LIGHTHOUSES IN ANTIQUITY: CASE STUDIES OF THE LIGHTHOUSES AT DOVER, ENGLAND; PATARA, TURKEY; AND LEPTIS MAGNA, NORTH AFRICA

A Thesis

by

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ABSTRACT

There may have been upwards of 100 lighthouses in the Mediterranean, along the northern Atlantic coast, and in England during the Roman Imperial period. Lighthouses were simultaneously a common structure and triumphs of Roman engineering. They were statements of power, prestige, and identity. After the construction of the Pharos of Alexandria in 280 BCE, lighthouses came to be a typical monument in Roman harbors, and a beneficial invention that continue to be built today. Architecture has adapted and evolved over time, but lighthouses have maintained the same basic shape, structure, and function. Lighthouses are represented in the three artistic media of ancient evidence: archaeological remains, iconography, and primary (contemporary) sources. The data is uneven, however, because no ancient lighthouse known today has all three. A study of ancient lighthouses requires a holistic approach that utilizes archaeological remains, iconography, contemporary sources, historical sources, and modern scholarship. The following thesis reviews the artistic media, the history of and possible precursors to ancient lighthouses such as Bronze Age temples and Classical signal towers; the function of ancient lighthouses, and their illumination. Three case studies of the ancient lighthouses at Dover, England; Patara, Turkey; and Leptis Magna, North Africa are examined in detail. These three lighthouses differ in their historical context, dates, shape, placement, and construction materials. This thesis examines these criteria through the use of case studies and the analysis of archaeological remains, iconography, contemporary sources, and historical sources to construct a more complete view of

ancient lighthouses. An in-depth study of the three lighthouses and the available evidence revealed that, although there are inconsistencies, archaeology, iconography, and contemporary sources can often each fill in the gaps where the other evidences are lacking and provide information about ancient lighthouses that we otherwise would not have. For example, archaeological remains provide information about lighthouse construction and materials, iconography offers clues regarding illumination and external construction, and contemporary sources indicate lighthouse placement and historical context. While a holistic study of ancient lighthouses cannot account for all missing information, the evidences often support one another and work together to provide a more comprehensive view on the subject.

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CHAPTER I

INTRODUCTION AND BACKGROUND

Several topics should be considered in an in-depth study of ancient lighthouses. Together, archaeology, iconography, primary (contemporary) sources, and secondary scholarship provide a comprehensible picture of the subject. This chapter addresses the necessary background information for ancient lighthouses and introduces physical and functional aspects that will be discussed as they apply to each case study that follows.

Challenges of the Data

Specific challenges arise when examining the incomplete corpus of ancient lighthouse data. These challenges highlight the necessity of a holistic approach. Researchers like Douglas Hague, Renee Bouchard, Baldassare Giardina, and Arthur De Graauw have spent years gathering data to present as comprehensive as possible a compilation of ancient lighthouses. Even with these efforts, our understanding is incomplete. In many cases, the term "lighthouse" is used with reservation because the archaeological remains are scant, and what does survive is inconclusive. The second-century CE Ã Coruna, or Torre de Hercules, lighthouse in Spain is considered one of the oldest standing lighthouses but was largely reconstructed in the 18th century with the addition of Neoclassical elements. Little remains of the original tower, except some Roman masonry

on the interior.[1] The lighthouse has an inscription which identifies its architect, Lupus of Corunna, but its earliest reference dates only to 415-417 CE.[2] Most often, what survives of an ancient lighthouse is its base and a collapsed portion of the tower, like the first-century CE Patara lighthouse in southern Turkey. When only the foundation remains, it is difficult to identify the structure as a lighthouse with much confidence. For example, the signal tower was also a common structure in antiquity and because the two often are similar in shape, both with multiple stories and a tapering form, it can be difficult to identify a tower as either a lighthouse or a signal tower. The distinction is sometimes made based on location, but even that is not always accurate because there are cases where both signal towers and lighthouses have been found in the same/similar locations. Signal towers were intentionally built near the lighthouses at both Patara and Leptis Magna, Libya (second or third century CE), and there was a tower 0.3 miles from the possible sixth-century BCE lighthouse at Kroupa on the Greek island of Lefkada, although its function is unknown.[3] Because the data is uneven and often incomplete, identifying an ancient lighthouse requires the use of a combination of iconography, contemporary sources, and archaeological remains. Ideally, each type of evidence fills a gap left by the others, although not in all cases, like at Dover and Patara, for which there are only archaeological remains.

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[1] This thesis follows the American Journal of Archaeology citation style. Hauschild, T., 1976, "Der Romische Leuchtturme von La Coruna (Torres de Hercule)," *MM* 17; Redde, M., 1979, "La représentation des phares à l'époque romaine," *MEFRA* 91:845.
[2] Oros. *Historiae adversum Paganos* (Fear, A.T., ed. and transl., 2010, *Orosius: Seven Books of History against the Pagans. Translated Texts for Historians 54*. [Liverpool: Liverpool University Press]).
[3] Morris, S.P., 2001, "The Towers of Ancient Leukas: Results of a Topographic Survey, 1991-1992," *Hesperia* 70, 3:311-12.

