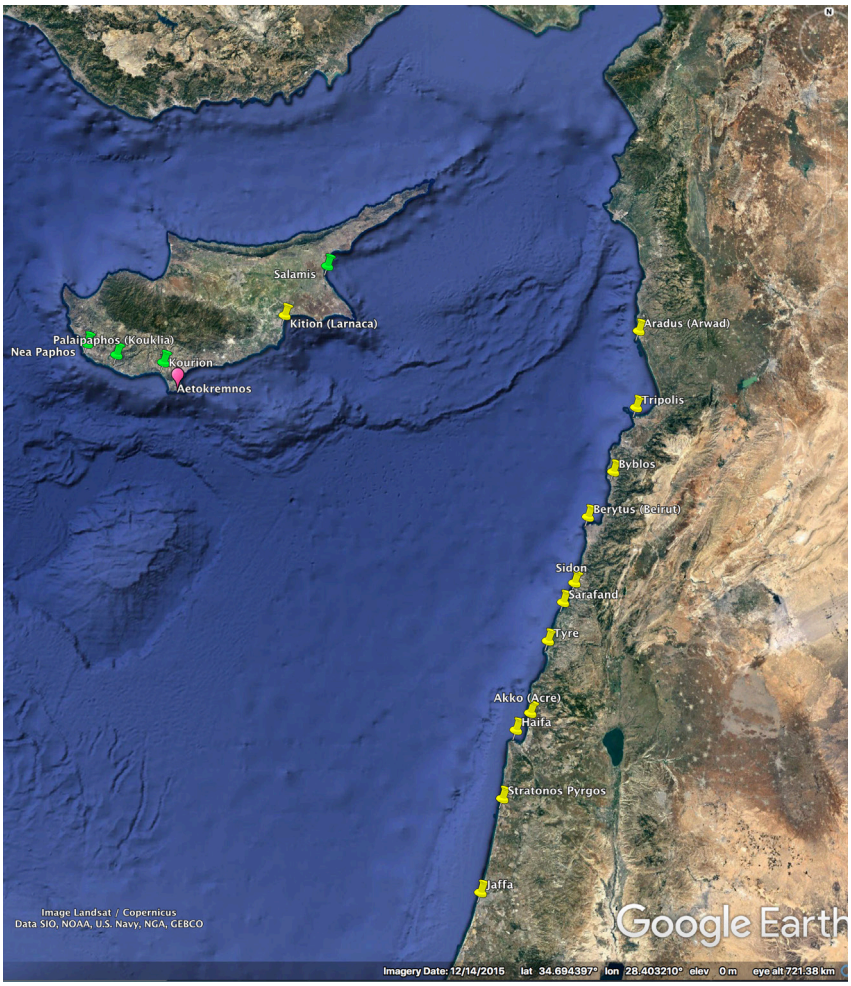


Fig. 4-4: Map of the lands that became known as Phoenicia - a group of city-states or polities that included the sites from north of Aradus to south of Jaffa. The land of Canaan extended beyond the bounds of these cities so it was mostly but not exclusively Phoenician. On Cyprus, the settlement of Kition was the only Phoenician colony, whilst those shown as green pins were ancient Greek settlements, discussed on p110. Remains of the famous pygmy elephants were found at Aetokremnos.[63]

There were undoubtedly settlements of enterprising peoples in the coastal strip regions, but they were not large enough, nor was their level of civilization sufficiently well developed, for them to be seen as living in identifiable cities or to have a significant group identity or culture. These polities that became Phoenicia were situated along the coastal strip between the sea and the mountains of Lebanon. The mountains represented a significant barrier between the sea and the lands to the east, and so the peoples of the polities were effectively cut-off and relied upon contact with their neighbours at first. To some extent, they were even cut-off from each other because the mountains reached down as far as the sea and made north-south journeys by land quite difficult. It was only natural to use the coastal waters for travel and the Phoenicians were ideally suited for that.

One striking feature of Phoenician settlements stands out above all others - their location. Almost without exception they were founded on rocky promontories that could have a dual aspect landing for alternative use depending on the weather. The Phoenicians also liked to settle on islands that could be easily defended. Thus, for example, when Alexander the Great decided to conquer Tyre, he had to build a causeway to reach the island. At all times Phoenician priorities for ports and harbours put sheltered anchorage and landings at the top along with defensive capabilities. Some of these will be discussed further below.

Aradus

The modern Syrian town of Arwad occupies the whole of an island once known as Aradus. Its identity fits the Phoenician pattern perfectly and it was indeed established by people of that culture in the early 2nd millennium. Their port was built on the sheltered eastern side of the island, and as a city at the edge of the Phoenicia it developed good defensive capabilities with both naval and commercial ships.

Tripolis

In northern Lebanon stands a city, much less famous than it Libyan counterpart, Tripoli. Geography alone would indicate its suitability as an ancient home for Stone Age inhabitants, but its significance as a Phoenician centre is debated. There seems no doubt about its Phoenician identity during the period 800 to 400 BCE, but beyond those markers lies great uncertainty because of a lack of archaeological evidence.

Byblos

The contender for the oldest continuously inhabited city in the world is Byblos, supposedly a home for people since 5000 BCE, although even earlier settlements have been reported around 8800 to 7000 BCE. Canaanite civilization developed in the third millennium BCE with evidence of identifiable groups of uniform houses being found. Evidence of the early Phoenician alphabet dating from around 1200 BCE was found here, a discovery that promotes the picture of Byblos as a thriving Phoenician commercial centre.

Berytus

Modern Beirut began as a Phoenician town called Biruta, established much later than the other centres, and probably originating as a useful port half-way on the journey from Sidon to Byblos. It was developed significantly once in Roman hands from 64 BCE, under whom the city of Berytus became the capital of the Roman presence in the Levant.

Sidon

Sidon may have been the oldest of the Phoenician settlements, first settled in the 4th millennium BCE and there have been many stone age items found here. The city's name derives from a grandson of Noah and its inhabitants were first to establish a commercial identity, continuing ancient practices brought with them from their origins in the Persian Gulf. By the time of King David (ca. 1000 BCE) Sidonian importance was eclipsed by Tyre as the latter exerted greater power because of its natural island defences, but Tyre Sidon and Byblos continued to dominate the Phoenician power base that spanned the period 1200 to 800 BCE and beyond, until Carthage emerged to act as a major competitor.

Tyre

Herodotus dated the foundation of Tyre as 2750 BCE. Originally it was a settlement close to the shore, but soon a port facility was established on an island just offshore. Not only did it offer excellent facilities for communication with neighbours and the trading that that entailed, but it was a good defensive position and was well fortified as a result. Thus Tyre became one of the strongest and most powerful of the Phoenician network along the shores of the Levant. It was here that the people developed the production of a purple dye extracted from shellfish, and it was the manufacture of the dye that led to the Greeks applying the name of Phoenike (purple people) to them. After resisting many attacks, the Tyrians finally gave way to the might of Alexander who conquered it in 332 BCE whilst on his way to take control of Egypt and establish Alexandria.

Acre

One of the oldest continuously inhabited cities in the world is Acre, or Akko, its name derived from a Canaanite word meaning a border, since Akko was at the northernmost point of the Israelite lands. In Greek, Ake means cure and it was here that Heracles was able to find herbs to assist the healing of his wounds. After initial settlement in Early Bronze Age times around 3500 to 3050 BCE, Akko became an urban centre around 2000 BCE and remained occupied thereafter, although it was subject to many changes in ownership over centuries, like many other cities in the region. It was part of the Phoenician group during the middle of the 1st c. BCE.

Haifa

A small port-city has existed in the natural bay of Haifa since the middle of the 2nd millennium BCE. The 6th-century BCE geographer Scylax describes a city "between the bay and the Promontory of Zeus", known also as Mount Carmel, a place of historic and religious significance. In Arabic, the highest peak of the Carmel range is named El-Muhrrakah, or the "place of burning." This relates to the burnt offerings and sacrifices on this hilltop in Canaanite and early Israelite times. It is believed that this was the point of Elijah's biblical confrontation with hundreds of priests of a Baal; the Baal in question was probably Melqart.

Jaffa

Archaeological evidence indicates that Jaffa was inhabited from around 7,500 BCE. There has always been a natural harbour, which makes it a desirable location for habitation. The origin of its name is said to be after its builder, Japheth, son of Noah, who settled there after the Great Flood. In 1440 BCE it was mentioned in an Egyptian letter, where it was considered to be a Canaanite city. In the Hebrew Bible it was described as a port of entry for the cedars of Lebanon. Under King David, the Israelites took Jaffa, but over centuries before the current era governance exchanged between Egyptians, Persians, Philistines, Assyrians, Babylonians, Phoenicians, and Romans. Today, the historic sites of Jaffa fall within the boundaries of Tel Aviv.

Fig. 4-5: A Phoenician merchant ship from the 1st. c. CE on a bas-relief in the Beirut Museum.[64]

Phoenician Ships

Although no Phoenician ships have been excavated, sufficient is known about them from documents and reliefs to be confident about their structures. Three types of ship are known. The earliest was a small craft with a prow in the shape of a horse's head that was rowed by one or two men for short distances. The second was a merchant vessel that was the mainstay of the Phoenician activity over a period of a thousand years. The third was a warship. These ships typically had convex sterns and horse's heads on the bow, as depicted in the images, Figs. 4-5, 4-6 and 4-7. The merchant ships were hard to handle because of their design, which might loosely be described as the shape of a bathtub. They were large and of great capacity: a Canaanite merchantman in 1200 BCE is thought to have been able to carry loads of between 200 and 450 tons. They used square sails and were rowed in the absence of wind.[19] [20]

For naval warfare boats needed both size and robustness to become fighting machines. In the absence of the ability to fire projectiles from a distance, navy ships were more often platforms for hand-to-hand combat, but the first warships were also designed to sink an enemy vessel by ramming, a development associated with the Phoenicians. A Phoenician warship was a galley, propelled by oars, making possible bursts of speed and rapid manoeuvres. Ramming an enemy ship was the main tactic of naval warfare throughout the Phoenician, Greek and Roman periods. The warship was propelled by oars with a full complement of fifty men and fitted with a ram. These fighting vessels were very successful in battle, thanks, not only to the good design, but also to the highly developed Phoenician seamanship. Only when the Romans had caught up in technology and fighting skill (which occurred towards the end of the Punic Wars) did the Phoenicians suffer significant reversals in battle. The Phoenician naval fleet is considered today to be the first naval power in history.[20] (A thousand years after the first Phoenician example, Roman warships had a bronze beak beneath the prow, below water level. They were protected from ramming by belts of metal around the ves-

sel.) The only way of increasing the speed of a Phoenician warship was by adding more oarsmen. This could be achieved with a longer ship, but too much length caused structural weakness so oarsmen were arranged in banks. By 700 BCE the Phoenicians were using two banks, one above the other, in the type of vessel known as the bireme. Within the next two centuries a third bank was added, to make a trireme.

Phoenician Traders

The Phoenicians were lucky. Having developed an excellence in travel by sea, they were able to act as traders and merchants for all the materials and artifacts necessary for the development of the other Mediterranean cultures who did not have ready access to distant lands such as Gades - present-day Cadiz. Gades was founded on three islands that the Phoenicians called 'gdr'. (A characteristic of Phoenician language was to use consonant sounds only. Gdr was expanded into Gadir, and the Greeks and Romans used Gadir in the singular, and Gades as the plural word that reflected the fact that three islands were involved.) This proved to be the greatest entrepreneurial step the Phoenicians made, for the huge amounts of silver, gold and tin, extracted from rich lode-bearing soils in the area of the River Guadalquivir in southwest Spain, and shipped from Gades, was the source of much wealth and the envy of many would-be competitors.

We should note that it was trading of ores and finished products, not necessarily the manufacture of metallic goods that occupied the Phoenicians. Although it is thought that the smelting of iron was invented in eastern Anatolia around 1500 BCE, it was the Phoenicians who, by virtue of their ability to travel, learned that skill and then exported it to other places. This gave rise to an entire period of human cultural evolution known as the Iron Age (ca. 1200 BCE – 555 BCE). As great seafarers, the ability to use first bronze and later iron resulted in superior ships better able to travel the great distances that were becoming the norm. The use of iron nails - harder than copper and bronze, for example, allowed big improvements to ship design. Pieces were joined more effectively and the flat hull of an older vessel was replaced by a proper keel that acted as the backbone of a ship onto which the skeleton was fixed. So the main objec-

Fig. 4-6: Phoenicians and their ships working with cedar logs. A bas-relief dated around the 7th c. BCE, found in the palace of Sargon at Khorsabad and presently in the Louvre, Paris.[65]

Fig. 4-7: A Phoenician coin showing a warship. The coin was minted in Byblos around 340 BCE and is now in the Beirut National Museum.[66]

tive in the great voyages made by the Phoenicians was in the trading of metals – gold, silver, copper, lead and tin. The use of metals was the key to advances in civilization. Precious metals benefited art; they represented wealth and were symbols of the success and development of a culture. More importantly, copper, tin and lead were of benefit to engineering, making the alloys needed for the tools and weapons with which strong civilizations exercised their power over weaker ones.

At first, from around 1200 BCE, trading was a simple bartering process, where items were exchanged on the basis of their usefulness, but soon the idea of value was adopted, and this was based upon the intrinsic perceived value of a metallic material. From 1000 BCE onwards, value was determined by the weight of silver and a scale of value was created. From around the 4th century BCE, a piece of silver was hallmarked as an indication of its quality. The normal unit of weight was the mina (0.5 kg) that was equal to 50 shekels. A shekel of silver was equal to 200 shekels of copper or 227 shekels of tin. A talent of silver was about 30 kg and was equivalent to 50 minas and 3000 shekels. 1 shekel of gold was equivalent to 4 shekels of silver, but silver was the main trading currency for the next 1000 years. A kind of currency had been created, although not yet based upon coins.

Interestingly, a period of inflation in this fledgling economy occurred around 750 BCE because the amount of silver in circulation was increasing, but the amount of gold, which was much more scarce, was not. This corresponded with the exploitation of a rich new seam of silver ore in what was known as the Rio Tinto mines in the region of Huelva in southwestern Spain. Following a large forest fire in which the ground containing the rich silver ores became very hot, the ground appeared suddenly loaded with a great deal of metallic silver that had been produced by the fire. The native peoples were surprised. They had no use for the silver, but when the Phoenicians saw it they immediately recognized the potential. They traded the silver for quantities of ordinary things that they could supply easily, and then began shipping the silver east to Assyria and Asia. At the time, this was the richest deposit of silver that had been found. Phoenician ships were loaded with silver until they could carry no more, but it is said they got around this and carried yet more by casting even the anchors in silver. The result in the wider Mediterranean was a devaluation of the currency, but this mattered little to the Phoenicians who had access to as much wealth as they needed. Huelva, meanwhile, developed into a wealthy port based on the smelting of the silver and other metallic ores found close by. It should be realized that the local peoples dealt with all the mining, extraction and land transport issues, whilst the Phoenicians engaged only in its trade and sea transport.

Although coins were not used at first, it is easy to see how the idea of the value of a mass of metal could be developed into a coinage-based currency. The concept of a market economy with its laws of supply and demand and ideas about standardization of value had been established. The Phoenicians were able to search out new supplies of the raw materials for these metals and hence to source the very materials that the Mediterranean civilizations needed for their development. This was to prove the major reason for the expansion westwards, to the farthest reaches of the Mediterranean and beyond, where new sources of copper, silver tin and gold were to be found.

Phoenician Navigation

We have already recognized that the Phoenicians are almost universally regarded as the foremost navigators of ancient times. We have also considered plenty of evidence of early navigational practices from well before these times, and that there was a great deal of seagoing activity long before the Phoenicians became dominant.

Let us consider the position at around 1200 BCE. We can be confident that the Egyptians had developed ship technology on the Nile from the early Bronze Age when metals gave so many advantages in tool making. Soon after 1200 BCE the Phoenicians were also particularly skilled at using the existing technology to create ships that were much better disposed towards voyages across open waters, rather than the quieter regimes of rivers. They were especially helped by their access to the copious reserves of fine cedar wood on land under their control in the Levant, an asset not available to the Egyptians who constantly courted the Phoenicians for ship-building supplies.

The ancestors of the Greeks were also active at sea, whether in the Minoan civilization of Crete and nearby islands or later in the Mycenaean peri-

od. The maritime skills they too acquired were due to their worlds being dominated by the geography of small islands and the need to travel between them. Before 1200 BCE, coastal navigation was quite primitive and done mostly on canoes or rafts - short daily runs and shore stops at night. When bigger cargoes needed dispatch, Minoan (Cretan) and later Mycenaean craft had to be rented to transport them because only these people had the necessary ships. By the time of the Trojan War when the Phoenician navigation culture was still young, the Greeks possessed powerful men-of-war and military transports, and hence the ability to embark unchallenged upon long sea voyages. Again, their methods of navigation were basic and undeveloped.

At least one author believes that voyages consisted of coastal navigation where a series of short daily hops were made from one colony to the next, keeping the coast in view at all times. Cintas wrote,

> *"For lack of compass, navigation was performed under the guidance of Ursa Minor, which the Greeks called 'Phoenician'. The ships did not go far out to sea: the Phoenicians ... probably founded their landing stages at a day's voyage apart, so as to be able to shelter on the land at night."*[21]

Speaking of a journey made across the desert, Silius Italicus described how they navigated:

> *"We steered our course across these hollows by observation of the stars; for daylight confuses the tracks, and the Little Bear, which never deceives the Phoenician mariner, guides the traveller, as he strays over the sandy depths and ever sees the waste all round him."*[22]

This was a clear reference to the method of navigation used by Phoenician mariners, made in a time when it was assumed to be commonplace. Polaris, the Pole Star, was known to the Greeks as the 'Phoenician' star, a clear mark of respect to the recognized superior navigation skills of the Phoenicians.

Herodotus describes the way the Persian fleet kept near to the coast during its attacks on Greece. His story related how Artabanus told the Persian King Xerxes:

> *"So far as I know, there is not a harbour anywhere big enough to receive this fleet of ours and give it protection in the event of storms: and indeed there would have to be not merely one such harbour, but many – all along the coast by which you will sail."*[23]

There are large areas of the Mediterranean where, thanks to high mountains, the land is visible from afar, so the spacing of Punic settlements at regular intervals of 20-30 miles along the coastline is consistent with the number of miles it was sensibly possible to travel each day. However, this argument fails when one considers Phoenician settlements in Cyprus, Sicily, Sardinia and Ibiza, places that were not at first reached by short daily hops. Routes were certainly kept close to the land whenever possible and maximum use was made of shelter in protected waters behind promontories or islands. Few voyages took place in winter when visibility was poor or the weather bad with unfavourable winds; winter sailing in the Mediterranean was not widespread until the 16th century. It has been calculated that a voyage from Tyre to Gades would last about 3 months and, allowing for the need to winter at the destination, it would be almost a year to complete the return trip.[21] No text consulted in this work makes any mention of the use of artificial aids to navigation during these Phoenician voyages. Since coast-hopping strategies do not really require major aids to navigation, the theory that Phoenicians sailed this way is probably correct, at first. However, as time went on, the evidence is that they increasingly explored the seas across greater distances by open sea voyages in which they could not see their destinations. They were not deterred by the most distant destinations and characteristically made special use of islands in the open sea as anchorages.[24]

Three maps on later pages will help you to appreciate some of the next passage: Fig. 4-21, Fig. 4-22 and Fig. 4-27. A ship sailing from Tyre to Gades would have two main options: a northern route or a southern route along the North African coast. The second of these is unfavourable because the prevailing currents are almost all west to east. Thus, it is assumed that the first port of call would be in Cyprus at the Phoenician settlement of Kition established in 900 BCE. After passing around the south of the island, the ship would make contact with the southern coast of Turkey and three possible ports lay ahead at Phoinike (modern Finike), Phoinix in Caria, or Lydia, facing the island of Rhodes. The next port of call was probably Kithira,

followed by Malta. By keeping to southern Sicily and Sardinia, the ship would avoid headwinds and adverse currents, whilst making for the island of Ibiza and southeastern Spain. Even today, passing through the Straits of Gibraltar can be a problem because of the narrowness and because the currents and winds are predominantly from west to east. In difficult conditions, ships could be delayed for many weeks here, while they awaited the abatement of the wind and sea conditions. They frequently sheltered along the coast of southeastern Spain. In some cases it was even necessary to disembark at Malaga and make a nine-day return trip overland to Tartessos. The reverse route from west to east was not as difficult and by following the north coast of Africa it was easy to reach Carthage and Utica (which was then a port on the coast about 40 km from Carthage). From there the route to Tyre via Egypt was straightforward.[25]

An important conclusion from this discussion is that the natural sea routes were extremely well worked out by the Phoenicians, with a series of logically positioned and strategic settlements that formed a very strong commercial and powerful presence across the entire Mediterranean. Great navigators though they were, no evidence has been presented that they used artificial aids to navigation. Indeed, it could be argued that with such expert knowledge of the Mediterranean and the skills to navigate it, the Phoenicians never felt the need to devise any aids to navigation other than the natural features they had been using for hundreds of years. They knew that they were operating in a sea with known limits in all directions and that no matter if they lost sight of land they would come across a recognizable feature on land sooner or later.

But deep-sea voyages were obviously made. Navigation at night was based on use of the "Phoenician star" – the Pole Star - in Ursa Minor, and this was recognized by other cultures applying the name 'Phoenike' to the Ursa Minor constellation. Thus, the Phoenicians were excellent celestial navigators too. So confident did they become that they occasionally made extreme voyages of exploration. For example, it is generally accepted that they did complete the first circumnavigation of Africa around 600 BCE. Besides finding the Azores, distant settlements in West Africa, possibly in Senegal or Cameroon, probably resulted from voyages by Hanno. The Carthaginian Himilco is reported to have sailed as far as the Cassiterides (Isles of Scilly, England) in search of tin around the 5th century BCE. There are scholars who believe that the Phoenicians first settled at La Coruña in Spain, although archaeological evidence seems to have been obliterated by later Roman and medieval works. (See Part 6.) Such distant forays beyond the Mediterranean and the immediate Atlantic Ocean are considered very rare, even for such excellent navigators.

Along with sophisticated ships, the Phoenicians developed a clever strategy for their ports. Their eastern Mediterranean homeland harbours were always developed around natural features that were common in that region and particularly suitable. Thus, reefs, small islets and natural promontories were utilized to the full such that the best access between ship and land was obtained and the greatest amount of shelter from inclement tide and weather conditions was afforded at all times. When it was not possible to moor directly to the shore, ships could ride offshore, but this was not ideal because of the need to transfer goods in smaller boats. In the western Mediterranean, the geographical features were not always so favourable except at Gades (Fig. 4-10), Malta and Motya (Sicily, Fig. 4-21), all of them island ports. When the coast was steep, ships could get close and gangplanks could be set up from the prow to the shore. If the slopes were gentler, it was not so easy to get close to the shore. In southeast Spain, conditions proved to be especially favourable in a number of places and ships were able to get easy access to the beaches. Not surprisingly, this was a popular area for Phoenician settlement.

To determine whether the Phoenicians were likely to have built the first lighthouses, we now turn our attention to their skills in shipbuilding and navigation. There is almost complete agreement that the Phoenicians were the greatest navigators of their era. This represents a time that spanned at least a thousand years from 1200 BCE, the date ascribed to their emergence as an independent people, and about 250 BCE when, during the first Punic war, the Romans were learning fast due to the need to defeat the Carthaginians. By the time the Phoenician culture was in serious decline, the Pharos at Alexandria had been built (280 BCE). It is therefore possible that they did produce the first

lighthouses upon which later lighthouses were modelled. If so, the most likely sites would surely have been in their homeland ports, or at Gades or Carthage. More will be said of this shortly.

Expansion out of Phoenicia

The great trading cities of Phoenicia were established to include their own religious rites and festivals, but for centuries from 1000 BCE onwards it was part of their culture to pay respect to Tyre as the mother city and to the god known as Melqart that had been adopted as the senior deity by Hiram, king of Tyre. Recent studies have concluded that there were many aspects of overlap between the Phoenician and Greek cultures, not least a co-identification of Melqart with Heracles (Table 4-1).[26] It is now clear that when Phoenicians decided to found a new settlement, they first instituted a sacred altar and/ or temple dedicated to Melqart that would act in the same way as we have seen for Greek migrants respecting Heracles. A state of passive co-existence between Greek and Phoenician city-states lasted for centuries and resulted in much cultural crossover between them until, around 500 BCE, the demands of commercial competition created hatred and outright enmity that prompted wars in Sicily.

Phoenicians had already established ports of call at numerous other waypoints across the Mediterranean, and, in so doing, had set up a network of lighted aids to navigation that, if not lit purposefully for the aid of mariners and maintained every night during the hours of darkness, at the very least acted as occasional visible markers to help them find safe harbour. There is much to be learned from studying the whole Mediterranean and identifying typical sites, for the result is a surprisingly efficient network of port-to-port sea legs that were of great assistance to the Phoenicians as they went about their business from one end of the Mediterranean to the other, as well as around the Black Sea and into the north Atlantic. The Romans named the Isles of Scilly in Cornwall UK, Cassiterides – the Isles of Tin, but it seems most likely that they were simply traversing routes established centuries before them by the Phoenicians. It is quite consistent with Phoenician strategy to have established distant outposts at La Coruña in northwest Spain, in the Iles des Ouessant in France, and on one of the Scilly Islands such as St. Agnes where they could then have traded tin or tin ore extracted both from the island, and (more likely) from surface mining by locals in West Cornwall.

The initial driving force for the establishment of the settlement at Gades – in the Atlantic Ocean and outside the comparative safety of the Mediterranean – was to gain access to the rich deposits of silver in southwestern Spain around Tartessos. The Phoenicians had other objectives too, not least of which was the desire to interact with other civilizations and to expand their sphere of influence amongst them.

There is a reported ‘dark age’ for the eastern Mediterranean between 1200 and 1000 BCE when, following the end of the Trojan Wars, there was a big redistribution of peoples around the region that resulted in much unrest and instability. It may have been a long term effect of the downfall of the Minoan civilization after the great volcanic eruption on the Greek island of Thera (Santorini) in 1650 BCE, but this is a matter of argument. It may also have been a result of the mysterious ‘Invasions of the Sea Peoples’. These invaders emerged from the regions adjacent to the Aegean Sea along southern Asia Minor by land and sea, to the coasts of Syria and Palestine.

Cyprus did not escape the troubles. There was certainly some inter-racial mixing with those who called themselves Phoenician, further complicating an already mixed ancestry. The Sea Peoples were eventually defeated in Egypt in 1180 BCE by Rameses III, as a result of which many of them turned back and settled in Palestine.[27] These disturbances put a brake on the development of the Phoenicians and others. It may even have provided a motivation for them to more purposefully explore the seas to the west and thus to arrive at Gades. From 1000 BCE, stability returned and the Phoenicians, now much more identifiable as an independent people in their own right, continued to expand their cities and their colonies.

Fig. 4-8: Paphos lighthouse (E5908) on Fanari Hill, possible site of an ancient lighthouse.[67]

Cyprus

Cyprus has already been discussed in Part 2, in relation to its prehistory. The first habitation is thought to have occurred around 2500 BCE when the Mycenaeans established a presence on Cyprus, probably to exploit deposits of copper that had been found there. The oldest Mycenaean remains on Cyprus have been found at Palaipaphos (i.e. Old Paphos, modern Kouklion), some 18 km southeast of Nea (New) Paphos situated at a natural plateau on the far southwest of the island, and with a natural harbour and sheltered port. It was at Nea Paphos where ships in transit across the northeastern Mediterranean most frequently called.

Ptolemy established Paphos (instead of Salamis) as the capital of the island. When the first mariners sailed out of Phoenicia, Kition (Larnaca) was their first port of call. Only the simplest of craft were necessary to make the crossing when the first proto-Phoenicians contacted the existing inhabitants around 1500 BCE. The Cypriot peoples of 1200 BCE were subjected to the same influences from the Sea Peoples as were the inhabitants of Phoenicia; if anything, Cypriots absorbed a greater amount of Aegean culture than they did from the Phoenicians, and Cyprus remained strongly Greek thereafter. But Kition was by far the strongest link to Phoenicia on the island such that it was probably under direct rule from Tyre in 1000 BCE.

Even though the Phoenicians did not settle other sites on Cyprus that we know of, they did exert some cultural influence into the native Cypriot way of life. Phoenician religious practices too were influential, and already closely related to those of the original Bronze Age practices that had carried on across Cyprus. Besides at least two spectacular temples that are well known, there were many smaller sanctuaries scattered across the island, especially at places where copper deposits or building materials had been excavated.

The strong Phoenician presence lasted from around 800 BCE until 312 BCE when Ptolemy I sent an army to conquer the island. Phoenician temples and other buildings were destroyed and built upon, removing much of the evidence that would have been so useful to us today.[28] From 312 BCE until the fifth century CE, trading links between Paphos, Alexandria and Caesarea Maritima were busy and the evidence for a Pharos-type lighthouse structure is strong.

The archaeological remains of Nea Paphos are Hellenistic for their orderly layout, which indicates the influence of Ptolemy. There is a strong probability that a Pharonic-type lightstructure at Paphos was built in the 3rd. c. BCE as part of the port facilities, in accordance with what we now know about other Hellenistic ports.[29] The orientation of the Ptolemaic layout is slightly different from the earlier one, showing the application of the Vitruvius rule for avoiding streets being swept by prevailing westerly winds.[30]

Giardina suggests that there were two lighthouse sites in Paphos. Besides the most likely site in the port, the other, earlier site was atop Fanari Hill where the present lighthouse is situated, Fig. 4-8. There is little more that can be said, except that a high level temple light seems most likely, in accordance with the practices we find at other locations.

The construction of a harbour pharos-type lighthouse, if there was one, would have been a Hellenic construction, built after 280 BCE.

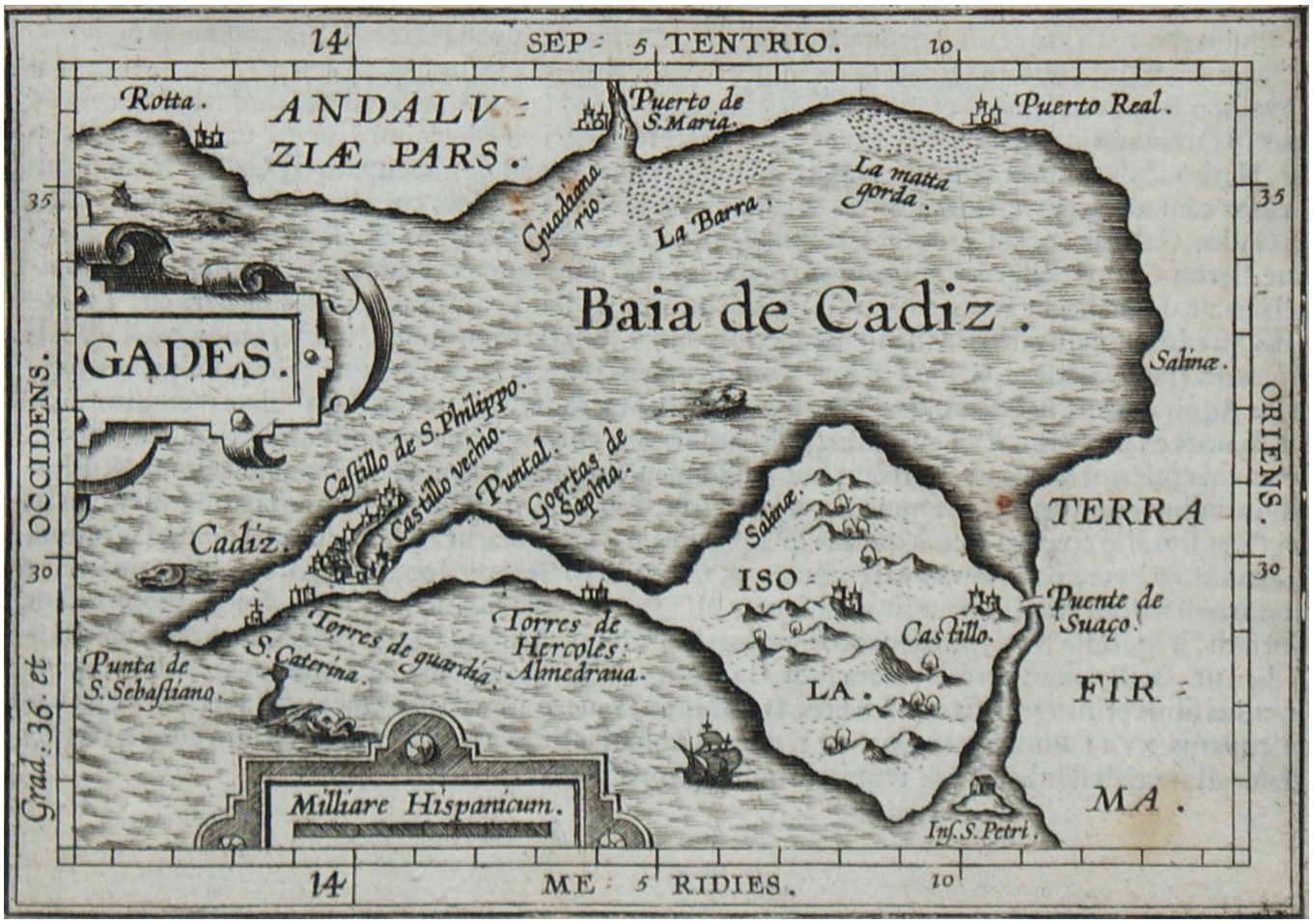


Fig. 4-9: Old Map of the Bay of Cadiz, known to the Phoenicians as Gadir (Gades).

Gadir - Gades (Cadiz)

As new city-states emerged along the coast of the Levant there was a period of time when the inhabitants were so active in the Mediterranean that they established a reputation for exploration. During this time, before around 1200 BCE, it is probably better to describe them as Sidonians, or Tyrians, since they were still not an identifiable unity. (The Bible and other sources refer to them simply as Canaanites, a more general but less accurate term.) During the ages of bronze and iron, the Phoenicians became pre-eminent in the spread of technology around the entire Mediterranean, a human activity that involved metals. As they went farther afield in search of materials to trade, they established new ports - perhaps both temporary and permanent in nature, and these settlements naturally had the same physical characteristics as in the east: Carthage (Tunisia) and Nora (Sardinia) were founded on promontories, whilst Motya and Sulsic (Sicily), Cadiz (Spain) and Mogador (Morocco) were founded on islands. The founding of Lixus in Mauritania and Cadiz (known as Gadir or Gades) in southwestern Spain took place about 1110 BCE according to information in several ancient textual references, with Lixus preceding Gades by 'a few years'. Founding is one thing, but the establishment of a stable community is quite another, which perhaps explains why there has been a continued debate about the year in which Cadiz was founded. There seems little doubt that the Phoenicians landed at Gades around 1110 BCE, but that a community sufficiently mature to be called a city did not evolve until around 770 BCE.[31] One scholar argues that a bronze figure found in Spain proves the Phoenician presence in the Straits of Gibraltar region from the middle of the second millennium BCE.[32] However, no archaeological evidence has yet been found to date the presence of the Phoenicians in these areas before 800 BCE, an argument often used to suggest that Phoenicians did not reach Gades in the 12th c. BCE after all. For example, Aubet[31] argues vigorously that the lack of archaeological finds in Cadiz before 800 BCE fixes the date of the founding of Gades no earlier than this. The reported date of 1110 BCE, she argues,

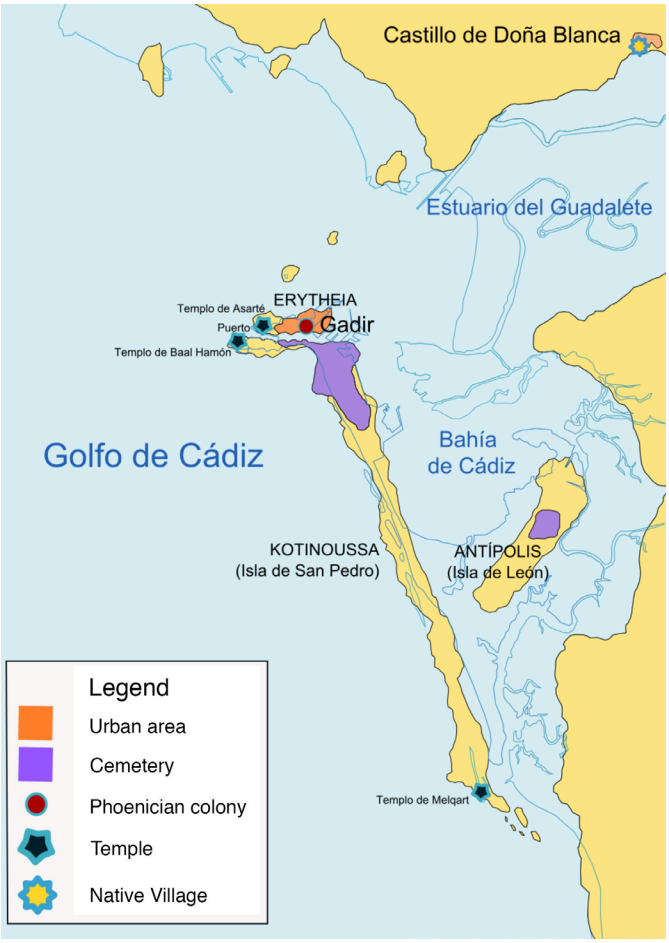


Fig. 4-10: Map of Ancient Cadiz (Gades or Gadir) of ca. 1000 BCE. Three temples are indicated for the three most important deities: Melqart, Baal Hamon, and Asarte. Melqart is considered equivalent to Herakles (Hercules).[68] We note the location of the Temple of Melqart / Herakles at the southern end of the island, a point that would be the first sight of Gades for travellers approaching from the south by sea.

Fig. 4-11: A satellite image of modern Cadiz. The current land shape retains much of the original at the time of the first landings by the Phoenicians (Fig.4-10). There is no trace of the three temples, but the northwestern corners of the islands are of much interest, Figs. 4-13, 4-14).[69]

is in error because of a confusion of history and mythology surrounding Heracles in classical Greek texts. As a divine hero in Greek mythology, Heracles (aka Hercules) may have been a real person in ancient history, but there is no proof of it and any dates that might be associated with him are vague. If he ever existed, there is a strong body of evidence that he was involved in one of the earlier attacks on Troy I - VI, well before the one commonly known as the Trojan War described in detail by Homer. Those who believe that the stories of the Trojan War are derived from a specific historical conflict usually date it to the 12th or 11th centuries BCE, often preferring the dates given by Eratosthenes as 1194–1184 BCE, which roughly corresponds with archaeological evidence of a catastrophic burning of Troy VIIa.[33]

The Pillars of Gades are thought to have been a marker for the end of the known world at that time. Strabo wrote:

> *"There are some who transfer hither both the Planctae and the Symplegades, because they believe these rocks to be the pillars which Pindar calls the Gates of Gades when he asserts that they are the farthermost limits reached by Heracles."*[34]

The Planctae and the Symplegades were two groups of 'wandering rocks' in the narrows at Sicily and the Bosphorus where the waters were particularly dangerous, so this is surely a red herring. Pindar had written about the Pillars of Gades some 500 years prior to Strabo, so the latter was simply unsure about what was actually being described. Sadly, Pindar's work is now lost. In any case, it became common to equate the Pillars of Gades

Fig. 4-12: A wall painting dating from the 1st-3rd centuries CE which was unearthed during an excavation in Cadiz. The drawing purports to show a lighthouse built by Phoenicians. The design is a close relative of one used at Gesoriacum (Boulogne, France) and Dubris (Dover, England). (See Part 6.)[70]

with the Pillars of Herakles (Hercules), although Gades was significantly more distant, outside the Mediterranean and in the Atlantic Ocean. Strabo continued:

> *"Dicaearchus, too, and Eratosthenes and Polybius and most of the Greeks represent the Pillars as in the neighbourhood of the strait. But the Iberians and Libyans say that the Pillars are in Gades, for the regions in the neighbourhood of the strait in no respect, they say, resemble pillars. Others say that it is the bronze pillars of eight cubits in the temple of Heracles in Gades, whereon is inscribed the expense incurred in the construction of the temple, that are called the Pillars; and those people who have ended their voyage with visiting these pillars and sacrificing to Heracles have had it noisily spread abroad that this is the end of both land and sea. Poseidonius, too, believes this to be the most plausible account of the matter, but that the oracle and the many expeditions from Tyre are a Phoenician lie."*[33]

It is at this point that the writing of Strabo becomes very significant for our study:

> *"Now, concerning the expeditions, what could one affirm with confidence as to their falsity of the trustworthiness when neither of the two opinions is contrary to reason? But to deny that the isles or the mountains resemble pillars, and to search for the limits of the inhabited world or of the expedition of Heracles at Pillars that were properly so called, is indeed a sensible thing to do; for it was a custom in early times to set up landmarks like that. For instance, the people of Rhegium set up the column — a sort of small tower — which stands at the strait; and opposite this column there stands what is called the Tower of Pelorus. And in the land about midway between the Syrtes there stand what are called the Altars of the Philaeni. And mention is made of a pillar placed in former times on the Isthmus of Corinth, which was set up in common by those Ionians who, after their expulsion from the Peloponnesus, got possession of Africa together with Megaris, and by the peoples who got possession of the Peloponnesus; they inscribed on the side of the pillar which faced Megaris, 'This is not the Peloponnesus, but Ionia,' on the other, 'This is the Peloponnesus, not Ionia.' Again, Alexander set up altars, as limits of his Indian Expedition, in the farthermost regions reached by him in Eastern India, thus imitating Heracles and Dionysus. So then, this custom was indeed in existence."*[33]

We note, for example how Strabo writes that, "It was a custom in early times ..." and that "the people of Rhegium set up the column — a sort of small tower — which stands at the strait; and opposite this column there stands what is called the Tower of Pelorus." Strabo's descriptions of the building of pillars and towers are most significant. He goes to great length to explain how the Pillars of Gades and the Pillars of Herakles could both exist, describing how the interpretation of language and the common practice of building pillars, columns or towers at the extremities of land

claimed for a settlement can be brought together. Strabo concludes that the Pillars of Hercules were indeed at Gibraltar, and the Pillars of Gades was the name for the site of the Temple of Herakles at the southeastern arrival point of Gades, as shown in Fig. 4-10.