Introduction to the Artistic Media of Evidence

Because the archaeological remains of lighthouses are often limited, iconography and contemporary textual evidence can often provide the basis of what ancient lighthouses may have looked like, how they were illuminated, the construction materials that were used, and what lighthouses represented symbolically. Contemporary sources are useful because ancient authors often observed the structures firsthand, but such sources can be scarce and give little detail about how lighthouses were constructed. Pliny, Josephus, Caesar, and Strabo all mention the magnificence of the Pharos of Alexandria, but say little about its actual appearance, only that it had great height, many stories, and was made of white marble.[4] Iconography provides more detail about the appearance of ancient lighthouses. In establishing early compendia of ancient lighthouses, researchers relied largely on iconographic representations. Even so, further scholarship is always necessary. For instance, since Michel Redde established his lighthouse typology in 1979, based on pictorial representation of lighthouses, a few significant archaeological remains of ancient lighthouses have come to light or re-emerged. Examples include Dover, which

[4] Plin. *NH*. 2.87, 5.11, 5.34 (Bostock, J., ed. and transl., 1855, Pliny the Elder, *The Natural History* [London: Taylor and Francis]); Joseph. *BJ*. 4, 10.5 (Whiston, W., A.M. Auburn and Buffalo, ed. and transl., 1895, Flavius Josephus, *The Works of Flavius Josephus* [John E. Beardsley]). Both Caesar (*BCiv*. 3.112, Duncan, W., ed. and transl., 1856, Julius Caesar, *The Commentaries of Caesar* [St. Louis: Edwards and Bushnell]) and Josephus (*BJ*. 4, 10.5.) indicate that the Pharos had great height and Strabo (*Geog*. 17. 1, Jones, H.L., ed. and transl., 1924, Strabo, The Geography of Strabo [Cambridge: Harvard University Press; London: William Heinemann, Ltd.]) writes that it had many stories and was made of white marble.

was officially excavated in the 1980s,[5] and the lighthouse at Patara, which was identified in 2003.[6]

Challenges of Contemporary Sources

There are distinct challenges presented by contemporary sources. The contemporary writers who discuss the settlements of Dover, England[7] and Patara, Turkey,[8] such as Suetonius and Pliny, do not mention the lighthouses. No iconographic depictions have been found for either lighthouse, so the archaeological remains and modern scholarship provide the basis of information instead, as will be shown in the chapters that follow. These ancient texts primarily discuss the harbors, history, and military conflicts occurring at the time. In addition to the lack of construction details, the various texts that reference the Pharos of Alexandria do not specifically mention any form of illumination.

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

[6] Işik, F., 2006, "Patara," in *Stadtgrabungen und Stadtforschung im Westlichen Kleinasien*, edited by H. Radt von Wolfgang, 263-78, Internationales Symposion 6./7, August 2004 in Bergama, Turkei, (Istanbul: BYZAS Veroffentlichungen des Deutschen Archaologischen Instituts). There is no known iconography for either lighthouse but it is possible that either none has survived, or has simply not been found.

[7] Suet. *Claud.* 35 (Reed, J.E. and A. Thomson, ed. and transl., 1899, Suetonius, *The Lives of the Twelve Caesars* [Philadelphia: Gebbie & Co]); Caes. *BGall*. (McDevitte, W.A. and W.S. Bohn, ed. and transl., 1869, Julius Caesar, *Caesar's Gallic War* [New York: Harper & Brothers, Harper's New Classical Library]).

[8] App. *BCiv*. 4.10 (White, H., J.D. Denniston, E. Robson, ed. and transl., 1912-1913, Appian, *Roman History* [London: W. Heinemann; New York: Macmillan and Co., Ltd.]); Diod. Sic., *Hist.* 20.93 (Bekker, I. L. et. al. in aedibus, B. G. Teubneri, ed. and transl., 1903-1906, Diodorus Siculus, Diodori Bibliotheca Historica, Vol 4-5. [Leipzig]); Livy, *Ab urbe cond*. 37.17 (Roberts, C., ed. and transl., 1912, Titus Livius, *The History of Rome* [New York: E. P. Dutton and Co.]); Luke, *Acts*, 21.1 (Browning, W.R.F., ed, "Acts of the Apostles," in *A Dictionary of the Bible*, Oxford Biblical Studies Online, http://www.oxfordbiblicalcstudies.com/article/opr/t94/e28 [Accessed Oct 21, 2018]); Plin. *NH*. 5.33 (Bostock 1855); Strabo, *Geog*. 14.3; Pseudo Scylax, *Peripl* (Shipley, G., ed. and transl., 2011, *Pseudo-Skylax's Periplous: the Circumnavigation of the Inhabited World* [Exeter: Bristol Phoenix Press]); Stadiasmus, 246 (Müller, K., ed., 2010, "Anonymi Stadiasmus Maris Magni," in *Geographi Graeci minores*, 427-514, Vol. 2 [Cambridge: Cambridge University Press]).

In Caesar's discussion of the Pharos in 50 BCE,[9] instead of describing the structure, he refers to the Pharos simply as a "*turris*" or tower, although some translations suggest that the term "lighthouse" may have been used instead.[10] Strabo wrote after he visited the city in 25 BCE and his description of the Pharos also refers to a tower, with no mention of any sort of illumination.[11] It is not until Lucan writes in the first century CE, that the Pharos of Alexandria is distinguished by its fire.[12] From then on, texts generally associated the Pharos of Alexandria with guiding ships into the harbor by means of illumination in its top story. Although the details of ancient lighthouses are elusive in contemporary sources, the texts are important for substantiating the location of archaeological sites, supporting iconography, and providing deeper dimension and accuracy to modern scholarship. There are however, sometimes discrepancies between ancient evidence, and within each medium. There are always variations in iconography from a structure's original appearance, due to artistic choice, the impossibility of being able to capture every detail, and an artist not having actually seen the structure. Since so few lighthouses remain in their entirety, it is difficult to know which iconographic depictions are correct. Texts also do not always corroborate one another. For example,

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[9] Caes. *BCiv*. 3.112 (Duncan 1856); Sprague de Camp, L., 1965, "The 'Darkhouse' of Alexandria," *Technology and Culture* 6, 3:424.
[10] Sprague de Camp 1965, 424. Some less literal translations of Caesars's text translate "*turris*" to lighthouse. Long's translation (Long, F.P., ed. and transl., 1906, Julius Caesar, *The Commentaries of Caesar* [Oxford: Clarendon Press]) uses "Pharus is a lighthouse standing upon the island..." and Warner's: "The island of Pharos gives its name to the lighthouse there." Warner, R., 1964, *War Commentaries Of Caesar* (New York: The New American Library).
[11] Strab. *Geog*. 17.1.6 (Jones, H.L., ed. and transl., 1924, Strabo, *The Geography of Strabo* [Cambridge: Harvard University Press; London: William Heinemann, Ltd.]).
[12] Luc. *BC*. 9.11.1004-5 (Ridley, E., ed. and transl., 1905, M. Annaeus Lucanus, *Pharsalia* [London: Longmans, Green, and Co.]); Sprague de Camp 1965, 424.

Suetonius[13] and Cassius Dio[14] both indicate that the lighthouse at Ostia was built on an island between two moles in front of the Ostia harbor, while Pliny writes that the lighthouse stood on part of the mole.[15]

Iconography

There is a greater focus on iconography in this chapter because of the range of detail that can be gathered from the depictions of lighthouses. There are several types of artistic media from primarily the Hellenistic and Roman Imperial periods that depict ancient lighthouses, including harbor mosaics, reliefs- both funerary reliefs and reliefs on triumphal columns like Trajan's column (second century CE); coins, and lamps. Some of the surviving iconographic representations include the lighthouse of Leptis Magna on the Severan Arch located in the city, which will be discussed in greater detail in Chapter IV; Trajan's Column; the Torlonia Relief, which depicts the lighthouse at Ostia, mosaics at Forum of the Corporations at Ostia; and a variety of coins.

Trajan's Column is a triumphal column in Trajan's Forum in Rome, built in the second century CE to commemorate his victory in the Dacian Wars (101–102 and 105–106 CE).[16] The scenes represented on the column depict separate events of the Dacian Wars

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[13] Suet. *Claud*. 20.2 (Reed and Thomson 1899).
[14] Cass. Dio. 60.11.4-5 (Cary, E., H.B. Foster, and W. Heinemann, ed. and transl., 1914, Cassius Dio. *Dio's Roman History* [London; New York: Harvard University Press]).
[15] Plin. *NH*. 14 (Bostock 1855).
[16] The Dacian Wars occurred in the Danube provinces north of Greece. Goldsworthy, A., 2004, *In the Name of Rome: The Men who Won the Roman Empire* (London: Weidenfeld and Nicolson); Leppard, F.

and scene 48 (bottom of Fig. 1-1) shows legions crossing a river using a pontoon bridge. A lighthouse may be depicted in the left portion of scene 48. The structure differs from other buildings on the column in its slightly tapering shape and the rounded arch of its windows. Its identity as a lighthouse may be based on two dividing lines possibly indicating stories, and the presence of ships on both sides. Wilson-Jones even argues that the Column itself may have been inspired by the design of lighthouses.[17] It is possible, however, that the structure depicted on the column is not a lighthouse and is instead a gate on the pontoon bridge, and one must ask the question of whether or not a lighthouse was even required on a river bank, especially considering pontoon bridges were somewhat temporary in nature. The depicted building also appears to be rubble instead of ashlar masonry, which may be an architectural indication of a less sophisticated, more "rustic" construction.

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and Frere, S., 2016, *Trajan's Column*, Rev. ed. (Stroud: Fonthill Media); Matyszak, P., 2004, *The Enemies of Rome: From Hannibal to Attila the Hun* (Thames and Hudson: New York).

[17] Wilson-Jones, M., 1993, "One Hundred Feet and a Spiral Stair: The Problem of Designing Trajan's Column," *JRA* 6.