Just as the Pillars of Hercules in ancient mythology were probably the very high natural features marking the entrance to the Mediterranean - effectively, the Gates to the Civilized World - as seafaring and trading activities spread beyond these gates, so new ones were established. Thus, the Phoenicians who were the natural explorers and extenders of the trading network beyond the Mediterranean certainly established a vital port at Gades. New gates were constructed and, some say, a lighthouse built to seal the port's role as a safe harbour and trading centre.

In an unreferenced report for UNESCO, the authors refer to an ancient lighthouse at Gades:

> *"... built by Hercules on the site of a temple. It had a quadrangular base and measured 100 cubits (89.22 metres) in height. According to preserved sources, this lighthouse was topped by a large statue and was destroyed in 1146 by the Arab armies of Ibn Isa Maymum. As it was lost so early in history, no graphic testimonies have been preserved.*

> *"In Cadiz, in addition to the temple of Hercules, there was an ancient Phoenician tower, which acted as a lighthouse in Roman times, as is shown by a wall painting dating from the 1st-3rd centuries A.D. which was unearthed during the excavation of an ancient salting factory that was found under the Teatro de Andalucía in Cadiz. It shows a tower-like structure of twelve bodies decreasing in height, five of which have exterior staircases. It is known that the lower part of this tower was incorporated into the Tower of San Sebastián, (Fig. 4-16) which functioned as a lighthouse from the 12th century until 1898, when the War Minister decided to have it destroyed. In 1906, Rafael de la Cerda took on the task of building a new lighthouse for the fort of San Sebastian, which was to be made of laminated steel and would measure 30 metres in height."*[35]

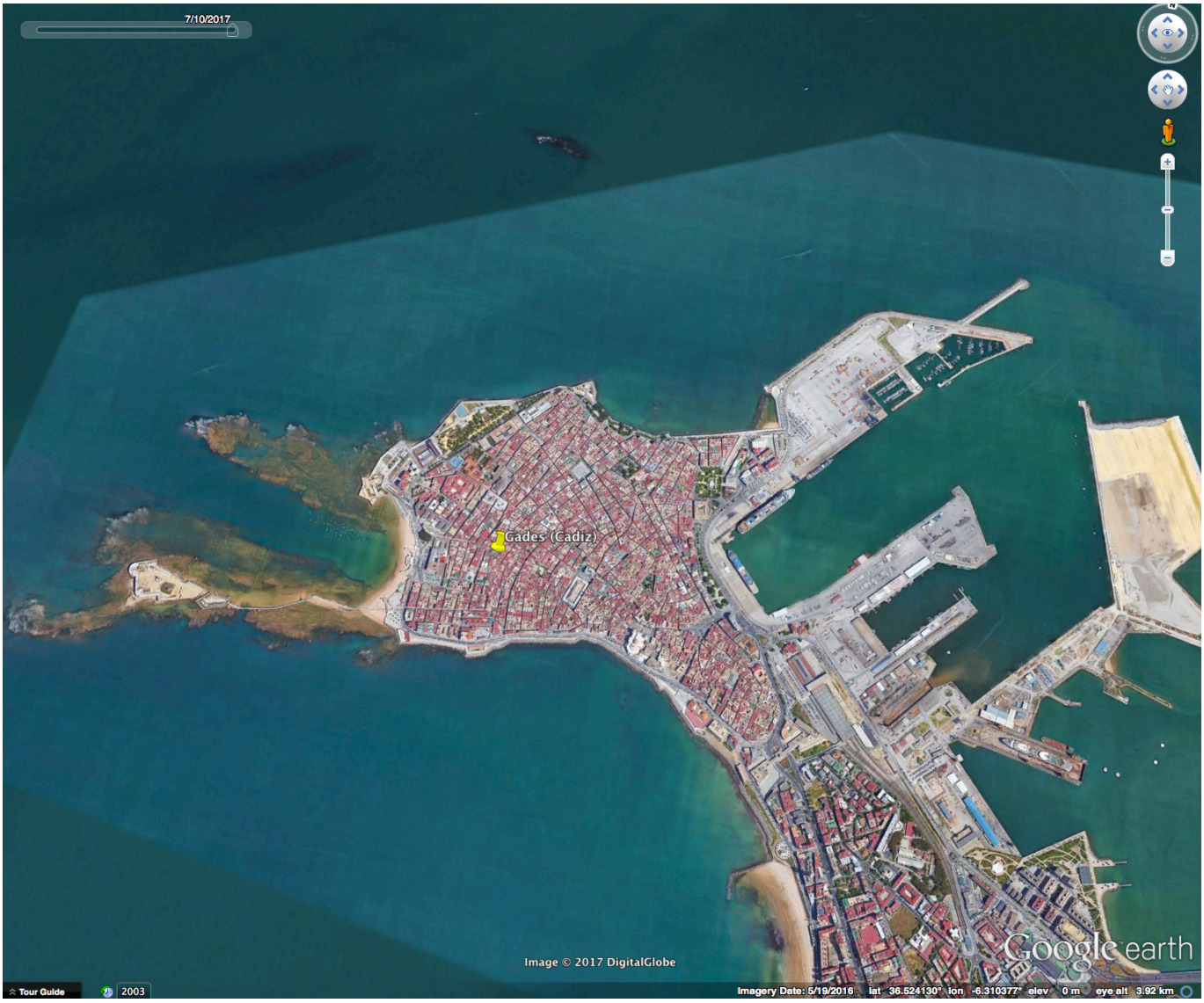
The image shown in Fig. 4-12 was claimed to be "an ancient Phoenician tower". This conclusion must be doubtful in view of the lack of evidence found for such structures elsewhere in the Phoenician diaspora. There is a marked similarity to Roman structures, however, as will be discussed in Part 6.

There seems little doubt about the building of a Roman tower as an *almenara* (beacon) but whether it was lit is another matter. At least one author is most doubtful citing reputable written evidence from the 12th century that the beacon was solid and had no doors that would have allowed the maintenance of a light. In any case, the discussion relates to the Roman construction built after the Alexandrian Pharos and so unrelated to any possible structure built in earlier times by the Phoenician founding fathers of Cadiz.

In a comprehensive and scholarly French text, Fichou is confident about a Phoenician lighthouse at Cadiz being the first lighthouse.

Fig. 4-13 (above): A panoramic view of the northwestern shores at Cadiz where the first temples of Baal Hamon (at the end of the southern rocky outcrop, left and centre) and Asarte (at the head of the northern rocky outcrop, right) are thought to have been built.[71]

Fig. 4-14 (below): An image of the northwestern tip of Cadiz, corresponding to the image in Fig. 4-10. The northern and southern rocky outcrops at the left of the image are at the right and centre of Fig. 4-13.[72]



"It was the Phoenicians who were the first to erect a tower carrying a hearth on its summit; this first lighthouse in history was built at Cadiz, probably in the 4th century BCE. However, this structure has not left the least trace in the texts that we know of."[36]

However, we have no indication of the source of Fichou's evidence for this conclusion.

In a similar vein, Hague confidently writes:

"There was a strong tradition that the lighthouse of Cadiz was built by the Phoenicians, and it has been suggested that the circular Roman one, destroyed in the seventeenth century, was actually the reused Phoenician tower."[37]

It may be true that the Phoenicians did build such a tower there at some point in history, and it is possible that this was the first lightstructure. However, we have no idea when this might have taken place. It could have been at any time between the questionable date of first founding of the city in 1110 BCE and the later date around 850 BCE, or it could have been any time up to the end of the Phoenician influence in Cadiz, around 100 BCE.

The Phoenicians almost certainly did build another lighthouse much later in the mouth of the river Guadalquivir 26 Km to the northwest. Strabo, writing in 20 BCE, described a pharos called Turris Caepionis at Caepio in Spain, a forerunner of the present lighthouse of Chipiona. He wrote that it stood on a rock washed on all sides by the sea and resembled the Pharos of Alexandria. He said that this beacon preserved vessels from the sunken rocks and shallows at the mouth of the river Guadalquivir.[38] It was built, we are told, under orders from a Roman Consul Quintus Servilius Caepion around 100 BCE. Yet again, it could be argued that the Phoenicians built the first lighthouse and that the Alexandrian Greeks copied it.

This is a very early report of a rock-based, rather than a land-based, lightstructure. If it were a sign that lights were being used as warning signals of dangerous rocks then it would be a significant feature in lighthouse construction but it is more likely an indicator of the entrance to the important river and its facilities.

The following quotation from the work of Strabo is quite long and detailed, but presents a good description that is most relevant to our study:

Fig. 4-15: The modern lighthouse at Cadiz (D2362) is inside a military area, the site of which is inside the Castillo de San Sabastian, on the land where the Temple of Baal Hamon once stood (Fig.4-10). This temple, possibly built in its earliest form at the time of the first landings by Phoenicians around 1110 BCE, may have performed the function of a lighthouse for mariners arriving at the port.[73]

"Close to the Pillars there are two isles, one of which they call Hera's Island; moreover, there are some who call also these isles the Pillars. Gades, however, is outside the Pillars. Concerning Gades I have said only thus much, that it is about seven hundred and fifty stadia distant from Calpe (that is, it is situated near the outlet of the Baetis), but there is more to be said about it than the others. For example, here live the men who fit out the most and largest merchant-vessels, both for Our Sea and the outer sea, although, in the first place, it is no large island they live in, and secondly, they do not occupy much of the continent opposite the island, and, thirdly, are not well-off in the possession of other islands; indeed,

Fig. 4-16: An old photograph of an earlier lighthouse, known as the Tower of San Sebastian, that was built close to the site of the present tower, Fig. 4-15. Local archaeologists believe that this lighthouse, modified several times, was built over the remains of an ancient Phoenician tower.[74]

> *they live mostly on the sea, though a mere few keep at home or else while away their time at Rome. In population, however, Gades does not fall short, it would seem, of any of the cities except Rome; at any rate I have heard that in one of the censuses of our own time there were five hundred men assessed as Gaditanian Knights — a number not equalled even in the case of the Italian cities except Patavium. But though the Gaditanians are so numerous, they occupy an island not much larger than a hundred stadia in length, and in places merely a stadium in breadth. As for their city, the one they lived in at first was very small indeed, but Balbus of Gades, who gained the honour of a triumph, founded another for them, which they call "Nea"; and the city which is composed of the two they call "Didyme," although it is not more than twenty stadia in circuit, and even at that not crowded. For only a few stay at home in the city, because in general they are all at sea, though some live on the continent opposite the island, and also, in particular, on account of its natural advantages, on the islet that lies off Gades; and because they take delight in its geographical position they have made the island a rival city, as it were, to Didyme. Only a few, however, comparatively speaking, live either on the islet or in the harbourtown which was constructed for them by Balbus on the opposite coast of the mainland. The city of Gades is situated on the westerly parts of the island; and next to it, at the extremity of the island and near the islet, is the temple of Cronus; but the temple of Heracles is situated on the other side, facing towards the east, just where the island runs, it so happens, most closely to the mainland, thus leaving a strait of only about a stadium in width. And they say that the temple is twelve miles distant from the city, thus making the number of the miles equal to that of the Labours; yet the distance is greater than that and amounts to almost as much as the length of the island; and the length of the island is that from the west to the east."*[39]

The geography of modern Cadiz is remarkably similar to what it was two to three thousand years ago. However, the opportunities for archaeological research are severely limited, for the original islands on which the Phoenician activities were concentrated have now become land covered with expensive real estate. The far northwest of the Cadiz promontory hosts old fortifications that remain in use, and so any remains of the temple of Baal Hamon or of Asarte were long ago obscured by military building activities. It remains to be seen if any archaeology will be carried out here in the future.

The most probable site of an ancient lighthouse is on or close to the site of the present lighthouse (Fig. 4-15) where we must presume the first Phoenicians built a *temenos* to Baal Hamon and made their sacrifices. Clearly, this sanctuary would have fulfilled the functions of an ancient lighthouse for some or all of the time when it was used.

The ancient writers who described temples at Gades, seem to have been referring to the Temple of Melqart, which has been determined as located at the extreme southern tip of the ancient island group, a place where the earliest explorers might

have made the first landing. Unfortunately, there appear to be no remains at this site, but perhaps future archaeological research might yet discover some.

We can conclude, therefore, that there is perhaps a better-than-even chance that at least one of the three Phoenician temples in Gades provided the functionality of a lighted aid to navigation as a secondary, if not a primary function. The level of confidence for a primary Roman lighthouse at nearby Guadalquivir is significantly higher.

Carthage

The story of the founding of Carthage has been recounted in many books. For those readers who are unfamiliar with it, the tale concerns a woman called Elissa who many believe is the same person as Dido, the subject of a well-known poem by Virgil. Elissa was sister of Pygmalion, the king of Tyre, regarded as the 'capital' of the Phoenician homelands. Elissa's husband, Acharbas, began to acquire more power and wealth through his wife, much to Pygmalion's disdain. Pygmalion ordered Acharbas's assassination, and, fearing for her own life, Elissa fled Tyre and eventually arrived in north-eastern Tunisia. She sought land to establish a base, but finding that negotiations were not to her advantage, she reportedly played on the innocence of the local people by asking for a piece of land that was big enough to be enclosed by the edges of an ox hide. Thinking that this would be very small, the locals agreed. Then Elissa cut it into narrow strips, laid them end-to-end and formed a huge circle. She had created enough land inside the perimeter of the ox hide to build a city, and that city, which she named Carthage, was to become one of the most influential in the entire Mediterranean region for almost 700 years. This event is presently accepted as occurring in 825 BCE.[40]

Carthage was intended to be a permanent, lasting settlement, rather than a simple trading centre. It was perceived that a base in the central Mediterranean area was needed where it was remote from the oppressive intentions of other groups on the Phoenician homeland in the east.

As the culture and civilization of Carthage grew over hundreds of years, the people became identified as Punic, rather than Phoenician. The name Punic describes those people from Carthage who claimed descendency from the Phoenicians and the Berbers. Strabo wrote that, before its fall, the population of Carthage was 700,000, and led an alliance of 300 cities. The Greek historian Polybius referred to Carthage as "the wealthiest city in the world."[41]

The strategic location of Carthage at a confluence of Mediterranean trade routes (Fig. 4-21) made its success inevitable. The site occupied land where there were safe anchorages to the north and south in the Gulf of Tunis and all ships traversing between the eastern and western Mediterranean were almost bound to stop there. The Phoenician people had established a *de facto* capital city to rival most others. By the middle of the first millennium BCE Carthage had become the most powerful (and richest) city in the Mediterranean, but was destined to come into conflict with the developing power of the Romans. The most famous son of Carthage was Hannibal, who used elephants to reinforce his army and embarked on an epic journey across the Alps to attack the Romans during the Punic Wars.

In Carthage, the citadel is called Byrsa from the Greek βύρσα meaning "oxhide", a clear reference to the story of Dido cutting an oxhide into strips to surround the hill on which the citadel stands and claim it as Phoenician land. Sladen believed that Byrsa was from the Phoenician word for 'hill'.

The Roman poet Virgil wrote about his hero Aeneas arriving at Carthage:

> *"They came to the place where today you will see the huge walls and rising citadel of new Carthage, and bought ground – Byrsa they called it therefrom – as much as they could encompass by a bull's hide."*[42]

The citadel of Carthage is today identified with the Acropolium, also known as Saint Louis Cathedral, an ancient Roman Catholic cathedral that sits on the peak of Byrsa Hill. It was supposedly built atop the ruins of an old temple dedicated to Eshmun, the Punic god of healing.

It was a clear case of envy that led to the Romans waging war on the great Phoenician City. The Romans' deep hatred of the Phoenicians was expressed by razing the city to the ground, an act that led to the addition of the word 'punitive' to the English vocabulary.

Carthage became embroiled in three terrible wars with Rome known as the Punic Wars. They were essentially fought over the land occupied by

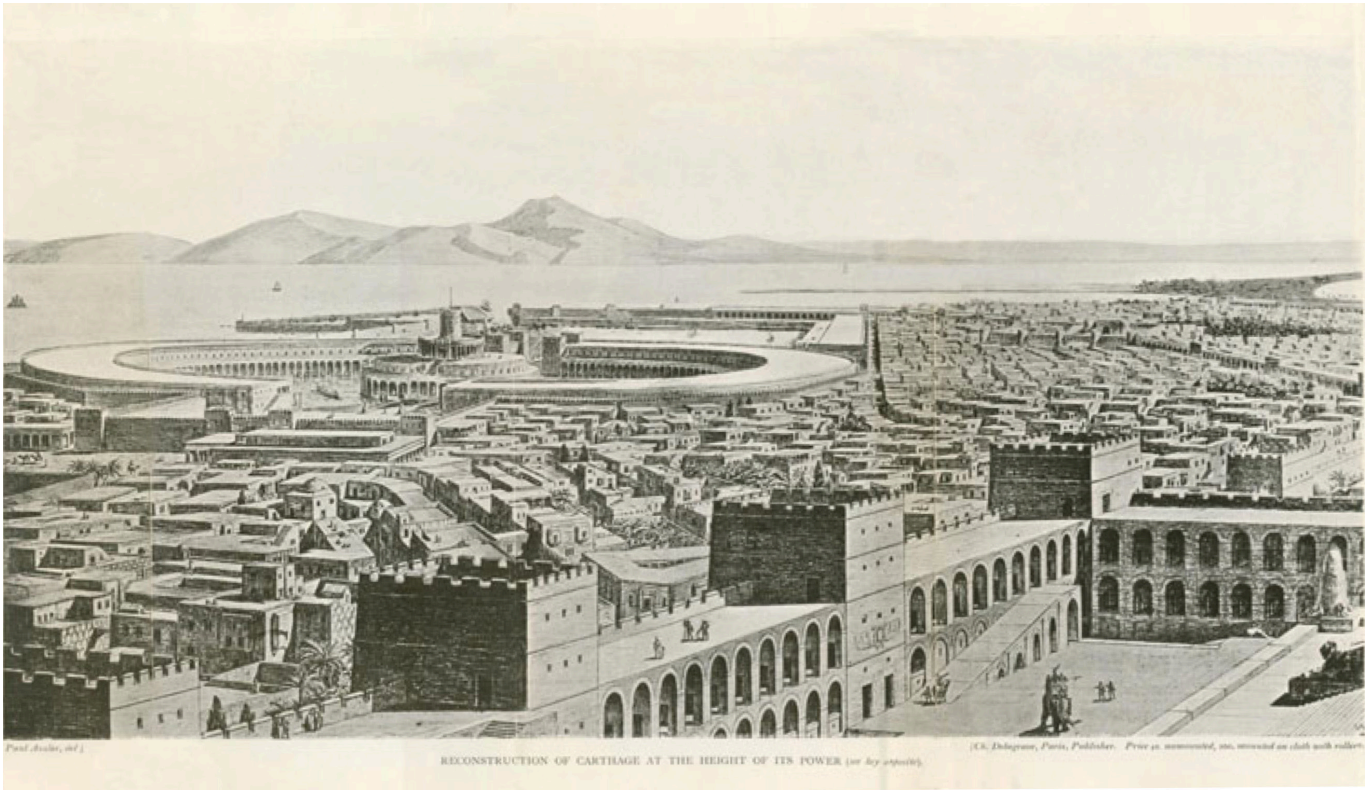


Fig. 4-17: A view of the ancient city of Carthage from the north.[75]

the Carthaginians in Sicily, which had been used as a staging post on the long east-to-west voyages. The first war, (Fig. 4-3) from 264 - 241 BCE, was a series of successes and reversals for both sides: Roman might at sea had not yet attained its maximum potential. At first the Carthaginians were far better at sea and could beat the inexperienced Roman naval forces, but the latter soon learned from their mistakes and eventually, the Carthaginians were defeated. The peace terms were harsh and they lost their land in Sicily. Furthermore, sufficient damage had been caused to their nation that they never really recovered. They had control over most of southern Spain, thanks to their general Hasdrubal. When he was assassinated in 221 BCE, Hannibal, another great general, succeeded him.

Commencing the second Punic war in 218 BCE, he led his army, including many elephants, from Spain across the Pyrenees, Gaul and the Alps to attack the Romans in Italy. After a series of successes, the initiative fizzled out. The Romans gathered strength and finally in 204 BCE Scipio crossed to Africa and, after enlisting the help of the Numidians, defeated Hannibal in 202 BCE at Zama. Hannibal was forced into exile and eventually committed suicide, as the Carthaginian subjugation became more severe.

A third and final confrontation with Rome occurred during 149-146 BCE and this resulted in

Fig. 4-18: The oldest lighthouse in Tunisia known as Cape Carthage / Djebel Menara / Sidi Bou Said / Phare de Ras Qatarjamak (E6412) may have been the site of an ancient lighthouse at Carthage, but the evidence in favour is poor.[76]

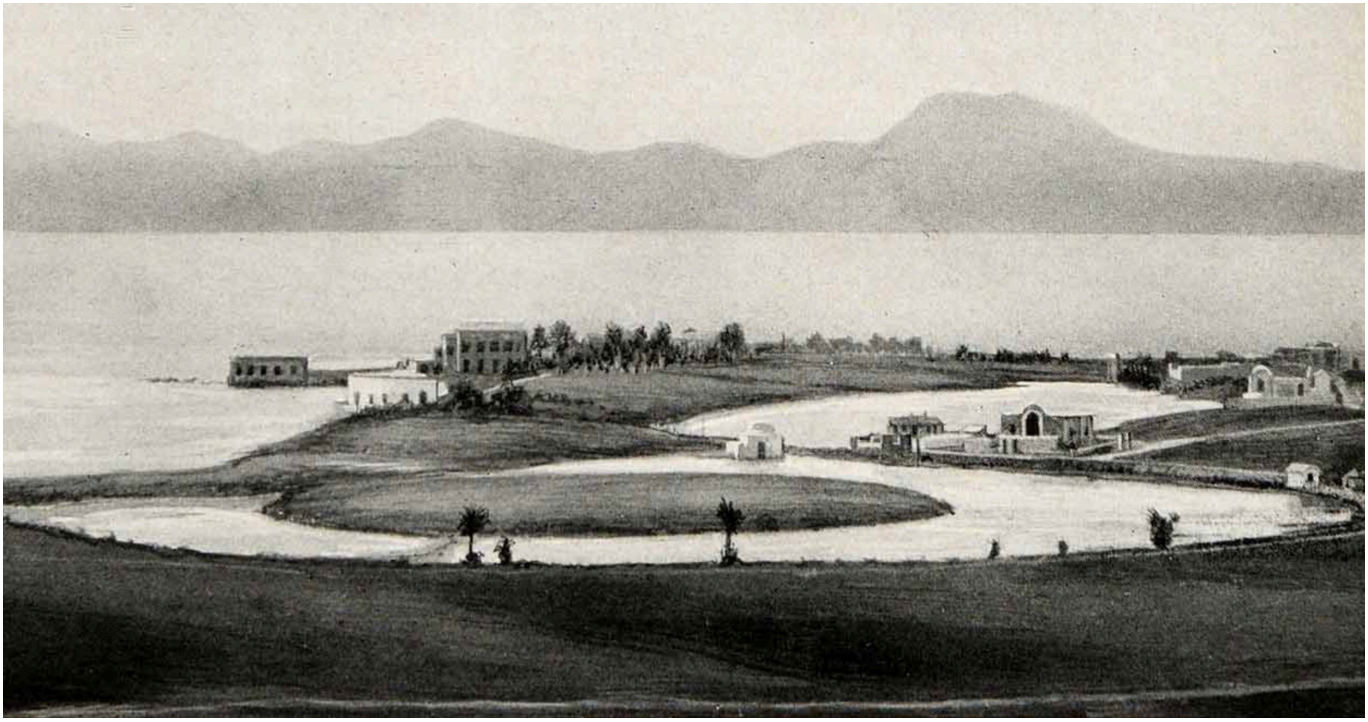


Fig. 4-19: A photograph published in 1923 showing the remains of the old port of Carthage from the north. Almost nothing had been left after the Romans razed it to the ground. However, the layout of the port area remains quite clear.[78]

Fig. 4-20: A satellite view of the remains of the ancient port of Carthage, north at 12 o'clock position. There is no evidence of a port lighthouse having been built here.[77]

the almost complete destruction of Carthage. The legacy of the Punic culture, however, remained amongst the North African peoples for centuries afterwards.[43]

The existence of Phoenicia as a free country in the east had also essentially come to an end with the victory of Alexander over the Persians in 333 BCE. With the exception of Tyre, the Phoenicians welcomed him with open arms and Tyre was subjugated the following year. Thus, the Phoenicians in the east were subsumed into the Hellenistic culture spread by Alexander and based in Byzantium.

So, was there a lighthouse at Carthage? In 1906, Sladen was certain that Carthage had always had a lighthouse. A writer from the late Victorian era, Sladen was motivated to create the kind of travelogue so typical of its time, with old Carthage and modern Tunis as its subjects. An entire chapter was devoted to a critique of Salammbô (1862), a historical novel by Gustave Flaubert, set in Carthage during the 3rd century BC. Flaubert had supposedly carefully researched his material but presented a very poor representation of both Carthaginian culture and topography.

Of the landscape Sladen bemoaned:

> *"Never once did the book when I was reading it bring back before me the long, low hill of Carthage stretched between the lake of Tunis and the African sea, and rising at its*

ends into the bluff of the citadel and the higher bluff, still crowned, as in the days of Hanno the navigator, with a lighthouse."[44]

Sladen identifies Aeneas's viewpoint of the Byrsa mentioned earlier as the locality on the hill known as Sidi Bou Said where today a lighthouse stands at a high point known more widely as Cape Carthage.[45]

Sladen is convinced of the presence of an ancient lighthouse on this site and surely, if this were part of the Punic culture, this would be true.

"Nor must we forget that the only lofty site on the peninsula is occupied by Sidi Bou Said. It is the strongest and finest position, and, as such, must have been an important part of ancient Carthage."[46]

Sladen presents no evidence to support his words and we have nothing to suggest that Phoenicians built towers dedicated to provision of lights as aids to navigation. So far, all of the evidence presented in this book supports the theory that it was from temples in lofty positions that lights burning around the clock could be seen by navigators. Such a temple was almost certainly built on the Byrsa Hill and all evidence lost by the overbuilding of later places of worship.

We shall see later how much the construction of Roman ports focused on genuine lighthouses. Perhaps a lighthouse was present at the port entrance? The best ancient description of the port was provided by the Roman historian Appian of Alexandria. The relevant section reads as follows:

" ...for they had two Ports, disposed in such manner that a Ship might easily go from one to the other; and yet there was but one entrance, through a passage of about sixty-six Foot wide, secured with Chains. The first was for Merchants, where were many and divers sorts of Quarters for the Mariners; the other, which was the inner Port, was for the Men of War, in the midst of which stood an Island, encompassed about as well as the Port, with vast Keys, in which there were Places or Docks to put under covert two hundred and twenty Ships, and above Storehouses, where they wrought and made all things necessary for the Shipping. The front of each place were upheld by two Pillars of Marble of Ionick workmanship, so that the whole round, as well of the Port as the Island, represented on both sides two magnificent Gallies. Within this Island stood the Admiral's Palace, from whence the Trumpet gave the Signal of his Orders; from whence he published his Ordinances, and from whence he overlooked all Things. The Island stood directly opposite to the mouth of the Port, extending itself a good way forward, so that from thence the Admiral could discern what passed at Sea a great distance off, but those at Sea could not perceive what passed within; nay, when the Merchants were entered into their Port, they could not see the Men of War, for their Port was separate from the inward Port by a double Wall, and for them there was an entrance from their Port by a Gate into the City, without passing into the other."[47]

This description has been passed down and used on countless occasions to create artists' impressions of the port. Whereas it might have been coloured with scholarly doubt in ordinary circumstances, the most unusual preservation of the port basins lends great credence to modern interpretations. An extra bonus rests in the remarkable similarity with the much better-known Roman port at Portus Romanus which will be described in Part 6. This strong correspondence leads to the inevitable conclusion that the port of Carthage was used as a model by the Roman architects some two hundred and fifty years after Carthage was leveled. However, there is no evidence whatever of a lighthouse being constructed in or outside this harbour. Likewise the site of the present lighthouse at Sidi Bou Said (Fig. 4-18) has naturally overlain any ancient remains that may still be present. So, at present, and in agreement with evidence from other Punic sites, there is no supporting evidence for an ancient lighthouse at Carthage.

Sicily

Sicily is a large volcanic island of around 26,000 sq km, roughly triangular in shape, that lies close to the southwest tip of Italy. The current consensus is that its earliest inhabitants belonged to a tribe called Sikanoi, who are thought to have arrived on the island after migrating from Spain around 8000 BCE. Later, the Sikanians were displaced to the east when another tribe, the Elymians (Elymoi), settled in the same northwest part of the island. A third significant group called the

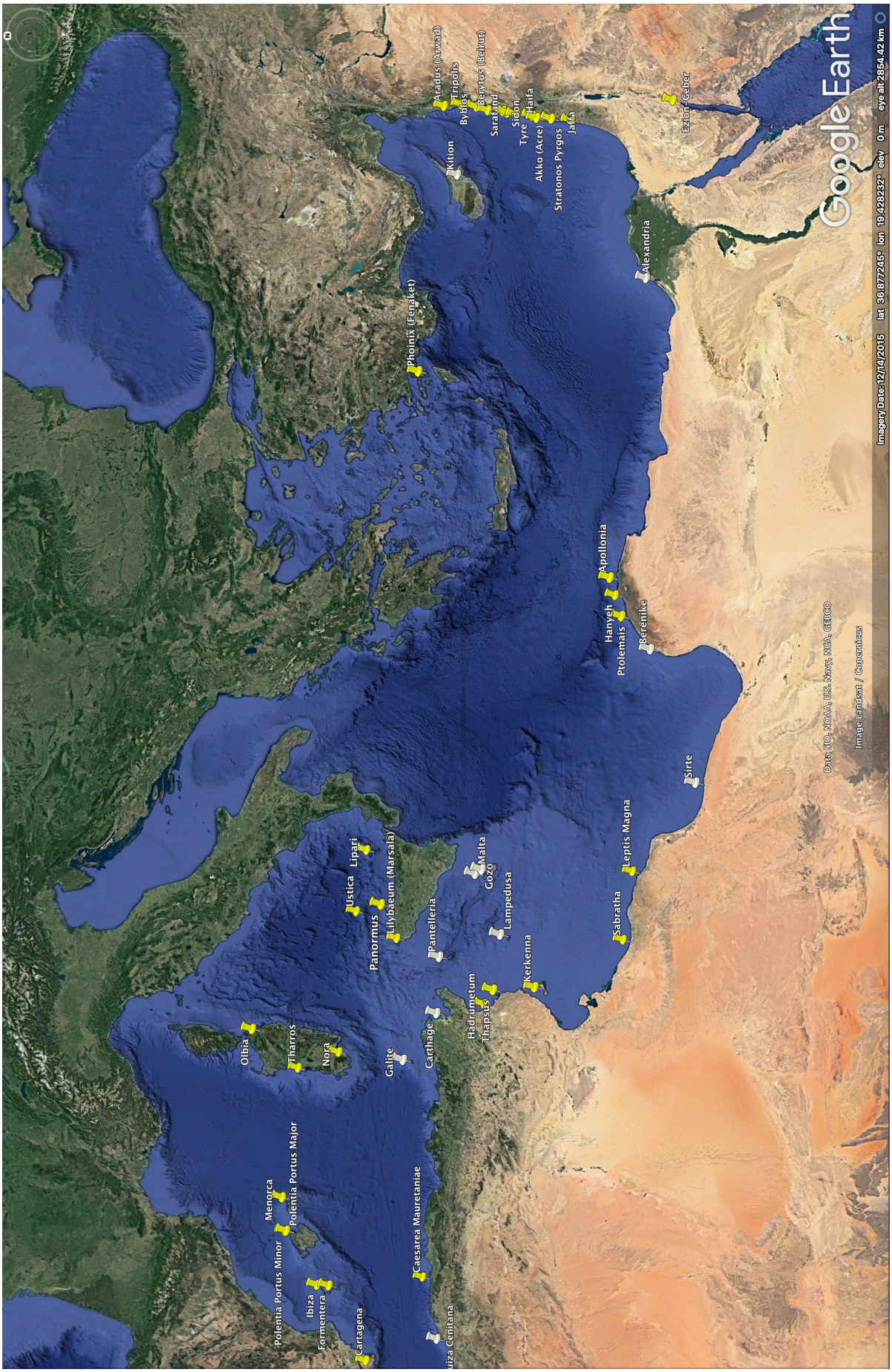


Fig. 4-21: Satellite map showing the scope of Phoenician and Carthaginian activity in the Mediterranean Sea. Yellow and white pins (not Alexandria) are generally regarded as Phoenician sites.[79]

Sikels (Sikeloi) arrived in the east across the Straits of Messina from the Italian peninsula around 1200 BCE, again displacing the Sikanoi, this time back to the middle of the island. Recent genetic studies have revealed that inhabitants from all three of these tribes interbred with others of Mediterranean, North African and Iberian origin to form a distinctive group whom we would call native (or proto-) Sicilian.

Much of our present understanding of Phoenician presence in Sicily is due to Thucydides[48] and subsequent academic analysis of his work.[50]

Phoenicians were the first of the major civilizations to settle in Sicily some time after local populations had been established, as shown in Fig. 4-23. Just as was the case at Gades, there are two streams of thought. The first is that there was an early Phoenician presence in the 13th or 12th century BCE that saw them establish staging posts - if not formal city states - at strategic intervals around the Mediterranean and beyond. The second is that there was a period of deliberate settlement from the 8th century BCE following the foundation of Carthage in the 9th c. It would seem straightforward to distinguish the two dates since the first would have been by Phoenicians - whether Tyrians or Sidonians is unclear - and the second by Carthaginians. Tusa argues that, since the early Phoenician locations were ports-of-call and not true settlements, they left nothing behind, and hence no archaeological evidence has been found.[49] Others have argued that Phoenicians did live there until the main period of development in the eighth century. No firm conclusion has yet been made.

We should find truth in both theories for in the 12th century BCE when, as we have seen, there was a sudden burst of activity all across the Mediterranean by a newly competent cohort of Phoenician mariners, these bold explorers and traders set down marks at many strategic locations. That does not mean that new settlements were established with the aim of permanent residence, but rather that they were recognizable sites that could be used as places of respite for weary seamen, as well as markets (emporia) that acted as focal points for sale and exchange of all kinds of commodities.

A point of interest is that the northwest region of Sicily seemed to hold a special attraction, and we note that, for sea travellers, the view of the land from the northwest was dominated by what appeared to be the island's second highest peak (after Etna), Mount Eryx (Erice). It was here, on the summit, that proto-Sicilians had founded a most important temple and it was this site that dominated the activities of northwest Sicily. The sanctuary was of such importance that it was regarded with equal reverence by all people of the island. The Phoenicians dedicated it to Astarte whilst others associated it with her theological equivalent, Venus Erycina. (Table 4-1). If, as seems likely, the sanctuary existed prior to the arrival of the Phoenicians, then it is argued that it was set up by Bronze Age peoples of a quite different culture. Most scholars attribute it to the Elymoi (Elymians), who were allied with the Punic inhabitants for centuries. It is clear that this site was an important way-point for mariners, even if only as a beacon by day. However, its use for such an important deity must also have given it visibility at night also.

At first, the Phoenicians found little or no competition and flourished based upon trading rather than expansionism. It was not until the 8th century, once Carthage had been built and grown into a regional superpower, that a policy of expansion by a now mature civilization was promoted and secured by the founding of many new permanent settlements in Sicily and beyond. Naturally, those with which the Carthaginians were most familiar would have been the first to grow, followed by others that were totally new or developments of abandoned neolithic sites. This policy was both an expression of superiority and a deliberate action designed to maintain monopolies, especially over the Greeks who had just begun to emerge into their new age of strength known as the Archaic Period. Thus Phoenicians had a long period of success in Sicily before the arrival of the Greeks who then exerted such pressure on them as to cause a gradual Phoenician retreat to their strongholds in the northwest, especially Motya. This polis was one of the first Phoenician settlements, set up in 8th century in the typical way by taking ownership of an island that could be easily defended. Along with Panormus (Palermo), Motya became one of the longest established Phoenician centres on Sicily. As the Phoenicians, with the assistance of the Elymians, gradually secured the west of the island, Greeks were likewise putting down roots in much of the remainder.

Before the rise of the Roman Empire, Greece

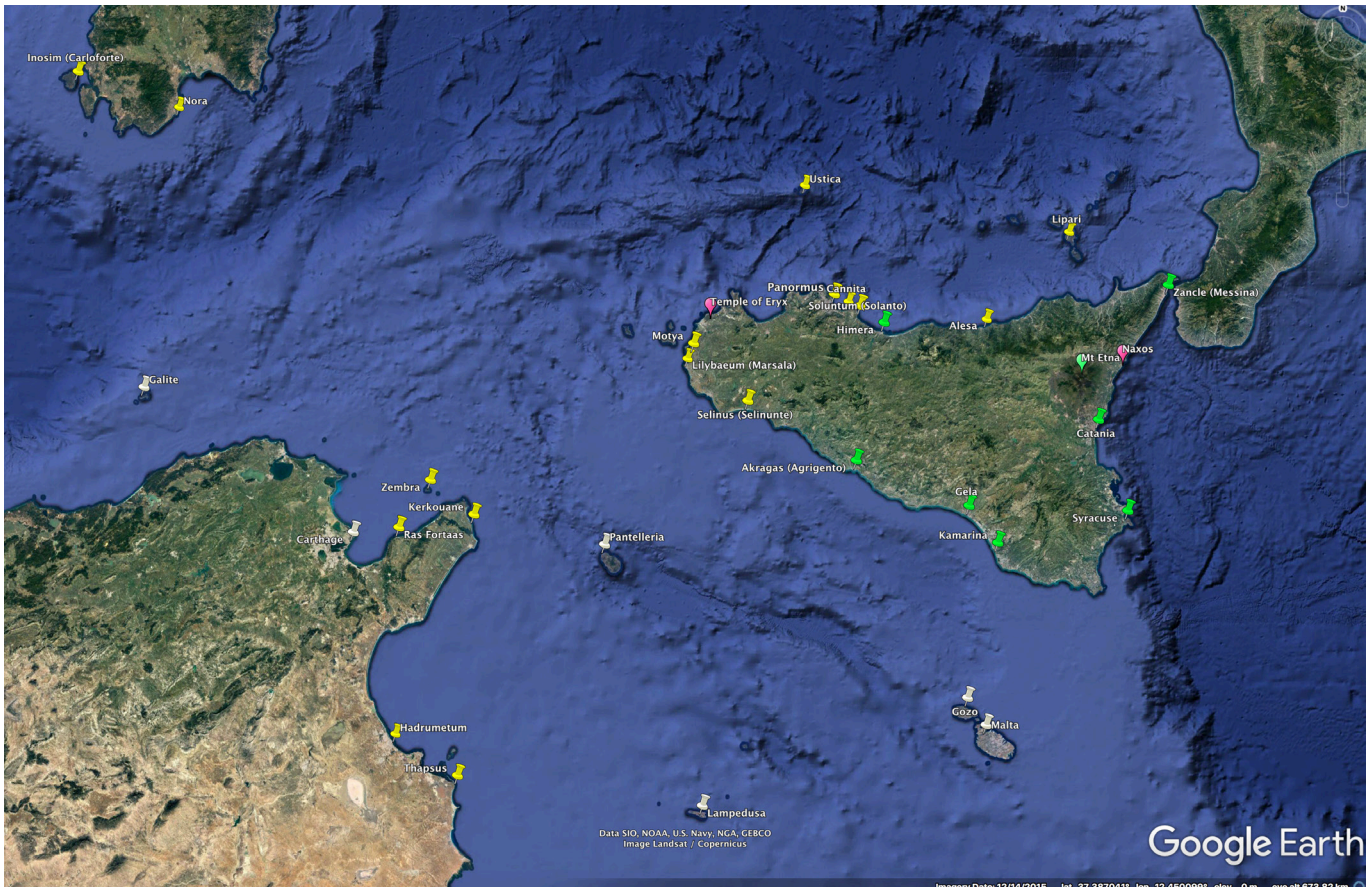


Fig. 4-22: Satellite image showing locations of Phoenician sites (white and yellow pins), Greek sites (green pins), and sacred sites (pink balloons) on Sicily and surrounding coasts in the mid-1st millennium.[80]

Fig. 4-23: Map of Sicily showing its proto-Sicilian populations. Symbols represent bronze age sites. Of especial note is the site of Eryx (Erice) in the northwest where a high altitude sanctuary was established on Mount Eryx that was of great importance to the whole island.[51]

had been the dominant force in the Mediterranean and had settled many disparate locations, some of which, Kroton (Crotone) perhaps being the most significant, were to be found in southern Italy. With Greeks already in possession of substantial parts of southern Italy, it was an obvious move to expand across the narrow Messina Strait into Sicily. Magna Graecia was the name given by the Romans to the coastal areas of southern Italy that were extensively populated by Greek settlers. The first Greek occupation of Sicily was in 734 BCE when Theocles landed with a group of settlers from Chalkida in Euboea. The site was called Naxos, perhaps because some members of the group had emigrated from that island in the Greek Cyclades. They immediately set up a sanctuary to Apollo Archêgetês as founder of Naxos (Table 4-1). For most islanders, this became the holiest site, requiring all travellers entering or leaving the island to make sacrifice at its altar. Unlike Mount Eryx in the west, this sanctuary was on the coast almost at sea level and is notable as the place where Octavian moored his fleet in 36 BCE. If there was but one light on the island that functioned as a way-point and an aid to navigation, this must surely have been it. But Naxos did not develop as a settlement and the light would not have functioned as a port lighthouse.