Fig. 1-1. Scene 48 of Trajan's Column which depicts legions crossing a river using a pontoon bridge. Reprinted and adapted from library.artstor.org/asset/ASITESPHOTOIG_10312732333, photograph by Samuel Magal.

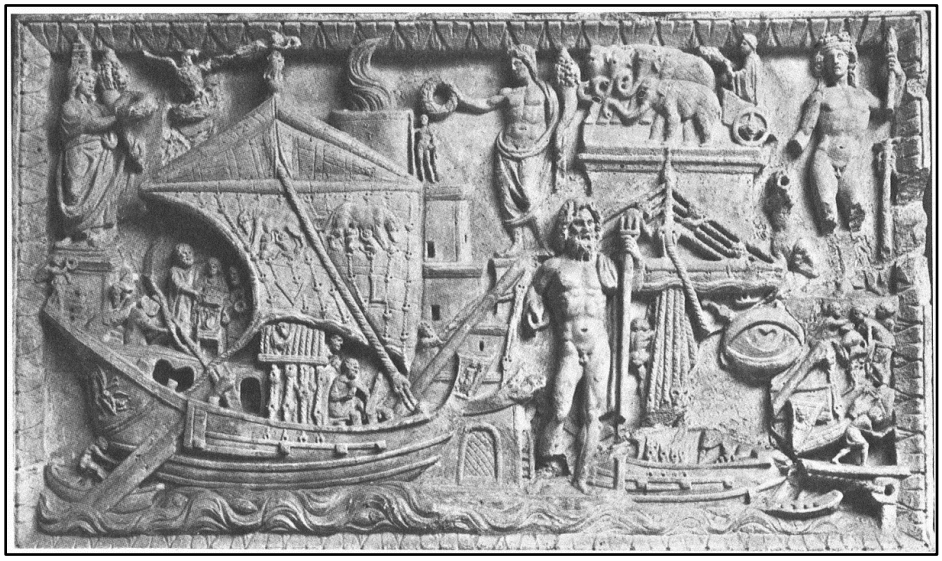

Fig. 1-2. The Torlonia Relief which depicts maritime motifs. Reprinted from Testaguzza 1970, 171.

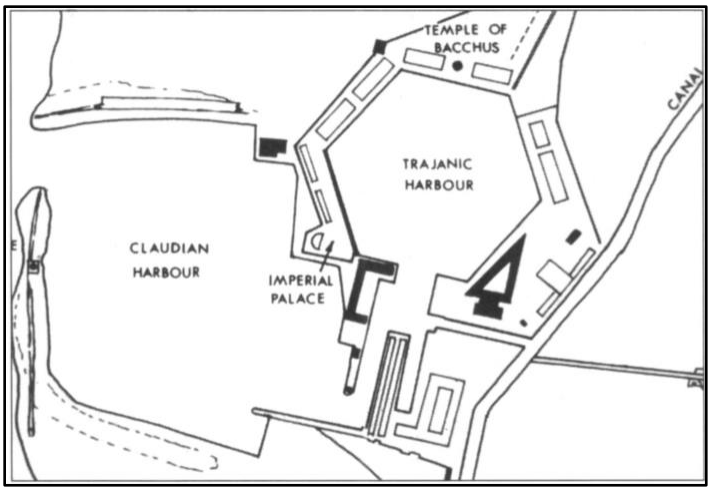

Fig. 1-3. Map of the Portus Harbor. Reprinted from Tuck 1997, fig. 22.

The Torlonia relief is a relief made of Greek marble from the Severan Period (193-211 CE) (Fig. 1-2), found in the 19th century near the Imperial Palace in the Portus harbor complex (Fig. 1-3). Based on the letters "VL" that were inscribed on the carved ship's sails, which stand for "V(otum) L(ibero) or V(otum) L(ibens) S(olvit)", it may have been a votive offering from the Temple of Liber Pater, who was also known as Bacchus.[18] The relief depicts maritime motifs such as ships, quays, and an evil eye,[19] but most importantly, it depicts the Claudian lighthouse.[20] Although some features of the lighthouse are hidden behind other parts of the relief, its square shape, the presence of multiple stories, and the fire on top of the structure are consistent with typical lighthouse form, as well as other depictions of the lighthouse at Ostia.

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[18] Bakker, J.T., 2008, 30 March, "Reliefs of Portus" *Ostia The Harbor District: Portus*, http://www.ostia-antica.org/portus/reliefs.htm (Accessed 9/1/2018).
[19] Nowak, T., 2006, "Archaeological Evidence for Ship Eyes: An Analysis of Their Form and Function," (Master's Thesis, Texas A&M University).
[20] Mott, L.V., 1996, *Development of the Rudder: A Technological Tale* (College Station: Texas A&M University Press), 12-3, 22, 39; Redde 1979, 864.