Having founded Naxos, a number of Greek settlements quickly followed, but with settlers of different origins. Rather like the English and Scottish in the British Isles, Dorians and Ionians moved in to multiple sites in Sicily, the more aggressive Dorians tending to favour the northern and eastern locations, and the more passive Ionians the southern sites. However, when it came to disagreement between the two main cultures, the Ionians joined the Dorians to attack their Punic foes such that they were confined more tightly within their enclaves in the northwest. For centuries, Sicily was an island of two halves, portrayed by writers as divided along ethnic lines by Phoenicians and Greeks. Of course, this is too simplistic, for it takes no account of the proto-Sicilians, nor the fact that the Greeks who later made their homes in the north, east and south of the island had different origins. From 600 to 265 BCE a series of conflicts were fought between the Greeks of Syracuse and the Phoenicians of Carthage for control over the island.[50] These were known as the Sicilian or Greco-Punic Wars. Motya was settled in the 8th c. BCE, walled in the 5th c. and destroyed in 397 BCE, driving its Punic inhabitants to Lilybaion for safety. It was then rebuilt and reinforced by Carthaginian efforts in preparation for a counter-attack to the east. These hostilities were interspersed with periods of peace. No sooner had the wars with Greeks come to an end than war broke out with the Romans. The disagreements were ended only in 241 BCE when the Romans concluded their First Punic War against Carthage and gained control over the whole of Sicily.[51] During more peaceful years, the bipolar island of Sicily saw Phoenicians controlling the western shores from the port of Panormus (Palermo), and Greeks in the east with their bases at Zancle (Messina) and Syracuse. However, the Phoenicians also had strong interest in nearby islands, especially at Ustica, situated 65 km northwest of Panormus, and Lipari in the Aeolian Islands 140 km to the east of northeast (Fig. 4-22). With both of these destinations inside the zone of Greek influence it was important for Phoenician ships laden with valuable cargoes not to risk contact with hostile Greeks. Dispatch of ships on accurate courses to both of these destinations was important.

In 2013 it was reported that three large boulders surrounding the present lighthouse at Capo Gallo, the northern cape closest to Palermo, looked unnaturally placed.[52] Investigation using the satellite imaging tool, Google Earth, showed how the three large boulders, themselves unusual amidst the normal landscape, appeared to offer precise indications of the sea routes to the two island locations of Ustica and Lipari, both sites having a Phoenician presence. Ships on course to Ustica needed merely to align two of the boulders – which were at different heights to remain visible from a distance – to obtain a clear bearing to the destination. Other ships heading for Lipari were able to use a different pair of stones in alignment towards their destination. The three boulders were of such a size as to be clearly identifiable from significant distances by day. However, they were also observed to have flat upper surfaces, and it has been suggested that, if fires were lit on them, their valuable alignments could also be observed at night.[53] This appears to be an entirely new possibility in the understanding of ancient lighthouses and, if correct, it represents a new feature of Phoe-

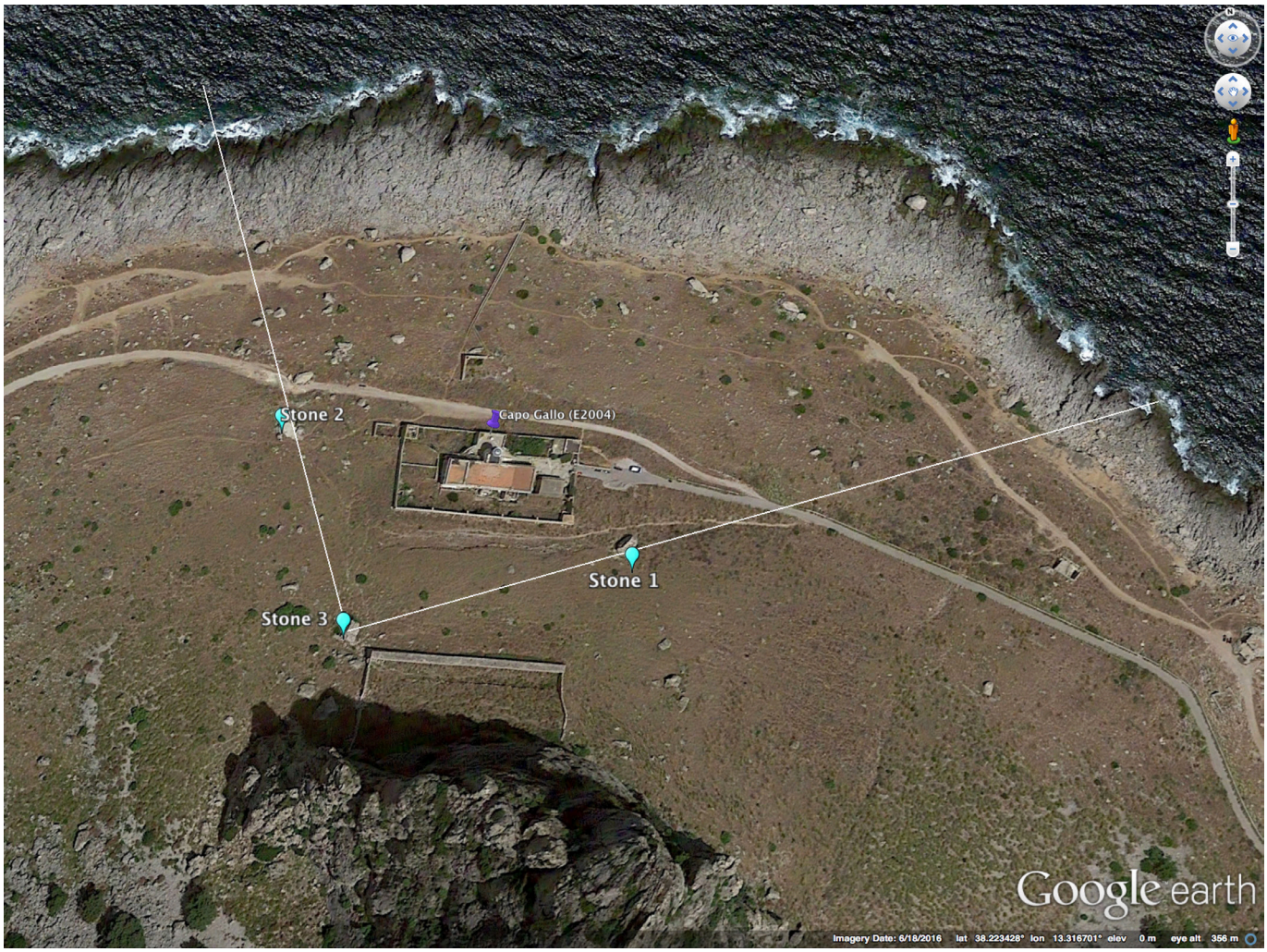


Fig. 4-24: A view of the terrain of Capo Gallo near Panormus (Palermo) in Sicily. The modern lighthouse is indicated with the purple pin. Three stones are indicated with the alignments of 2 and 3 marking the route to Ustica, and the alignments of stones 1 and 3 marking the route to Lipari.[81]

nician navigation. This most uncharacteristic use of megaliths suggests that they were placed in position by earlier Bronze Age inhabitants of Sicily who used neolithic technology. It further suggests that these people had need of marine signposts, and being prior to 1200 BCE, it is the earliest indication of such a navigational method. If it is accepted that fires were indeed lit on the flat tops, then other important aspects arise from this interpretation, for it raises the idea of human attendants to light and maintain the fires. In the cases where sanctuaries have provided lighted aids to navigation as a secondary function, it was the priests who were acting as 'lighthouse keepers'. Here, there is no suggestion of religious attachment and so fire attendants would be needed solely to ensure that aids to navigation were in operation. If proven, this theory would represent a major step forward in the understanding of ancient navigation techniques, as well as adding new credence to theories of the emergence of pharology. Clearly, there are other boulders scattered around the site, and it could be argued that these alignments are coincidental. However, the following points should be considered. First, there are *two* alignments, both with very accurate positioning. Second, the different heights of the stones above sea level contributes to the ease of identification from afar and makes coincidence less likely. Third, the method would have been very much more difficult to implement in the absence of available megaliths. As yet, no further evidence is available to support the theory, but tests for fire residues on the surfaces of the boulders and in the surrounding soils would be an important first step. It would seem essential for archaeologists to visit this site to look for further evidence in support of this new theory. One of the most exciting aspects of this discovery is that there is good reason to suppose that other sites can be identified with similar megalithic boulders marking

Fig. 4-25: Isola Della Bocca (E1014), possible site of an ancient lighthouse at Olbia in Sardinia.[82]

Fig. 4-26: Capo Di Pula (E1070), possible site of an ancient lighthouse at Nora in Sardinia.[83]

routes to other significant destinations. A search of other locations is now in progress to find unusual placements of megaliths close to the shores. As we shall see next, Sardinia is known to have had a period of occupation by people with skills in the building of megalithic structures. Perhaps the same was true in Sicily?

Sardinia

Compared to their history in Sicily, Phoenician and Punic peoples had rather less competition over the land of Sardinia. The island became third in importance as a Phoenician territory after the homeland in the Levant and Carthage. By the 7th century BCE almost all of the coastline had been claimed by Phoenician and Punic settlements, so much so that Carthaginians went on to settle the interior of the island too, a somewhat unusual situation for a normally coast-hugging people. Of course, there comes a point when the number of inhabitants exceeds the support that can be offered purely from marine activities and Sardinia's interior needed agricultural development to feed the people living on the coast. In a move that reflects some situations today, it appears that the Phoenicians relied upon immigrant labour from Africa to assist with their agriculture, although it is clear that Africans were not enslaved in this process.[54]

The earliest archaeological finds in Sardinia now indicate settlements from the 7th millennium during paleolithic and neolithic cultures derived from the Spanish and Italian peninsulas. Settlements were made mostly along the northern and western coasts. For example, in northern Sardinia Monte d' Accoddi is a Neolithic archaeological site consisting of a massive raised stone platform thought to have been an altar. At once, we are reminded of a parallel occurrence in Sicily where Bronze Age inhabitants established sites of great religious importance. The oldest parts dated to around 4000 BCE. After times of destruction, it appears that the site was rebuilt by later prehistoric civilizations, a fact that must support the considered importance of the site.[55]

Between 1900 and 700 BCE, the island passed through a stage known as the Nuragic Period characterised by the building of megalithic edifices mostly in the northwest sector of the island.[56] In short, there was already a well-established local population when the Phoenicians began calling at several coastal sites such as Karalis (Cagliari), Nora, Bithia, Inosim (Carloforte), Sulci (Sant' Antioco), and Tharros, primarily with the aim of setting up safe waypoints on their trans-Mediterranean routes. No doubt, they also traded with locals if they encountered them. It is beguiling to think that as Phoenicians came into such close contact with these peoples for the purposes of trade, they may have learned how to find reliable sailing directions to the next ports-of-call from those who had already established megalithic markers at crucial points nearby. Fig. 4-27 shows that, from Sardinia,

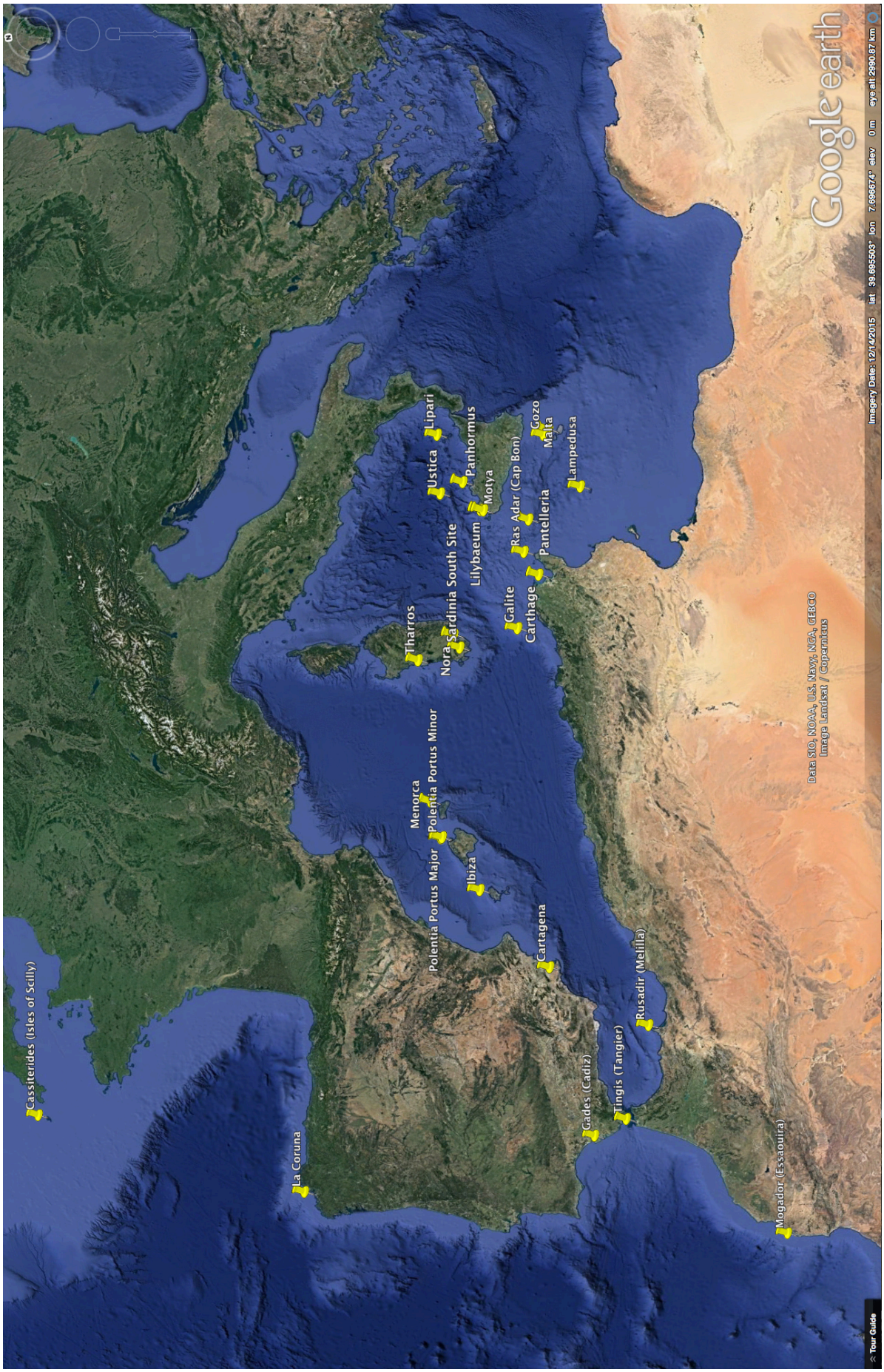


Fig. 4-27: Map of the Western Mediterranean and Atlantic seaboard showing the major Phoenician and Carthaginian settlements and trading centres.[84]

there were several vital routes. For example: (1) East to Sicily and thence to Cyprus, Phoenicia and Alexandria; (2) South to Carthage; (3) West to the Balearic Islands and thence to southern Spain and the Atlantic Ocean. For megalithic signposts to be already in place to guide the Phoenician craft must have been a great bonus. Work is presently under way to try to identify such signposts - if they exist - at many points where Phoenicians were known to have frequently visited. And on Sardinia there is much to investigate, for there are many known comparatively undisturbed sites of Phoenician archaeology still to be fully examined, including at Tharros, Nora and Bythia, although, of course, it is sites that are in positions of high exposure and visibility that are more likely to have megalithic signposts, in contrast to the usual protected and sheltered ports and harbours.

In many ways, the growth of settlements in the southwest sector of the island paralleled the growth of Carthage, and there were inevitably strong influences from Carthage concerning the politics of the island. For example, there was a concerted strategy to take control of the entire island, from the 6th c. BCE and this was achieved, although not without much fighting.

By the 4th c., Punic merchants were supplying Sardinian grain to Sicily and Carthage, but there was increasing difficulty in relations with Rome, which was rapidly gaining power. At first, the Punic people had superiority, and a treaty with Rome made in 348 BCE forbade trading or settlement by Romans in Sardinia. Eventually, the competition was settled in three Punic Wars that ended with the total loss of Sardinia to Roman might.

Archaeologists have been interested to find that although Sardinian history shows a mixture of influences of almost all the major cultures, there is almost no sign of Greek influence, unlike the situation in Sicily. In 283 BCE Sardinia (and Corsica) became a province of the Roman Republic at the end of the first Punic War. By that time, Nora had long been recognized as the capital and under Roman administration it went from strength to strength.

Giardina discusses the possibility that the remains of a Punic lighthouse-tower could be seen at Nora until the 1970s. Even if the tower was indeed used as a lighted aid to navigation, we have not found this to be a characteristic of Punic culture and it may have been Roman, rather than Punic.[57] There are other possible locations where an ancient lighthouse might have existed, the most obvious being on the Capo Di Pula (Fig. 4-26), close to Nora where, because of the strategic position, much other building has taken place. Without new archaeological information, the presence of an ancient lighthouse here can only be given a 50% probability. A similar situation exists at the north-eastern port of Olbia, where a Phoenician port is known to have existed. Its sheltered location at the end of a long estuary demanded a waypoint light on a small island at the entrance to the estuary. A modern lighthouse exists here today - the Isola Della Bocca, Fig. 4-25, but there are no more than a few clues to an original lighthouse having been built here by Phoenicians.

Ibiza

Ibiza is the westernmost island of the Balearic group and there was a great value in its location as a way-point across the western Mediterranean. In this case, it is considered that Phoenicians were its first inhabitants and an established presence is well known at a site called Puig des Molins where there is a fine example of a Phoenician necropolis (cemetery) close to the town of Ibiza. The settlement was located some distance away at Sa Caleta about 10 km to the southwest. We have no evidence of ancient lighthouses here.

Trade Routes and Landfall Lights

Ancient navigators who made voyages across open sea had no guidance other than the few naturally occurring clues available in the sea and sky. They constantly studied the horizon for the merest sight of land, and, at night, hoped for a light that would coincide with expectation. The best navigators knew their approximate position, and by means of their own instincts and calculations by dead reckoning, they could anticipate the emergence of land over the horizon. If they also knew that they could expect to see a light, then they were comforted when they saw it. This is what mariners have called a landfall light. The best landfall lights can be seen from a great distance, a property that is achieved by having the brightest light shine from the greatest height.

We have been discovering locations where

Fig. 4-28: The Phoenician temple of Ras il-Wardija on the southwest tip of Gozo, close to Malta. The strategic location would have made an ideal lighted aid to navigation in the early 1st millennium BCE.[85]

there were temples and other sanctuaries, created for religious purposes, often at elevated heights above sea level, but having the secondary function of a lighted aid to navigation. We have noted that this was may already have been occurring when the Phoenicians embarked upon their exploratory expeditions. These were very much waypoint markers and not port or harbour lights, and it may be that the functionality of what today we call a lighthouse was intimately associated with the religious activity of sacrifice and worship.

To a society of advanced seafarers, the landfall light would have been very important. Less experienced sailors could follow the contours of the shore as they made short, coast-hopping journeys. To the Phoenicians, however, the landfall light must surely have been an essential part of their success as maritime traders.

We have already investigated some locations that were the centres of Phoenician activities, and we have found no hard evidence of lighthouses, except for the functionality offered by these temple lights. These aids to navigation had the common feature that they were located in sites of ports and harbours from where they shone their beckoning rays of welcome. In this sense, a temple light was also a harbour light, but only as a secondary function. A true (primary purpose) harbour light was available only when a building was made specifically to house it, and there is no evidence whatsoever that any harbour lights were built by the Phoenicians.

But landfall lights are different. They are characterised by their elevation, often in locations where there are no settlements and no intention to indicate a place of safe landing. We should therefore consider this balance of probabilities: if Phoenicians did not construct harbour lights, did they, as expert mariners, build or make use of landfall lights?

We can say with certainty that the Phoenicians established ports of call at many waypoints across the Mediterranean, some of which are shown in Fig. 4-27. It seems logical to examine the shortest routes between these centres so as to suggest locations where landfall lights might have been established.

One site worthy of serious consideration is on Gozo where a Phoenician temple was excavated at Ras il-Wardija near San Lawrenz on the southwest tip of this small island close to Malta in the 1960s (Fig. 4-28).[58] In a remarkable position on top of

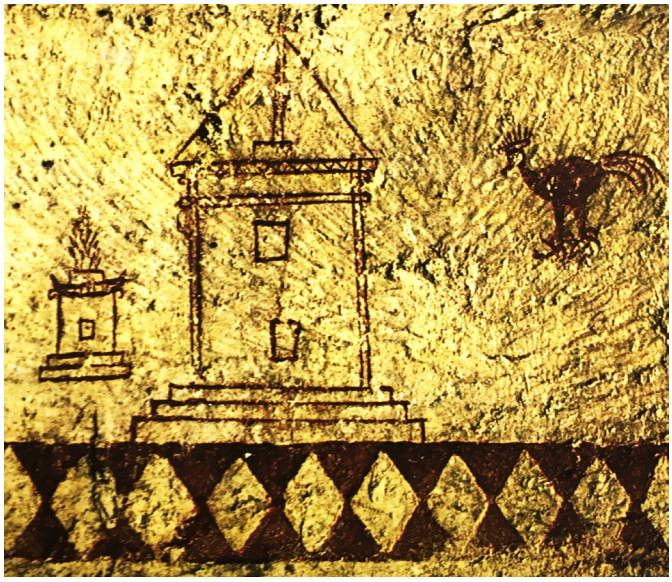


Fig. 4-29: A painting, made around the 4th c. BCE on the wall of a Phoenician tomb with graffiti that look remarkably like lighthouses. So far, this find is unique.[86]

precipitous cliffs, it maintains a strategic viewpoint over a part of the central-southern Mediterranean in which Phoenician sea traffic was prolific for centuries.

Despite our lack of understanding of Punic religious practices, we must ask if this site was used as a lighted aid to navigation by virtue of its role in Phoenician culture of Melqart worship. There is at least one place at the site that may have been used as the hearth for a significant fire, and if it was indeed used as such we might propose that it is the first real evidence of a Phoenician temple lighthouse in the times before the Pharos, although the dates for its use remain uncertain. Much site work remains to be done. Phoenician sites are quite easy to identify thanks to their characteristic locations on small islands or harbours protected by encircling promontories and many are already known.

General Remarks

Some writers discuss the presence of a lightstructure at Carthage. [59] [60] Again, it is possible that, if this lightstructure predated a similar one at Gades, then the first lightstructure was built here. This is a speculative conclusion for the Romans comprehensively destroyed the city and there is no firm evidence that the Phoenicians engaged in the building of lightstructures. However, Hague states:

> *"...re-excavation of the harbour at Carthage has brought to light the lower courses of an octagonal building 123 m across with walls about 2 m thick. The only details of the structure found were fragments of marble columns which it was thought might have formed part of an open lantern or similar feature."*[38]

This is not, in itself, sufficient justification for the conclusion to be drawn. Historical evidence suggests that if lighthouses were part of a culture then they would appear somewhere in the writings and artifacts of that culture. The Phoenicians invented the alphabetic language and were well versed in art, yet we find no representations of lightstructures amongst their writings or artifacts. There are many images that are considered to represent lighthouses in the cultures of the Greeks and the Romans, but there is nothing similar assigned to the Phoenician or Punic culture. Roman coins often featured both ships and lighthouses. Although Phoenician coins do show ships, there is nothing yet found that can be identified as a lighthouse. Guzzo[86] describes one painting on a wall of 4th-3rd century BCE tomb near Kerkouane in Tunisia as showing an object which does bear a striking resemblance to a pharos, as depicted in many other Roman and Hellenistic objects, Fig. 4-29. She identifies it as an 'altar', and there is certainly much evidence of the use of ritual sacrifice in the Phoenician culture to justify this interpretation. The similarity between her 'altar' and a lighthouse is, however, remarkable. There is no obvious marine context for the lighthouse interpretation of this icon.

It seemed natural to try to extend the theory by looking for other possible locations of unusual boulders at sites of advantage to navigators. Since Carthage was such a strategic port and the centre of great maritime activity during this time, new research has been recently carried out to identify similar locations. At Palermo, the chosen position was on an important headland, so an obvious parallel was at once clearly identifiable at Cape Bon, 70 km northeast of Carthage. This site is one of the most strategic in the entire Mediterranean where, as well as indicating the route into and out of Carthage, it is also a waypoint for all shipping traversing the southern routes from east to west and vice versa. Unfortunately, the terrain of Cape Bon is significantly rockier than Capo Gallo and there are limits to the capabilities of Google Earth at this

Fig. 4-30: On the island of Galite, an unusual collection of large boulders offer sight lines that point in the direction of southern Sardinia.[87] Note the orientation of north in the top right. This view is from the northwest. Mariners sailing north in the arc between the two red lines would be on course to Sardinia. See also Fig. 6-41.

site. Local investigations are clearly necessary, but the site remains one of the most likely for finding identifiable alignments of boulders.

A new possible site was found on the coast of northwest Galite, an island 40 km from the coast of north Africa. (Fig. 4-30.) Here, once again, an unusual placement of large boulders coincided with alignments to southern Sardinia where there were important Phoenician settlements. Clearly, at such an early stage of investigation, the possibility that Phoenician navigators used large boulders as daymarks to assist their course determinations remains entirely speculative. Nevertheless, there is a strong likelihood that, even if they did not actually place the stones in position, the Phoenician pilots took advantage of these most useful sightings. There is also no evidence that lights were set up in these positions, but the possibility exists even so. The authors who originally reported the boulders at Capo Gallo have pointed out that there is nothing in the Phoenician culture that suggests they used or set up megalithic monuments, and that if these boulders were indeed artificially placed, they were placed in position during the Bronze Age by contemporary navigators with similar interests.

Although they may have built some lightstructures in the later stages of their civilization, it is equally possible that the lightstructures that have been reported in sites of Phoenician settlement may have been placed there at a later date. The single report of a lighthouse at Carthage is speculation. Thus we must conclude that the Phoenicians were probably not builders of the first lightstructures.

Conclusions

Expert mariners who are generally called Phoenician made sea journeys in the Mediterranean and beyond in the period between the 13th and 2nd c. BCE.

In daylight, Phoenicians used all available seamarks as aids to navigation, some of which would have carried lights at night. This knowledge must have been learned by heart and passed from master to apprentice over generations.

There is a significant body of opinion that lighthouse towers representing Stage 3 functionality were built by Phoenicians at Cadiz, but the theory is not borne out by evidence that light-bearing towers were built elsewhere.

In view of the well-known practice of erection of temene at Phoenician ports and harbours, it is likely that lights shown from altars, sanctuaries and temples were used as Stage 2 aids to navigation across all of the ports used by Phoenician navigators from as early as 1250 BCE.

There is inconclusive evidence that Phoenician seamen used sight lines as signposts for routes between destinations. These large marker stones may have been serendipitous naturally-placed objects, or they may have been deliberately placed in useful positions by mariners from earlier cultures.

Notes

1 Diodorus Siculus: Bibliotheca Historica 5, 38, 3.

2 Herodotus: The Histories 4, 196.

3 Moscati (1988a).

4 Herodotus: The Histories 4, 42.

5 Moscati (1988a), p16.

6 Garbini (1988).

7 Pliny the Elder: The Natural History 5, 12.

8 Fischer (2001).

9 Garbini (1988).

10 Strabo: Geographica 3, 5, 1.

11 Pomponius Mela: De Situ Orbis 3, 1, 12.

12 Strong (2002).

13 Kassab (online).

14 Herodotus: The Histories 1, 1 (Phoenicians kidnap Io.)

15 Heeren (1854), p441.

16 Wikipedia, Phoenicia (2016).

17 Moscati (1988a): p24-5.

18 Herodotus: The Histories 2, 45.

19 Aubet (2001).

20 Bartoloni (1988).

21 Cintas: (1949), pp1-68.

22 Silius Italicus: Punica 662-665.

23 Herodotus: The Histories 7, 49.

24 Moscati (1988a), p118

25 Aubet (2001).

26 Moscati (1973a), p61.

27 Huxley (1964).

28 Karageorghis (1988).

29 Wright (1992).

30 Vitruvius: De Architectura 1, 6; The Directions of the Streets With Remarks on the Winds.

31 Aubet (1988).

32 Fantar (1988).

33 Wood (2005), p4.

34 Strabo: Geographica 3, 5, 5.

35 Tower of Hercules: Proposal for inclusion as a World Heritage Site (2008). Base document created by the Tower of Hercules Institute of Studies. https://whc.unesco.org/en/list/1312.

36 Fichou (1999).

37 Hague (1975), p1.

38 Stevenson (1959).

39 Strabo: Geographica 3, 5, 3.

40 Wikipedia: Dido (2016).

41 Wikipedia: Carthage (2016).

42 Virgil: Aeneid 1, 335.

43 Moscati (1988b).

44 Sladen (1906), p122.

45 Sladen (1906), p248.

46 Sladen (1906), p13.

47 The Description of Carthage in Appian's "Punic War". In the Translation of AD 1679, translator unknown. Quoted in Sladen (1906), pp3-4.

48 Thucydides: 6, 2.

49 Tusa (1988).

50 Halibutt - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=45431160

51 Wikipedia, Panormus (2017).

52 Wikipedia (2017).

53 Rapisarda (2016).

54 Moscati (1973b).

55 Wikipedia, Sardinia (2017).

56 Wikipedia, Nuraghe (2017).

57 Giardina (2010): pp94-5 and p289.

58 http://gozonews.com/18172/ras-il-wardija-in-gozo-the-return-of-the-lost-graffito/ (2016)

59 Tuck (2013).

60 Irby (2016).

61 Unattributed photo in the public domain.

62 Photo © 2009 Özgür Mülazımoğlu; Used under CC Licence

63 Google Earth (2017).

64 Piero Bartoloni: Ships and Navigation, p73. In: Moscati (1988).

65 Louvre Museum, Paris.

66 Beirut National Museum.

67 Photo in the public domain.

68 Image by Polat Kaya (2014); http://www.polat-kaya.net/PHOENICIAN%20CITY%20OF%20GADES%20

Part%202.htm

69 Google Earth (2017).

70 Image included on p138 in the document at note 35.

71 Photo: Ken Trethewey (2011).

72 Google Earth (2017).

73 Photo ©Mark Lewis.

74 J. Laurent. Old photograph in the public domain.

75 Aucler (1906).

76 Photo credit.

77 Google Earth (2017).

78 Photo: Anon. Old photo in the public domain as over 100 years old.

79 Google Earth (2017)

80 Google Earth (2017).

81 Google Earth (2017).

82 Photo credit.

83 Photo credit.

84 Google Earth (2017).

85 Photo credit.

86 Guzzo (1988).

87 Google Earth (2018). This was pointed out to the author in 2016 by Marco Vigano.

Bibliography

Conventions used

1. References are given in the usual format: Smith (2002), p123. Multiple citations having the same author and year are given the suffix a, b, c etc.

2. A reference given as Smith (online) has no date if it is continuously updated. Specific information downloaded from the Internet is given a date of download.

3. Entries in the Bibliography are considered relevant to the content of this book, but are not necessarily to be found in the references.

4. Entries are in alphabetical order of the first author's last name. Unnamed authors are assigned the usual 'Anon'.

Bibliography

Abu Hamid Al-Gharnati: Tuhfat Al-Albab, p99-100. In: Okasha el-Daly: Egyptology: The Missing Millenium: Ancient Egypt in Medieval Arabic Writings. (2008). ISBN 9781598742800.

Abulafia, David (ed): The Mediterranean in History, Thames and Hudson (2003). ISBN: 9780500251201.

Adams, William Henry Davenport: Lighthouses and Lightships, T. Nelson & Sons, London, (1871).

Akurgal, Ekrem: Ancient Civilizations and Ruins of Turkey. Haset Kitabevi, Istanbul (1985), 6th edition.

Allard, Emile: Les Phares. Histoire, construction, éclairage, Paris (1889).

Al-Edrisi; R. Dozy; M. J. de Goeje; E. J. Leyde (trans): Description de L'Afrique et de L'Espagne. Troisième climat, quatrième section. Brill (1866).

Al-Gharnati, Abu Hamid; Jean-Charles Ducène (trans.): De Grenade à Baghdad - La Relation de Voyage d'Abu Hamid al-Gharnati (1080-1161). L'Harmattan, Paris (2006). ISBN: 9782296005594.

Allen, Jim; O'Connell, James F.: Getting from Sunda to Sahul, pp31-46. In: Clark (2008).

Alley, R.B.: GISP2 Ice Core Temperature and Accumulation Data. IGBP PAGES / World Data Center for Paleoclimatology Data Contribution Series #2004-013. NOAA/NGDC Paleoclimatology Program, Boulder CO, USA (2004).

Al-Masudi (translated by Lunde and Stone, (2007), p46.

Al-Masudi: Les Prairies D'Or. Translated in French by C. Barbier de Meynard et Pavet de Courteille. Volume 2, Paris, (1863) p433.

Al-Murtadi: The Egyptian History. Vattier, Pierre (French): 1623-1667, Davies, John (English): 1625-1693. London, (1672), 8 vols.

Al-Qazwini, Zakariya Ibn Muhammad: Br. Mus., Or. MS 3623, fol. 41b. http://www.iranicaonline.org/articles/atar-al-belad-geographical-work

Ambraseys, Nicholas N.; Melville, C. P.; Adams, R. D.: The Seismicity of Egypt, Arabia and the Red Sea - A Historical Review, Cambridge University Press (1994). ISBN: 9780521391207.

Ambraseys, Nicholas: Earthquakes in the Mediterranean and Middle East - A Multidisciplinary Study, Cambridge University Press (2009), 968pp. ISBN: 9780521872928.

Anderson, Atholl; James H. Barrett; Katherine V. Boyle (eds.): The Global Origins and Development of Seafaring. McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge UK (2010). http://www.mcdonald.cam.ac.uk/publications/publication-images/table%20of%20contents/global-seafaring-toc

Anon: A Brief History and Description of Nea Paphos. Antiquities Department, Republic of Cyprus (1978).

Anon: Brief History and Pre-History of Libya. www.temehu.com

Anon: The Adventures of Leucippe and Clitophon, V.6 (online). http://penelope.uchicago.edu/~grout/encyclopaedia_romana/greece/paganism/pharos.html

Anon: The Pharos Site, Alexandria, Egypt International Journal of Nautical Archaeology, March (1975) 4(1), pp126–130.

Arculf; Stewart, Aubrey (trans.): Burchard of Mount Sion. Palestine Pilgrims Text Society, Vol. iii. (1896). https://archive.org/details/libraryofpalesti12pale

Arnold, John H.: History: A Very Short Introduction. Oxford University Press (2000), p17. ISBN 019285352X.

Arunachalam, B.: Navigation Environment of Ancient and Mediaeval Ports of Tamilaham, KW Publishers, New Delhi, India (2008). ISBN: 9788187966784.

Aubet, Maria Eugenia: The Phoenicians and the West - Politics, Colonies and Trade. Cambridge University Press (1996). ISBN: 9780521795432. Also 2nd edition (2001). ISBN: 9780521795432.

Aubet: Spain (1988) p228. In: Moscati (1988).

Aucler, M. Paul. In: Sladen (1906).

Bailey, Geoff: Earliest Coastal Settlement, Marine Paleoeconomies and Human Dispersal - the Africa-Arabia Connection (2010). In: Anderson (2010).

Barthelemy, P.:History of Boulogne-sur-Mer, from Julius Caesar to the year 1825; embellished with plans by M. Barthelemy. Griset, Paris (1825).

Bartoccini, Renato: Il Porto Romano di Leptis Magna, In Bollettino del Centro Studi sull' Architetturo, Supplemento 13, Roma (1958).

Bartoloni, Piero: L'Antico Porto di Nora. In: Antiqua 13 (1979), pp57-61.

Bartoloni, Piero: Ships and Navigation (1988), pp72-7. In: Moscati (1988).

Beaver, Patrick: A History of Lighthouses, Peter Davies Ltd (1971).

Beckby, H. (ed.); Higgins, R. (trans.): Anthologia Graeca. Munich (1957) 4, 171.

Bedon, R.: Les Phares Antiques. In: Archeologia. Prehistoire et Archaeologie, Paris (1988b), pp54-66.

Bedon, R.; R. Chevallier, P. Pinon: Architecture et Urbanisme en Gaule Romain, Paris (1988a).

Behrens-Abouseif, Doris: The Islamic History of the Lighthouse of Alexandria. In: Muqarnas, Vol. 23 (2006), pp1-14. http://www.jstor.org/stable/25482435

Benett, Léon. In: Verne, Jules: Les Grands voyages et les grands voyageurs. Découverte de la Terre. Paris: J. Hetzel (1878). http://www.artfinder.com/work/ibn-battuta-in-egypt-hippolyte-leon-benett/

Bernard, E.: Alexandrie la Grande, Paris (1956).

Blackman, David: Roman Shipsheds; Memoirs of the American Academy in Rome, Supplementary Volumes, Vol. 6, The Maritime World of Ancient Rome (2008), pp. 23-36; University of Michigan Press for the American Academy in Rome. http://www.jstor.org/stable/40379295

Bloom, Jonathan; M. Cresswell: The Origins of the Minaret, Muqarnas 8 (1991) p56. http://archnet.org/system/publications/contents/4179/original/DPC0329.pdf?1384781505

Boin, Douglas: Ostia in Late Antiquity. Cambridge University Press (2016). ISBN: 978-1316601532.

Boivin, Nicole; Roger Blench; Dorian Q Fuller: Archaeological, Linguistic and Historical Sources on Ancient Seafaring (2009). In: Petraglia (2009) Chapter 18, p260.

Bond, G. et al.: A Pervasive Millennial-Scale Cycle in North Atlantic Holocene and Glacial Climates. Science 278, No 5431 (1997), pp1257-1266.

Boston Public Library: Ships and the Sea - A Catalog of an Exhibition of Books and Manuscripts, Boston Public Library, Boston, MA (1966).

Bouras, Catherine: On the Urbanism of Roman Harbours- The Evolution of Space Organization in Harbours of the Aegean Sea. In: Ladstätter (2014), pp669–682. http://www.ancientportsantiques.com/wp-content/uploads/Documents/PLACES/GreeceIslands/Rhodes&Kos-Bouras2014.pdf

Bouriant, Urbain: Description topographique et historique de l'Egypte. Paris (1895-1900), Chapter IX: Du Phare d'Alexandrie, pp444-50.

Brandon, C. J.: Roman Formwork Used for Underwater Concrete Construction. In Oleson (2014) Chapter 8, pp189-235.

Brandon, C. J.; R. L. Hohlfelder; J. P. Oleson: The Concrete Construction of the Roman Harbours of Baiae and Portus Iulius: The ROMACONS 2006 Field Season; submitted to International Journal of Nautical Archaeology 20 April

Breeze, David J.: The Northern Frontiers of Roman Britain. Batsford Academic and Educational Ltd., London (1982) 188pp. ISBN: 0713403454.

Broadhurst, Roland (trans.): The Travels of Ibn Jubayr. Goodword Books, India (2001). ISBN: 9788187570554. First published: London (1952).

Brogan, Olwen: Roman Gaul, G Bell & Sons Ltd, London (1953), 250pp.

Bromwich, James Stephen: The Roman Remains of Northern and Eastern France, Routledge (2013) p51-2. ISBN-13: 9780415143585.

Bronson, R.G., G Uggeri: Isola del Giglio, Isola di Giannutri, Monte Argentario, Laguna di Ortebello - Notizia Preliminare dei Rinvenimenti del 1968. In: Studi Etruschi, 38, II,(1970), pp201-14.

Broodbank, Cyprian: The Making of the Middle Sea. Thames and Hudson (2015). ISBN: 9780500292082.

Buceti, Giuseppe: Gialo. I Misteri Del Peloro, Messina, EDAS (2012), 176pp. ISBN: 9788878203747.

Burgess, Jonathan S: Tumuli of Achilles, Center for Hellenic Studies, Harvard University. https://chs.harvard.edu/CHS/article/display/1312

Butler, Alfred J.: The Arab Conquest of Egypt and the Last Thirty Years of the Roman Dominion. Clarendon Press, Oxford (1902). https://archive.org/details/arabconquestofeg029678mbp. Retrieved 20170330.

Butler, Alfred. J.: The Ancient Pharos at Alexandria. The Athenaeum, November 20 (1880), p681.

Casson, Lionel: The Ancient Mariners - Seafarers and

Sea Fighters of the Mediterranean in Ancient Times. Princeton University Press, 2nd edition (1991). ISBN: 9780691014777.

Casson, Lionel: Travel in the Ancient World, The Johns Hopkins University Press (1994). ISBN: 9780801848083.