Several mosaics were found in the Forum of the Corporations in the harbor at Ostia,[21] and the mosaics that portray lighthouses are more straightforward, with fewer accompanying images in the mosaics themselves. Figure 1-4 shows the lighthouse at Portus and two dolphins, while figure 1-5 shows two ships, a dolphin, and the lighthouse. In these representations, the lighthouses are unobscured, and they clearly show the lighthouse's four levels, rounded arch windows, and the fire on top of the structure. Other representations of the Ostia lighthouse are more simplistic, like the funerary slab in Figure 1-6 which was found at Ostia, although still have the same generic shape. The depictions in the mosaics at Ostia are similar to those of other lighthouse mosaics and reliefs. Most of the lighthouses have two to four stories, windows, and are either square or round in shape, sometimes with a fire on top. It is possible that a sort of iconographic template emerged after the construction and subsequent renown of the Pharos of Alexandria (third century BCE), similar to the way in which the Pharos inspired the construction of other lighthouses in its image. Artists may have created iconography based on other artistic depictions that they were familiar with, and created pieces of structures they knew.

[21] Other mosaics were found in the Imperial Palace, baths, House of the Harbor, and the necropolis, Isola Sacra.

Fig. 1-4. Ostia harbor mosaic depicting the Ostia lighthouse, *Piazzale delle Corporazioni* or the Forum of Corporations. Reprinted from Giardina 2010, Fig. 155a.

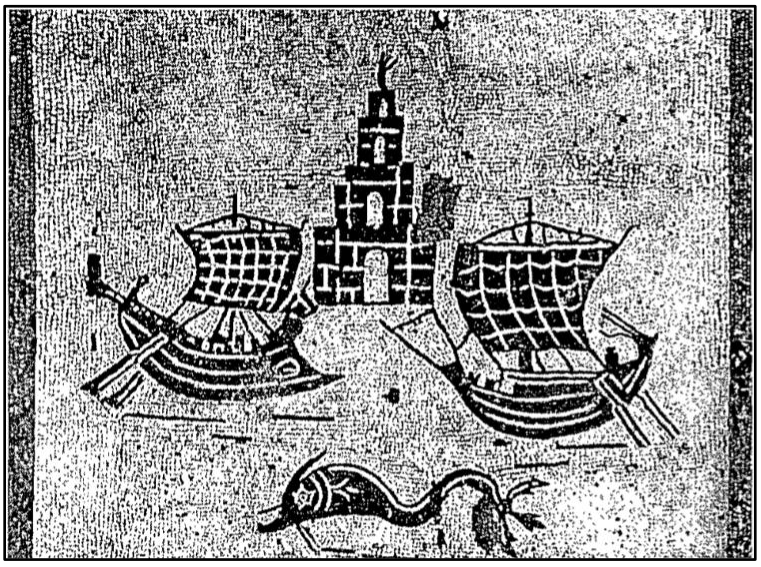

Fig. 1-5. Ostia harbor mosaic depicting the Ostia lighthouse, Forum of the Corporations. Reprinted from Bouchard 2007, 19, Fig. 19.

Fig. 1-6. Funerary slab found at Ostia which depicts the Ostia lighthouse, in the Museo Nazionale Romano, Rome. Reprinted from Stuhlfauth 1938, Fig. 7.

Coins depict a greater variety of lighthouses. Early lighthouses existed before the third-century BCE construction of the Pharos of Alexandria, but based on the numismatic evidence that has survived, representations of lighthouses on coins date to after the construction of the Pharos. The most common lighthouse depictions on ancient coins that have been found are those of the lighthouses at Ostia, Alexandria, and Laodicea ad Mare in modern-day Syria.[22] There are depictions of other lighthouses, such as those at Ege from the reigns of Macrinus (217-218 CE) and Decius Trajan (249-251 CE), Perge, and Side, all three in modern-day Turkey, and the lighthouse at Apamea in modern-day Syria.[23] In some cases, the coins are the only evidence that there was a lighthouse at particular sites, such as at Corinth, Laodicea ad Mare, and Apamea. Coins depicting the lighthouse at Laodicea ad Mare were issued during the reigns of Domitian and Septimius

[22] Handler, S., 1971, "Architecture on the Roman Coins of Alexandria," *AJA* 75, 1:57.
[23] Giardina, B., 2010, *Navigare Necesse est: Lighthouses from Antiquity to the Middle Ages. History, Architecture, Iconography, and Archaeological Remains* (Oxford: Archeopress. BAR International Series 2096), 248, 252-54.

Severus, but the exact date of construction is unknown. Roman emperors who issued the coins depicting the Pharos of Alexandria span from Domitian (81-96 CE) to Marcus Aurelius (161-180 CE)[24] and Commodus (177-192 CE). Other emperors who issued coins include Antoninus Pius, who is thought to have ordered the repair of the Pharos,[25] and Septimius Severus, (193-211 CE) who had the lighthouse at Leptis Magna built during his building program. For Roman emperors, the Pharos of Alexandria had become a symbol of power and prestige.

Some coins provide construction details that are not indicated by contemporary sources. For example, coins depicting the lighthouse at Laodicea ad Mare in modern-day Syria indicate that it had an external staircase (Fig. 1-7).[26] Although the preservation of many coins from the Roman Empire is often poor, enough detail remains to indicate the shape of the depicted lighthouse and sometimes what appears to be fire. The lighthouse at Laodicea ad Mare is depicted as cylindrical in coins,[27] and the lighthouse at Heraclea Pontica in northwestern modern-day Turkey is shown to have multiple tiered stories (Fig. 1-8).[28]

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[24] Handler 1971, 59.
[25] Rowan, C., 2013, "Imaging the Golden Age: The Coinage of Antoninus Pius," *PBSR* 81:221.
[26] Giardina 2010, 249.
[27] Supra n. 26; Wroth, W., 1964, *A Catalogue of the Greek Coins of Galatia, Cappadocia and Syria* (Bologna: *BMC*), 161.
[28] *PECS* 1976, "Herakleia" (Stillwell, R., ed., 1976, *Princeton Encyclopedia of Classical Sites* [Princeton: Princeton University Press]).

Fig. 1-7. Lighthouse at Laodicea ad Mare depicted on a coin issued by Domitian (81-96 CE), British Museum, London. Reprinted from Giardina 2010, 249, Fig. 40.

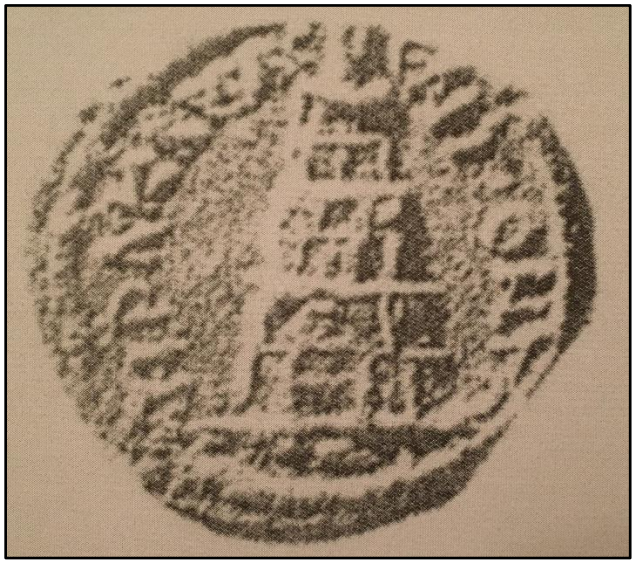

Fig. 1-8. Lighthouse at Heraclea Pontica depicted on a coin issued by Gallienus (253-268 CE). Reprinted from Giardina 2010, 262, Fig. 65.

Coins also depict deities in association with the lighthouses. The most common deities shown on coins were the goddess Isis, who had two epithets, Isis Pelagia, meaning “Isis

of the Sea" and Isis Pharia, meaning "Isis the Lighthouse Goddess";[29] a version of Zeus called Zeus Soter, meaning "savior";[30] and a sea deity like Poseidon, Neptune, or Triton. Isis Pelagia emerged in the Hellenistic period and was possibly inspired by images of the Egyptian goddess Isis in a boat and other Greek deities associated with seafaring.[31] Poseidon was the Greek god of the sea, Triton was Poseidon's son, and Neptune was Poseidon's Roman counterpart. All three variations are frequently found on coins, especially those depicting the Pharos of Alexandria, as well as in other iconography, such as the Torlonia relief (Fig. 1-2). The presence of these sea deities on coins suggests that statues of them were built on top or beside ancient lighthouses. Based on coins depicting the Pharos, it is believed that there were three Triton statues on top of the Pharos and a statue at the base. Isis Pharia was known as the protector of sailors[32] and had significant cult followings around the Mediterranean.[33] The frequency with which she is seen alongside Pharos representations in both reliefs and on coins (Fig. 1-9), suggests that a statue of her stood beside the monument itself.[34]

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[29] Supra n. 24; Donalson, M.D., 2003, *The Cult of Isis in the Roman Empire: Isis Invicta* (Lewiston: Edwin Mellen Press), 68, 74–5.
[30] Haas, C., 1997, *Alexandria in Late Antiquity: Topography and Social Conflict* (Baltimore: Johns Hopkins University Press), 144.
[31] Alvar, J., 2008, *Romanising Oriental Gods: Myth, Salvation and Ethics in the Cults of Cybele, Isis and Mithras* (Leiden: Brill), 296–300; Legras, B., 2014, "Sarapis, Isis et le pouvoir lagide," in *Power, Politics and the Cults of Isis*, edited by L. Bricault, Laurent and M. Versluys, 95-116, Proceedings of the Vth International Conference of Isis Studies, Boulogne-sur-Mer, October 13–15, 2011 (Leiden: Brill), 96–7.
[32] Supra n. 24.
[33] Handler 1971, 60.
[34] Handler 1971, 75.

Fig. 1-9. Coin issued by Hadrian (117-138 CE) from Alexandria, Isis Pharia shown alongside the Pharos. Reprinted from Handler 1971, Plate II.

Fig. 1-10. Coin issued by Antoninus Pius (138-161 CE) depicting the Pharos of Alexandria. Reprinted from Handler 71, Plate II.)