Cintas P.: Fouilles Puniques a Tipasa. Revue Africaine, 92 (1949), pp1-68.

Clark, Geoffrey; Foss Leach; Sue O'Connor (eds.): Islands of Inquiry (Terra Australis 29) Colonisation, seafaring and the archaeology of maritime landscapes. ANU Press (2008). ISBN: 9781921313899. http://press.anu.edu.au?p=26551

Clayton, Peter A.: The Pharos At Alexandria (1988b), pp138-57. In: Clayton (1988).

Clayton, Peter A.; Price M. (eds.), The Seven Wonders of the Ancient World. Routledge, London (1988a). ISBN: 0415002796.

Cobb, Paul (ed): The Lineaments of Islam: Studies in Honor of Fred McGraw Donner, Leiden: Brill, (2012), 488pp. ISBN: 9789004218857.

Constable, Anthony R.; William Facey (eds): The Principles of Arab Navigation. Arabian Publishing (2013), 146pp. ISBN: 9780957106017.

Cook, J. M.: The Greeks in Ionia and the East. Thames and Hudson, London (1962), 268pp.

Cook, J. M.: The Troad - An Archaeological and Topographical Study. The Clarendon Press, Oxford (1973), 444pp.

Cooper-Marsdin, Arthur Cooper: The History of the Islands of the Lerins - The Monastery, Saints and Theologians of S. Honorat. Cambridge University Press (1661). Republished (1913), (2013). ISBN: 9781107615465.

Cornide de Folgueira, José: Investigacion Sobre Origen, Progresos y Fabrica de la Torre Ilamada de Hércules Situada a la Entrada del Puerto de la Coruña. Madrid (1792).

D'Ascenzo, Annalisa: Civitavecchia Penuriava D'acqua Dolce da Bere da Molto Tempo Già Persa... ASITA2014. http://atti.asita.it/ASITA2014/Pdf/044.pdf

Dallas, M. F.; Yorke R. A.: Underwater Surveys of North Africa, Jugoslavia and Italy, Underwater Association Report (1968).

Daux, A.: Origines et l'emplacement des emporia Phéniciens. Paris, Imprimerie Impériale, (1869) p302.

De Asin, Don Miguel: Ibn Al-Sayj, the Duke of Alba, Proceedings of the British Academy, 19 (1933), pp277-292.

De Graauw, Arthur: Ancient Ports and Harbours. Volume I: The Catalogue, 5th edition (March 2016). Volume II: Citations of Ancient Authors. Volume III: Ancient Port Structures. Volume IV: Stories of Ancient Sailors. www.ancientportsantiques.com.

De La Blanchere, R.: Terracina, Saggio di Storia Locale, Terracina (1983); Reprinted from Terracine, Essai D'Histoire Locale, Paris (1884). https://archive.org/details/terracineessaidh34labl_0

De Montfaucon, Dom Bernard: L'Antiquité Expliquée et Representée en Figures, vols. 1-15, Paris (1719-1724).

De Rose Evans, Jane (ed): A Companion to the Archaeology of the Roman Republic, Wiley-Blackwell (2013), 746pp. ISBN: 9781405199667.

De Rossi, G.M.: Ventotene e Santo Stefano, Roma (1993).

Della Croce, I.: Nistoria Antica e Moderna Sacra e Profana Della Citta di Trieste, Venetia (1698).

Denny, Mark: The Science of Navigation, From Dead Reckoning to GPS; The Johns Hopkins University Press, Baltimore (2012), 262pp. ISBN: 9781421405124.

Di Vita, A.: Sabratha. In: Libya, the Lost Cities of the Roman Empire, Cologne (1999), pp146-175.

Diels, H.: Antike Technik, Osnabrück (1965).

Dionysius Byzantius; G³ngerich [1927] (trans.): Per Bosporum navigatio. (1958), pp92-94.

Donaldson, G.H.: Signalling Communications and the Roman Imperial Army. Britannia, Vol. 19 (1988), pp349-356, Society for the Promotion of Roman Studies, DOI: 10.2307/526204. http://www.jstor.org/stable/526204

Dorigo, W.:Venezie Sepolte Nella Terra Del Piave, Duemila Anni Fra Il Dolce E Il Salso, Rome (1994).

Dubois, Charles: Pouzzoles Antique (Histoire et Topographie). Paris, A. Fontemoing (1907).

Ducène, Jean-Charles (trans.): De Grenade À Bagdad: La relation de voyage d'Abû Hâmid al-Gharnâtî (1080-1168), L'Harmattan (2006), 210pp. ISBN 9782296005594. http://www.muslimheritage.com/article/lighthouse-of-alexandria

Duggan, T.M.P.; Aykan Akþay: On the Missing Navigational Markers, Beacon Towers; Pharos Of Antiquity, And Notice Of Two Extant Small Marker Beacon Towers of Roman Late 1st c. BC - Early 1st c. AD Anemorium. Akdeniz.Edu.Tr; Cedrus

Dunn, Ross E.: The Adventures of Ibn Battuta - A Muslim Traveller of the 14th. Century. University of California Press, Los Angeles (1986). ISBN: 0520243854.

El-Fakharani, Fawzi: The Lighthouse of Abousir in Egypt. Harvard Studies in Classical Philology, Department of Classics, Harvard University Press, Vol. 78 (1974),

pp257-272.

Elnashai, A.S.; L. Di Sarno; M.D. Carter: New Light on an Ancient Illumination - The Pharos of Alexandria. International Journal of Nonlinear Sciences and Numerical Simulation, Freund Publishing House Ltd, 7:2 (2006), pp137-48. https://scribium.com/sebastien-polet/a/laspect-du-phare-dalexandrie-dapres-les-sources-medievales

Empereur, Jean-Yves: Le Phare d' Alexandrie, La Merveille Retrouvée, Découvertes Gallimard (1998) 112pp. (In French). ISBN: 9782070303793.

Engels, Donald W.: Roman Corinth: An Alternative Model for the Classical City. University of Chicago Press (1990), 264pp.

Esposito, E.; E. Filici, P.A. Gianfrotta, E. Scognamiglio: Il Porto di Kyme. In: Archaeologia Subacquea, Studi, Ricerche, Documenti, III, Roma (2002), pp1-37.

Euzennat Maurice: Ancient Marseille in the Light of Recent Excavations. American Journal of Archaeology, Vol. 84, No. 2, Apr (1980), pp133-140; DOI: 10.2307/504261. http://www.jstor.org/stable/504261

Fantar, Muhammud: North Africa (1988), pp166-185. In Moscati (1988).

Fatta Francesca: Luci del Mediterraneo. I fari di Calabria e Sicilia. Disegni, rilievi e carte storiche. Rubbettino (2002), 198pp. ISBN: 9788849803501.

Feissel, D.: Gouverneurs et Edifices Dans Epigrammes de Smyrne au Bas Empire. REG, 111 (1998), pp125-44.

Ferentinos, George; Maria Gkioni; Maria Geraga; George Papatheodorou: Early Seafaring Activity in the Southern Ionian Islands, Mediterranean Sea. Journal of Archaeological Science 39(7), July (2012), pp2167-2176.

Fernandez Ochoa, C.; A. Morillo: Roman Lighthouses on the Atlantic Coast, BAR International Series 2162 (2010). https://www.academia.edu/9887581/_2010_Roman_lighthouses_on_the_Atlantic_coast. Retrieved 20180312.

Ferreol Salomon; Simon Keay; Nicolas Carayon; Jean-Philippe Goiran: The Development and Characteristics of Ancient HarboursùApplying the PADM Chart to the Case Studies of Ostia and Portus, September 15 (2016). https://doi.org/10.1371/journal.pone.0162587

Fichou, Jean-Christophe; Noel Le Hénaff; Xavier Mével: Phares - Histoire Du Balisage Et De Léclairage des C¶tes de France (1999), Editions Le Chasse-Marée / Armen, Abri Du Marin, 29177, Douarnenez Cedex, 452pp. ISBN: 2903708924.

Finocchi, S.: La Laguna e L'Antico Porta di Nora; In: Rivista di Studi Fenici 27 (1999), pp167-92.

Fischer, Steven Roger: A History of Writing. Reaktion Books (2001). ISBN: 9781861891679.

Fisher, M. B.; M. R. Griffin: Pliny's Letters, Cambridge University Press (1973), 74pp.

Florus, Lucius Annaeus; E. S. Forster (trans): The Epitome of Roman History (1929).

Forbes, Robert James: Studies in Ancient Technology, Vol. 4., E. J. Brill (1964) 311pp.

Forster, E. M.: Pharos and Pharillon, London (1923).

Foucher, L; Hadrumetum, Paris (1964).

Fox, Robin Lane: The Classical World - An Epic History of Greece and Rome. Penguin Books (2006).

Fraser, P. M.: Ptolemaic Alexandria, The Clarendon Press, Oxford, Volumes 1-3 (1972).

Garbini, Giovanni: The Question of the Alphabet (1988), pp86-103. In: Moscati (1988).

Gardiner R.: Earliest Ships - The Evolution of Boats and Ships. Conway Maritime Press Ltd (1996). ISBN: 9780851776408.

Gébara, Chérine; Christophe Morhange: Fréjus (Forum Julii); Le Port Antique; The Ancient Harbour. Portsmouth, R.I., Journal of Roman Archaeology (2010), 152pp. (2010)

Giardina, Baldassarre; Navigare Necesse Est - Lighthouses from Antiquity to the Middle Ages; History, Architecture, Iconography and Archaeological Remains. BAR International Series 2096; BAR Publishing; Oxford (2010) 348pp. ISBN:

Giorgetti, G.: Geografia Storica Ariminese. In: Analisi Di Rimini Antic, Storia Ed Archeoligica per un Museo, Rimini (1980).

Goiran, J-P.; Salomon, F.; TronchÞre, H.; Carbonel, P.; Djerbi, H.; Ognard, C.: Caractéristiques du Basin Portuaire de Claude - Nounelles Données pour la Localisation des Ouvertures, pp31-45. In: Keay (2011)

Goren-Inbar, Naama; Nira Alperson, Mordechai E. Kislev; Orit Simchoni; Yoel Melamed; Adi Ben-Nun; Ella Werker: Evidence of Hominin Control of Fire at Gesher Benot Ya`aqov, Israel. Science, 30 Apr (2004) Vol. 304, Issue 5671,

Grant Michael (ed): The Birth of Western Civilization, Thames and Hudson (1964).

Graves, Robert: The Greek Myths - The Complete and Definitive Edition, Penguin Books (1992), reissued (2011). First published (1955) by Pelican Books, London.

Grimal, Pierre; G. Michael Woloch (trans): Roman Cities. University of Wisconsin Press (1983).

Guzzo, Maria: Painting, pp448-455. In: Moscati (1988)

Hague, Douglas B; Rosemary Christie: Lighthouses, Their Architecture, History and Archaeology. Gomer Press (1975). ISBN: 850883245.

Hamarneh, S: The Ancient Monuments of Alexandria According to Accounts by Medieval Arab Authors (IV-XV century). Folia Orientalia 13 (1971), pp77-110

Hancock, Graham; Santha Faiia: Heaven's Mirror - Quest for the Lost Civilization. Michael Joseph and Channel 4 (1998). ISBN: 0718143329.

Hapgood, Charles H.: Maps Of The Ancient Sea Kings - Evidence Of Advanced Civilization In The Ice Age. Adventures Unlimited (1996). ISBN: 9780932813428.

Harari, Yuval Noah: Sapiens, A Brief History of Humankind. Vintage (2011). ISBN: 9780099590088.

Hardy, W. J.: Lighthouses - Their History and Romance. The Religious Tract Society (1895).

Harris, Eleanor: Ancient Egyptian Magic, Weiser Books, (2016), 240pp. ISBN: 9781578635917.

Harris, Jonathan: A Statue for America - The First 100 Years of the Statue of Liberty. New York City. Four Winds Press (1985). ISBN 9780027427301.

Harris, W. V.; Giovanni Ruffini: Ancient Alexandria between Egypt and Greece. Brill, Leiden, Netherlands (2004), 318pp.

Heeren, Arnold Hermann Ludwig: Historical Researches Into the Politics, Intercourse, and Trade of the Principal Nations of Antiquity, Henry Bohn (1854).

Heilbrunn: Timeline of Art History. New York: The Metropolitan Museum of Art, 2000. http://www.metmuseum.org/toah/hd/grlg/hd_grlg.htm

Hemingway, Colette; Sean Hemingway: Greek Gods and Religious Practices (2003). In: Heilbrunn (2000). http://www.metmuseum.org/toah/hd/grlg/hd_grlg.htm

Herm, Gerhard (trans. from German by Caroline Hillier): The Phoenicians. First Futura Publications, London (1975).

Herodotus; Aubrey de Sélincourt (1954): The Histories. Revised by John Marincola (1996), Penguin edition (2003.

Heyerdahl, Thor; P. Crampton (trans): The Ra Expeditions, Penguin (1972). ISBN: 9780140034622.

Higgins, Reynold: The Colossus of Rhodes. In: Clayton (1988), pp124-37. ISBN: 0415002796.

Hill, Donald: A History of Engineering in Classical and Medieval Times. Routledge (1996). ISBN: 0415152917.

Hodges, Henry: Technology in the Ancient World. Michael O'Mara Books, London (1996). ISBN: 9781854796042.

Hohlfelder, Robert L.; Christopher Brandon: Narrative of the ROMACONS Fieldwork. Ch. 4, pp73-81. In Oleson (2014).

Hohlfelder, Robert L.; Christopher Brandon; John P. Oleson: Constructing the Harbour of Caesarea on the Sea - New Evidence from the ROMACONS Field Campaign of October 2005. https://web.uvic.ca/~jpoleson/ROMACONS/Caesarea2005.htm

Holmes, George C. V.: Ancient and Modern Ships. Createspace (2015).

Homer; Butler, Samuel (trans): Iliad.

Homer; Murray, A. T. (trans): Iliad. Loeb Classical Library Volumes, Cambridge, MA, Harvard University Press; London, William Heinemann, Ltd (1924).

Homer; Murray, A. T. (trans): Odyssey. Loeb Classical Library Volumes, Cambridge, MA, Harvard University Press; London, William Heinemann Ltd (1919).

Homer; Pope, Alexander (trans): Iliad (1796); notes by Gilbert Wakefield.

Homer; Rieu, E. V. (trans): Iliad (1950); notes by Peter Jones, Penguin Classics (2003).

Homer; Rieu, E. V. (trans): Odyssey (1946). Penguin Classics (2003).

Hourani, George F.; Arab Seafaring - In the Indian Ocean In Ancient and Early Medieval Times. Princeton University Press (1951, reprinted 1995), 190pp. ISBN: 0691000328.

Hughes, A. J.: The Book of the Sextant with Ancient and Modern Instruments of Navigation. Brown, Son & Ferguson, Glasgow (1949).

Hutter, Siegfried: Der Romische Leuchtturm von La Coruna, Verlag Philipp Von Zabern, Mainz am Rhein (1973). (In German).

Hutton, Edward: Ravenna - A Study (1913).

Huxley, George: The History which Inspired Homer (1964). In: Grant (1964).

Irby, Georgia L. (ed): A Companion to Science, Technology, and Medicine in Ancient Greece and Rome, Volume 1 (2016a). ISBN: 9781118372678.

Irby, Georgia L.: Navigation and the Art of Sailing (Chapter 51) (2016b). In: Irby (2016a).

Irwin, G.: The Prehistoric Exploration and Colonization of the Pacific. Cambridge University Press (1992). Online publication date: January (2010). ISBN: 9780511518225. https://doi.org/10.1017/CBO9780511518225

Işık, Fahri; Merih Çobanoglu (trans.): Patara - The History and Ruins of The Capital City of Lycian League. Orkun & Ozan Medya Yayinlari, Antalya (2000), 173pp. ISBN 9789757094043.

Iskan-Isik, H.; W. Eck; H. Engelmann: Der Leuchtturm von Patara und Sex. Marcius Priscus als Statthalter der Provinz Lycia von Nero bis Vespasian. Zeitschrift fur Papyrologie und Epigraphik, 164 (2008), pp91-121.

James Stephen Bromwich: The Roman Remains of Northern and Eastern France, Routledge (2013) pp51-2. ISBN: 9780415143585.

Josephus; William Whiston (trans.): The Jewish War. Book IV Chapter 10.5, Cambridge (1737). http://penelope.uchicago.edu/josephus/index.html

K Muckelroy: Archaeology Under Water - An Atlas of the World`s Submerged Sites, London, (1981).

Karageorghis, Vasos: Cyprus (1988), pp152-165. In Moscati (1988).

Kassab, Maroun (online). www.phoenicia.org/originphoenicians.html

Keay, S. J. (ed): Rome, Portus and the Mediterranean. Archaeological Monographs of the British School at Rome, The British School at Rome, London (2012), 38pp. ISBN 9780904152654. http://www.bsr.ac.uk/site2014/wp-content/uploads/Rome-Portus-and-the-Mediterranean-Chapter-2.pdf

Keay, S. J.: Roman Spain, London (1988).

Keay, S. J.; Millett, M.; Paroli, L.; Strutt, K: Portus - An Archaeological Survey of the Port of Imperial Rome. Archaeological Monographs of the British School at Rome, 15. London: The British School at Rome (2005).

Keay, S. J.; Paroli, L.: Portus and its Hinterland. Archaeological Monographs of the British School at Rome, The British School at Rome, London (2011), 18pp.

Kozelj, T.; Wurch-Kozelj, M.: Phares de Thasos. Bulletin de Correspondance Hellenique, CXIII (1989) 1:161-181, Ecole Francaise d'Athènes. (In French). http://www.persee.fr/doc/bch_0007-4217_1989_num_113_1_4716

Krause, Clemens: Villa Jovis. Die Residenz des Tiberius auf Capri, Verlag Philipp von Zabern, Mainz am Rheim (2003), (In German). ISBN: 9783805330916.

Krischen, F., Die Grieschische Stadt, Berlin (1938).

Ladstätter, S.; Pirson, F.; Schmidts, T.: Harbors and Harbor Cities in the Eastern Mediterranean. BYZAS 19 (2014).

Lagan, Jack: Barefoot Navigator. Navigating with the Skills of the Ancients. A & C Black (2006). ISBN: 9780713674293.

Lakin, David; Fiona Seeley; Joanna Bird; Kevin Rielly; Charlotte Ainsley: The Roman Tower at Shadwell, London - A Reappraisal. Museum of London Archaeology Service, English Heritage, Archaeology Studies Series 8, (2002) 72pp.

Lamboglia, N.: I Monumenti Medioevali Della Liguria del Ponente, Torino (1970)

Lamboglia, N.: Liguria Romana. Alassio (1939).

Landels, J. G.: Engineering in the Ancient World. Chatto and Windus, London(1978), 224pp. ISBN: 0701122218.

Laronde, André: Apollonia de Cyrénaïque. Archéologie et Histoire, Journal des savants, no 1 (1996), pp3-49.

Lehmann-Hartleben, K; Die Antiken Hafenanlagen des Mittelmeeres. In Klio: 14 Aalen (1963) pp178-180.

Lewis, David: The Voyaging Stars. Secrets of the Pacific Island Navigators. Collins, Sydney (1978).

Lewis, David: We, the Navigators - The Ancient Art of Landfinding in the Pacific. University of Hawai'i Press, United States (1994). ISBN: 9780824815820.

Lianos, Nikolas A.: The Ancient Port of Marea-Philoxenite at Lake Mareotis in Alexandria. The Alexandria International Conference on Maritime and Underwater Archaeology (2016). https://www.researchgate.net/publication/322235868_The_ancient_port_of_Marea-Philoxenite_at_Lake_Mareotis_in_Alexandria

Lindsay, William S. (1816-1877): History of Merchant Shipping and Ancient Commerce. ReInk Books (2015).

Lipinsky, Edward: Itineraria Phoenicia (Orientalia Lovaniensia Analecta); Peeters Publishers (2005). ISBN: 9789042913448.

Litchfield West, Martin: Greek Epic Fragments from the Seventh to the Fifth Centuries BC. Harvard University Press, 2003 - Literary Criticism - 316pp.

Liversidge, Joan: Everyday Life in the Roman Empire. B. T. Batsford Ltd (London), G. P. Putnam's & Sons (New York) (1976). ISBN: 071343239X.

Long, Neville: Lights of East Anglia, Lavenham Press (1983) p2.

Lowe, Dunstan: Twisting in the Wind - Monumental Weathervanes in Classical Antiquity. Cambridge Classical Journal, 62, (2016), pp147-169. ISSN 17502705.

Lucian; H. W. Fowler; F. G. Fowler (trans.): The Works of Lucian of Samosata. The Clarendon Press Oxford, 1905, p135-6.

Lucian; William Tooke (trans.): Lucian of Samosata. Vol 2, London (1820). http://www.sacred-texts.com/cla/luc/wl2/index.htm

Mackintosh-Smith, Tim (ed): The Travels of Ibn Battut-

ah. Picador (2002) 325pp. ISBN 9780330418799.

MacPherson, James Rose: The Pilgrimage of Arculfus in the Holy Land About the Year A.D. 670, Palestine Pilgrims Text Society, London, (1895). https://archive.org/details/libraryofpalesti03paleuoft

Mahmoud-Bey, Memoire sur L'Atlantique Alexandrie. Copenhague (1872). https://archive.org/stream/mmoiresurlantiq00falagoog#page/n5/mode/2up

Maiuri, Amedeo: La Specola Misenate. In: Itinerario Flegreo, Bibliopolis, Napoli (1983), pp177-194. ISBN: 9788870880847.

Malkin, Irad: A Small Greek World. Oxford University Press (2011) 284pp. ISBN: 9780199315727.

Manfredini, C.: Il Libro Dei Fari Italiani. Mursia editore, Via Tadino 29, Milano, Italy, (1985), pp 196.

Mansel, A.M.: Die Ruinen von Side, Berlin (1963).

Marimpietri, K.: Fra le dune della Cirenaica/ Archeo (2008), XXIV 4 (278), pp12-13.

Maryon, H.: The Colossus of Rhodes. The Journal of Hellenic Studies, 76 (1956), pp68-86. doi:10.2307/629554.

Matter, M.: (1840-44).

McCann, A.M.; Bourgeois, J.; Gazda, E.K.; Oleson, J.P; Will, E.L.: The Roman Port and Fishery of Cosa - A Centre of Ancient Trade, Princeton University Press (1987).

McCormick, W. H.: The Modern Book of Lighthouses, Lightships and Life-Boats. A&C Black, London (1936), 142pp.

McCrindle, John Watson: The Commerce and Navigation of the Erythraean Sea. Forgotten Books, United States (2015). ISBN: 9781330880883.

McKenzie, Judith: The Architecture of Alexandria and Egypt 300 BCE - AD 700. Yale University Press, New Haven and London (2007) 460pp. ISBN: 9780300170948.

McMahon, Donald J.: A Seafarers Decoding of the Irish Symbols - The Oldest Testament - 3200 BCE to 2500 BCE. Createspace, United States (2014), 9781497395206.

Medas, Stefano:áDe Rebus Nauticis: L'Arte Della Navigazione nel Mondo Antico. Rome: L'Erma di Bretschneider (2004), 234pp. ISBN: 8882652785.

Meiggs, Russell: Roman Ostia, Clarendon Press, Oxford, UK (1997), p279.

Merriam, Augustus Chapman: Telegraphing Among the Ancients. Papers of the Archaeological Institute of America, Classical Series, 3, 1 (1890), 32pp.

Mikelson, Jon: An Overview - Greek Sanctuaries and Worship. AGRC01 (2004), 31pp. http://www.blackwell-publishing.com/content/BPL_Images/Content_store/Sample_chapter/0631232222/Mikalson_sample%20chapter_ancient%20greek%20religion.pdf

Milne, Gustav: The Port of Roman London. B. A. Batsford Ltd., London (1985), 160pp. ISBN: 0713443642.

Mingazzini, P.; F. Pfister: Forma Italiae: Regio I - Latium et Campania, Volumen Secundum, Surrentum, Firenze (1946).

Mirley, Margarett: Closing the Helix - The Journey and Experiences of Pytheas, the Greek Merchant Adventurer Who Explored the Northern Seas. Troubador Publishing, UK (2007). ISBN: 9781906221133.

Moreno, Alfonso: Hieron - The Ancient Sanctuary at the Mouth of the Black Sea. Hesperia, 77 (2008), pp655-709. Quotation on p697.

Morkot, Robert: The Penguin Historical Atlas of Ancient Greece. Penguin Books (1996). ISBN: 0140513353.

Morton, Jamie: The Role Of The Physical Environment In Ancient Greek Seafaring. Brill (2001), 363pp. ISBN: 9789004351073.

Moscati, Sabatino (ed): Phoenicians. Bompiani, Palazzo Grassi, Venezia (1988a).

Moscati, Sabatino: The Carthaginian Empire (1988b), pp54-61. In: Moscati (1988a).

Moscati, Sabatino; Alastair Hamilton (trans): The World of the Phoenicians, Weidenfield and Nicholson (1968), Also Sphere Books (1973). ISBN: 0351174044.

Moscati: Sardinia. (1973b), pp257-282. In Moscati (1973a).

Most, Glenn W.; Schreyer, Alice (Eds.): Homer In Print: A Catalogue Of The Bibliotheca Homerica Langiana At The University Of Chicago Library, University of Chicago (2013) 352pp. ISBN: 9780943056418. https://www.lib.uchicago.edu/e/webexhibits/homerinprint/BHL.html

Mothersole, Jessie: The Saxon Shore. The Bodley Head (1924).

Muckelroy, K.: Archaeology Under Water - An Atlas of the World`s Submerged Sites, London, (1981).

Naish, John M: Seamarks - Their History and Development. Stanford Maritime Limited, 12-14 Long Acre, London WC2E 9LP, (1985), 192pp. ISBN: 0540073091.

Newhouse, Daniel (Capt.): The Whole Art of Navigation in Five Books (1685).

Noble, Joseph V.; Derek J. de Solla Price: The Water Clock in the Tower of the Winds, American Journal of Archaeology, Vol. 72, No. 4. Oct (1968), pp. 345-355.

O'Connell, James; Jim Allen; Kristen Hawkes: Pleistocene Sahul and the Origins of Seafaring Ch5 (2010),

pp 57-68. https://www.researchgate.net/publication/251888687

Oates, Whitney J.: The Population of Rome. Classical Philology, Vol. 29, No. 2 Apr (1934), pp101-116.

Obregon, Mauricio: Beyond the Edge of the Sea. Modern Library Paperback Edition (2002). ISBN: 9780679783442.

Oleson, J. P. and M. D. Jackson: The Technology of Roman Maritime Concrete (2014b), pp1-10.

Oleson, John P., C. J. Brandon, M. D. Jackson, R. L. Hohlfelder: Building for Eternity: The History and Technology of Roman Concrete Engineering in the Sea, Oxbow Books, United Kingdom (2014). ISBN: 9781782974208

Oleson, John P., M. D. Jackson and G. Vola: Appendix 3: Catalogue and Descriptions of Concretes Drilled from Harbour Structures by ROMACONS, (2014a), pp260-263. In: Oleson (2014).

Ordonez Agulla, Salvador: El Faro de Gades y Las Fuentes Medievales. In: II Congresso Peninsular de Historia Antiga, Actas Coimbra (1993), pp247-277.

Ormerod, Henry A.: Piracy in the Ancient World. Johns Hopkins University Press, United States (1996). ISBN: 9780801855054.

Paget, R. F.; From Baiae to Misenum. Vergilius, The Vergilian Society, No 17 (1971), p22-38. http://www.jstor.org.stable/41591669

Paglia, Alessandro: La Lanterna - Trieste Sono Io, Trieste, Assicurazioni Generali, (1997) p116.

Palacios, Miguel Asin: Una Description nueva del faro Alejandria, al-Andalous 1 (1933), pp241-92. Reproduced in Obras Escogigas, II-II, 389-460.

Pasquinucci, Marinella; G. Rossetti: Porto Pisano - The Harbour Infrastructure at Pisa and Porto Pisano from Ancient Times to the Middle Ages. (1988), pp137-55. In Raban (1988)

Pasquinucci, Marinella; Simonetta Menchelli: The Landscape and Economy of the Territories of Pisae and Volaterrae (Coastal North Etruria). The Journal of Roman Studies, 69, November (1979).

Patai, Raphael: The Children Of Noah - Jewish Seafaring In Ancient Times. Princeton University Press (1998), ISBN: 9780691015804.

Pausanius; Peter Levi (trans.): Guide to Greece - Vol. 1, Penguin Books (1971), 586pp. ISBN: 9780140442250.

Peman, Cesar: Las Fuentes Literarias de la Antiguedad y Fundacion de Cadiz, Madrid (1954).

Petraglia, M. D.; Rose, J. I. (eds.): The Evolution of Human Populations in Arabia - Vertebrate Paleobiology and Paleoanthropology. Springer Science and Business Media B. V. (2009)

Petry, Carl: The Cambridge History of Egypt, Volume 1 & Volume 2. Cambridge University Press (2008).

Phillips-Birt, Douglas: A History of Seamanship. Allen & Unwin (1971). ISBN: 9780046230098.

Philp, Brian: The Excavation of the Roman Forts of the Classis Britannica at Dover 1970-1977. Kent Archaeological Rescue Unit, CIB Headquarters, Dover Castle, Kent (1981).

Pliny the Elder; John Bostock, H.T. Riley (trans): Natural History. Taylor and Francis, Red Lion Court, Fleet Street, London (1855).

Pliny the Elder; John Healy (trans.): Natural History - A Selection; Penguin Classics (1991).

Poochigian, Aaron: Phaenomena. Johns Hopkins University Press (2010). ISBN: 9780801894664.

Raban, A. (ed.): Archaeology of Coastal Changes. Proceedings of the First International Symposium: Cities on the Sea, Past and Present; Oxford, B.A.R. (1988).

Raban, Avner; Kenneth G. Holum: Caesarea Maritima - A Retrospective After Two Millennia. (Documenta et Monumenta Orientis Antiqui), Brill, Netherlands (1996). ISBN: 9789004103788.

Rapisarda, Massimo; M. Ranieri: A Phoenician Lighthouse at Capo Gallo Palermo. Mediterranean Archaeology and Archaeometry, Vol. 16, No 4 (2016), pp225-231.

Reich, David: Who We Are And How We Got Here, Oxford University Press (2018), 335pp. ISBN: 9780198821250

Renard, Leon: Les Phares, Editions L'Ancre de Marine, St. Malo (1990).

Ricci, R.: Bergeggi - Un Isola Davanti ad Un Isola, Torino (1998).

Rigsby, K. J: Asylia - Territorial Inviolability in the Hellenistic World. University of California Press, Berkeley (1996).

Robinson, Damian; Goddio, Franck (eds): Thonis-Heracleion in Context, Oxford Centre for Maritime Archaeology, University of Oxford (2015). ISBN: 9781905905331. http://www.franckgoddio.org/projects/sunken-civilizations/heracleion.html

Rowlett, Russ: The Lighthouse Directory (online). https://www.unc.edu/~rowlett/lighthouse

Rugua, Zhao; Hirth, Friedrich, W.W. Rockhill (trans.): Zhu fan zhi (1225), (1911). http://ebook.lib.hku.hk/CADAL/B31403797

Rutherford, Adam: A Brief History of Everyone Who Ever Lived. Weidenfield and Nicolson (2016), 420pp. ISBN: 9781780229072.

Sachs, Abraham: A Classification of the Babylonian Astronomical Tablets of the Seleucid Period. Journal of Cuneiform Studies, Vol. 2, No. 4 (1948), pp271-290.

Scarre, Chris (ed.): Antiquity, A Review of World Archaeology, Vol. 90, 350, April (2016).

Schoff, Wilfred Harvey: The Periplus of the Erythraean Sea - Travel and Trade in the Indian Ocean by a Merchant of the First Century. London, Bombay & Calcutta (1912).

Sharp, Andrew: Ancient Voyagers in the Pacific. Penguin (1957).

Silius Italicus; J. D. Duff (trans): Punica. William Heinemann Ltd, London (1959).

Sladen, Douglas Brooke Wheelton: Carthage and Tunis, The Old and New Gates of the Orient. Hutchinson, London (1906).

Smith, James: The Voyage and Shipwreck of St. Paul - With Dissertations on the Life and Writings of St. Luke, and the Ships and Navigation of the Ancients. Forgotten Books, United States (2016). ISBN: 9781332037926.

Somner, William: A Treatise of the Roman Ports and Forts in Kent. James Brome, Oxford (1693). http://name.umdl.umich.edu/A60898.0001.001

Spence, Simon: The Image of Jason in Early Greek Myth. Lulu.com, (2011), pp292. ISBN: 9781446115817.

Stevenson, Alan: On the Theory and Construction of Lighthouses (1857).

Stevenson, David A.: The World's Lighthouses Before 1820. Oxford University Press (1959).

Stewart, Charles: Magic Circles - An Approach to Greek Ritual. Journal of the Anthropological Society of Oxford 25:1 (1994), p91-101.

Strabo; Jones, Horace L. (trans.): The Geography of Strabo. William Heinemann, London & New York (1917). Books 1 to 17 in 8 Volumes with index in Volume 8.

Strong, Anthony: The Phoenicians in History and Legend. 1st Books Library (2002). ISBN: 140336690X.

Stuart, James; Nicholas Revett: The Antiquities of Athens. London (1762).

Suetonius Tranquillus, C.; Alexander Thomson (ed): The Twelve Caesars. Penguin Classics (2007)

Sutton-Jones, Kenneth: Pharos - The Lighthouse Yesterday, Today and Tomorrow. Michael Russell Publishing Ltd, Salisbury UK (1985).

Talbot, Frederick A.: Lightships and Lighthouses. William Heinemann, London (1913), 325pp.

Taylor, E.G.R.: The Haven-Finding Art; A History of Navigation from Odysseus to Captain Cook. Hollis & Carter, London (1956).

The New English Bible, Cambridge University Press (1970), Acts 27:20.

Thiersch, Hermann: Pharos, Antike, Islam Und Occident. B. G. Teubner, Leipzig und Berlin (1909). Reprinted under license. ISBN: 9781248365946.

Thomas, Stephen D.: The Last Navigator - A Young Man, an Ancient Mariner, the Secrets of the Sea. Booksurge Publishing, United States (2009). ISBN: 9781439233498.

Thompson, D.J.: Ptolemaios and The Lighthouse - Greek Culture in the Memphite Serapeum. Proceedings of the Cambridge Philological Society 33 (1987), p105-21.

Thouvenot, Raymond: Essai sur la Province de Bétique, Paris (1940).

Torrin, Ken: Maritime History Part 1 - Ancient Times Age of Navigation; Medieval Times; and More. Webster`s Digital Services (2016). ISBN: 9781276188869.

Toussoun, Prince Omar: Description du Phare d'Alexandrie d'aprÞs un auteur arabe du Xlle siÞcle. Bulletin de la Société Royale d'Archéologie d'Alexandrie 30 (1936) 49-53.

Trethewey, K. R.: What is a Lighthouse? A Modern Definition. World Lighthouse Society Quarterly Magazine, 1st. Quarter (2013), Volume 11, Issue 1, 5-14.

Tripati, Sila: Maritime Archaeology- Historical Descriptions of the Seafarings of the Kalingas. Kaveri Books, New Delhi (2000). ISBN: 9788174790385.

Tuck, Steven L.: Ports, Chapter 21. In: A Companion to the Archaeology of the Roman Republic, Jane DeRose Evans (ed) Wiley-Blackwell (2013), 746pp. ISBN: 9781405199667.

Tusa, Vincenzo: Sicily (1988) p186-205; In Moscati (1988).

Uggeri, Giovanni: Baro Zavelea near Comacchio, Aemilia Ferrara (1973); Torre Romana: In Fasti Archaeologica, XXX-XXXI, pp821-822.

Usai, D.; S. Salvatori: The Oldest Representation of a Nile Boat. Antiquity Vol 81 issue 314 December (2007).

van Berkem, Dennis: Sanctuaires a Hercules-Melqart, Syria, 44 (1967).

van Berkem, Max: Materieux pour un Corpus Inscriptionum Arabicarum (Egypte). Paris (1900), pp473-89.

van de Noort, Robert: North Sea Archaeologies - A Maritime Biography, 10,000 BC - AD 1500. Oxford University

Press (2011), pp282. ISBN: 9780199657087.

Vann, Robert L.: The Drusion - A Candidate for Herod`s Lighthouse at Caesarea Maritima. International Journal of Nautical Archaeology, Vol. 20 No.2 (1991), pp123-139.

Villa, Paola; Wil Roebroeks: Proceedings of the National Academy of Sciences, 14 March (2011). http://www.colorado.edu/today/2011/03/14/neanderthals-were-nifty-controlling-fire-according-cu-boulder-researcher

Vincent, William: The Commerce and Navigation of the Ancients in the Indian Ocean (1807). British Library, Historical Print Editions (2011). ISBN: 9781241411022; Also Nabu Press (2014), USA. ISBN: 9781294892038.

Vincent, William: The Periplus of the Erythrean Sea (1739-1815). Pre-1801 Imprint Collection (Library of Congress) DLC,Thomas Leiper Kane Collection (Library of Congress, Hebraic Section) DLC, ReInk Books (2015).

Vitruvius; Morris Hicky Morgan (trans.): The Ten Books on Architecture. Harvard University Press Cambridge Mass. USA / Oxford University Press, Oxford, UK (1914).

Vorderstrasse, Tasha: Descriptions of the Pharos of Alexandria in Islamic and Chinese Sources: Collective Memory and Textual Transmission (2012), pp457-81. In: Cobb (2012).

Wachsmann, Shelley: Seagoing Ships and Seamanship in the Bronze Age Levant. Texas A&M University Press (2009). ISBN: 9781603440806.

Wallace, Paul W.: The Tomb of Themistocles in the Peiraieus. Hesperia, Oct. - Dec. (1972), The American School of Classical Studies at Athens, pp. 451-462. http://www.ascsa.edu.gr/pdf/uploads/hesperia/147386.pdf

Wheeler, R. E. M.: The Roman Lighthouses at Dover. Archaeological Journal Vol. 86 (1929) 1:, pp29-46. https://doi.org/10.5284/1018054; www.archaeologydataservice.ac.uk

White, Tim D.; Asfaw, B.; DeGusta, D.; Gilbert, H.; Richards, G. D.; Suwa, G.; Howell, F. C.: Pleistocene Homo sapiens from Middle Awash, Ethiopia. Nature, 423 (6491) (2003), pp742-747.

Whitney, Marie: A Look At The History Of Sailing Including Ancient Maritime History, History Of Navigation, Maritime History Of The United States, Plus Historic Ship Types... Webster's Digital Services (2016). ISBN:

Wikipedia: Australia (continent) 20160727

Wikipedia: Beta Ursae Minoris 20160831

Wikipedia: Black Sea 20171012

Wikipedia: Black Sea Deluge Hypothesis 20171012

Wikipedia: Brittenberg 20180110

Wikipedia: Bronze Age Collapse 20171010

Wikipedia: Carthage (2016)

Wikipedia: Compass 20170828

Wikipedia: Cushi (2016)

Wikipedia: Denisova 20160727

Wikipedia: Dido (2016)

Wikipedia: Hellenistic Period 20171015

Wikipedia: History of the Cyclades 20171010

Wikipedia: Homo 20160723

Wikipedia: Inland Sea (Geology) 20180110

Wikipedia: Land of Punt 20160728

Wikipedia: Lighthouse of Alexandria 20160618

Wikipedia: Milos 20170828

Wikipedia: Mirrors, Telescopes, Speculum metal 20180228

Wikipedia: Neanderthal 20160727

Wikipedia: Nuraghe (2017)

Wikipedia: Odyssey, 20160822

Wikipedia: Panormus (2017)

Wikipedia: Periplus of the Erythraean Sea 20180129

Wikipedia: Phoenicia (2016)

Wikipedia: Pleistocene (2017)

Wikipedia: Pythea, 20180129

Wikipedia: Reed boats 20160723

Wikipedia: Sardinia (2017)

Wikipedia: Venerius the Hermit 20170417

Wilde, W. R.: On the Pharos of Coruña. Proceedings of the Royal Irish Academy (1836-1869), Vol. 2 (1840 - 1844), pp. 583-594, Published by: Royal Irish Academy, pp12. http://www.jstor.org/stable/20520203

Wilford, John Noble: Geologists Link Black Sea Deluge To Farming's Rise. The New York Times (17 December 1996). Retrieved 17 June 2013.

Witney, Dudley: The Lighthouse. Arch Cape Press (1989) 256pp. ISBN: 0517669536.

Wood, Michael: In Search of The Trojan War. BBC Books (2005). ISBN: 0563522658. Also ISBN: 0520215990.

Woodburn Hyde, Walter: Ancient Greek Mariners with Maps, Oxford University Press (1947).

Woodman, R.; Jane Wilson: The Lighthouses of Trinity House, Thomas Reed Publications (2002). ISBN:

190405000X.

Wright, George R.H.: Ancient Building in Cyprus. Brill, Netherlands (1992). ISBN: 9789004095472.

Wroth, L.C.: The Way of a Ship - An Essay on the Literature of Navigation Science. Martino Publishing, Mansfield Centre (2001). Reprint of 1937. ISBN: 9781578983254.

Yorke, Robert A.; David P. Davidson: The Harbour at Ptolemais - Hellenistic City of the Libyan Pentapolis. The International Journal of Nautical Archaeology (2017). https://doi.org/10.1111/1095-9270.12212.

Zemke, Friedrich-Karl: Leuchttürme Der Welt. (Volume 1), Koehler (1992). ISBN: 3782205375.