Ancient iconography presents specific challenges. Most depictions are fairly stylized, which is to be expected, given the difficulty of rendering detail in such a small space. Particularly with coins, the represented monument was likely modified to fit the small canvas, so it is hard to know if the depiction is accurate or not. Some coins depicting the Pharos of Alexandria show the structure itself and others lessen the structure to more

accurately depict the details, such as removing the middle story.[35] The identification of the three Triton statues and Isis Pharia (Fig. 1-9) in coins depicting the Pharos (Fig. 1-10) has been used to confirm the identity of the lighthouse. Furthermore, not all known lighthouses have known depictions. For example, no such iconography has been found for the Dover and Patara lighthouses.

Iconographic representation is important because the images can be used to verify the accuracy of textual sources and to determine what ancient lighthouses may have looked like when they were standing. The authenticity and accuracy of the iconography can be compared to any surviving archaeological remains,[36] contemporary accounts, and depictions in later sources. For example, up until the 1990s, the location of the Pharos of Alexandria was unknown, and it was unlikely that the remains would be located. The remains are thought to have been located since the original excavations in the 1990s by Jean-Yves Empereur.[37] The Citadel of Qaitbay, built in 1477 CE in Alexandria, was built where the Pharos had once stood and the original stone blocks and walls may have been seen on the inner walls of the citadel.[38] Combining the probable archaeological evidence with the textual sources, iconography, modern reconstructions, like that of

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[35] Supra n. 24.
[36] Surviving coins are often dated later than the establishment of the city where the lighthouses were located. Because so many of the lighthouses depicted on the coins discussed no longer survive and find little discussion in contemporary texts, it is difficult to compare remains with coins.
[37] Empereur, J.-Y., 1998, *Alexandria Rediscovered* (New York: George Braziller Inc.).
[38] Ragheb, R.A., 2014, "Alexandria's Eastern Entrance: Analysis of Qaitbay Waterfront Development," *International Journal of Architectural and Environmental Engineering* 8, 8:869.

Hermann Thiersch from 1909,[39] and modern technology like photogrammetry and computer processing, archaeologists have a good idea of what the lighthouse looked like and even more confidence in where it stood. Less extant archaeological evidence exists for the lighthouse at Ostia and it is not known where exactly it was built, but textual evidence and iconography indicate what it may have looked like. Pliny the Elder references the lighthouse at Ostia and Caligula's ship, indicating that "it was towed to Ostia and sunk there by order of the emperor, so to contribute to his harbour-works", [40] which is an important and relevant example of the connection between archaeological remains and contemporary texts. The remains of the ship may have been found during the construction of the Fiumicino Airport in Italy in the 1960s.[41]

Seafaring at Night

It is unknown exactly when extensive seafaring at night began but it may have been largely avoided up until the Bronze Age, due to the navigational dangers associated with a lack of visibility. There is some archaeological evidence from the Bronze Age for celestial navigation. Minoan (2700 -1100 BCE) sanctuaries and temples align with the rising and setting of certain stars, and the Minoans made long distance voyages to the Egypt and the Greek island of Thera, which would have required some overnight

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[39] Thiersch, H., 1909, *Pharos: Antike, Islam und Occident; ein Beitrag zur Architekturgeschichte* (Berlin: Leipzig).
[40] Plin. *NH*. 14.40, 201 (Bostock 1855).
[41] Morelli, C. and A. Arnoldus-Huyzendveld, 2011, "Porto di Claudio: nuove scoperte," in *Portus and Its Hinterland: Recent Archaeological Research*, edited by S. Keay and L. Paroli, 47-65 (London: British School at Rome).

sailing.[42] There are also several references to seafaring at night in ancient drama and contemporary sources. In Homer's *Odyssey*, his crew objected to sailing at night, and the fourth-century BCE Greek statesman and orator Demosthenes describes the death of Hegestratos who jumped overboard at night.[43] Third-century BCE Greek poet Aratus indicates that sailing at night in winter was dangerous, suggesting more safety in summer.[44] Fifth-century BCE Greek historian Thucydides records an event during the Peloponnesian Wars (431-404 BCE) where Peloponnesian triremes had to escape an Athenian fleet. He writes that a signal was flashed to the Peloponnesian ships to indicate that the Athenian ships were approaching Lefkada, and later records that the fleet set sail "well before dawn" (ἑτιπολλήςνυκτὸς).[45]

Seafarers rested, resupplied, and ate at nighttime, which may have required an amount of night sailing, for example, if their journey during the day had been delayed; and there were tools and techniques to mitigate the dangers presented. Navigational equipment like sounding lead and lines helped determine the depth of the seafloor, the type of coast

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[42] Blomberg, M. and G. Henriksson, 1997, "Evidence for the Minoan Origins of Stellar Navigation in the Aegean," in *Actes de la Vème conférence annuelle de la SEAC* (Gdansk, Warszawa: Institut d'archéologie de l'Université de Varsovie), 77; Davis, D., 2001, "Navigation in the Ancient Eastern Mediterranean." (Master's Thesis, Texas A&M University).

[43] Morton, J., 1998, "The Role of the Physical Environment in Ancient Greek Seafaring" (Ph.D. diss, University of Edinburgh), 221, 227. Objections of Odysseus's crew: Hom. *Od*. 12.286-90 (Murray, A.T., ed. and transl., 1919, Homer, *The Odyssey* [Cambridge: Harvard University Press; London: William Heinemann, Ltd.]); Death of Hegestratos who jumped overboard at night: Dem. 32.5 (Murray, A.T., ed. and transl., 1939, Demosthenes, *Speeches 31-40* [Cambridge: Harvard University Press; London: William Heinemann Ltd.]).

[44] Arat. *Phaen*. 300 (Mair, G.R., ed. and transl., 1921, Aratus Solensis, *Phaenomena* [London: William Heinemann; New York: G.P. Putnam's Sons]).

[45] Thuc. 3.80.2, 81.1 (Dent, J.M., ed. and transl., 1910, Thucydides, *The Peloponnesian War*, [New York: E. P. Dutton]).

they were approaching, and to estimate the distance to shore.[46] Using these tools, seafarers could identify reefs and shoals, and determine if they were approaching a harbor or safe channel. They also could rely on their senses to study the currents to assess the proximity of the coast, to hear waves breaking against the coast, and to use a reflection of the moon off the waves if it were a clear night.[47] The book of Acts in the Bible states that the sailors could feel the approaching land,[48] although it is unknown what this means.

Navigation by stars at night was also used.[49] The earliest known written record of navigation using stars dates back to Homer's eighth-century BCE *Odyssey*, where Calypso tells Odysseus to keep the Bear (Ursa Major) on his left hand and to use the Pleiades, Bootes, and Orion while sailing.[50] Navigating by the stars was a difficult task, as it depended on the time of night and the daily movement of stars to determine where specific stars and constellations were located. Ancient seafarers also relied on divine providence, like in the *Odyssey*, where "some god guided us through the murky night".[51] The passage from the *Odyssey* demonstrates the dangers of nighttime navigation, like

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[46] Thuc 8.102.1 (Dent 1910); Morton 1998, 179.
[47] Morton 1998, 180-81.
[48] Luke, Acts 1.27, 27.18-45.
[49] Casson, L., 1959, *The Ancient Mariners: Seafarers and Sea-fighters of the Mediterranean in Ancient Times* (London: Victor Gollancz Ltd.), 38; Davis 2001; Rouge, R., 1981, *Ships and Fleets of the Ancient Mediterranean*, Translated by S. Frazer (Middletown: Wesleyan University Press), 22; Taylor, E.G.R., 1971, *The Haven Finding Art: A History of Navigation from Odysseus to Captain Cook* (London, Sydney, Toronto: Hollis and Carter, for the Institute of Navigation), 3, 40, 63.
[50] Hom. *Od*. 273-6; 5.269-77 (Murray 1919); Dicks, D.R., 1970, *Early Greek Astronomy to Aristotle* (London: Thames and Hudson), 11, 31, 185; McGrail, S., 1991, "Early Sea Voyages," *IJNA* 20, 2:86; Morton 1998.
[51] Hom. *Od*. 9.142-8 (Murray 1919).

lack of visibility until they ran aground. Reliance on divine providence is also recorded in Aeschylus' fifth-century BCE drama, *Agamemnon*, where their hull remained unshattered from the cruel surge through divine intervention.[52] By examining the evidence, seafaring at night would likely have taken place primarily on long-distance voyages that crossed open sea with coastal sailing occurring during the day.[53]

Function

Lighthouses are built for two primary purposes: to indicate the location of a harbor and to help sailors avoid danger. If lighthouses are to function effectively, they must meet the needs of the seafarer by providing accurate information about the coast and indicate its hazards like islands, shoals, straits, reefs, and lagoons. Examples include the Italian lighthouses at the Strait of Messina, Cape Peloro,[54] and Canale S. Felice, which was located near a lagoon.[55] For flat coasts, according to Christiansen, a lighthouse must symbolically "define a territory of heights",[56] allowing the seafarer to mark the coast before land is in sight. For example, the North African coast, particularly at Leptis Magna and Alexandria, is flat, which could have made the harbors difficult to locate.

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[52] Aesch. *Ag*. 653, 661-66 (Smyth, H.W., ed and transl., 1926, Aeschylus, *Agamemnon* Vol. 2 [Cambridge: Harvard University Press]).
[53] Morton 1998, 228.
[54] Estiot, S., 2006, "Sextus Pompée, la Sicile et la monnaie: problèmes de datation," in *Aere perennius. Hommage à Hubert Zehnacker*, edited by J. Champeaux and M. Chassigne (Paris: Presses de l'université Paris-Sorbonne), 127, 142; Tigano, G., 2011, *Messina: scavi a Ganzirri e a Capo Peloro (2003-2006)* (Calabria: Rubbettino Editore); *RRC* 511/14.
[55] Christiansen, J., 2014, "La signalisation maritime dans l'Antiquité: Aménagement du littoral et appropriation territorial," (Master's Thesis, Université Lyon), 232, 235.
[56] Christiansen 2014, 233.

The Pharos of Alexandria indicated the coast, but also the island in front of the harbor, thus helping seafarers to avoid that particular hazard, both marking the land and indicating the harbor.[57] Similarly, the lighthouse at Akko, Israel, was constructed on a shoal, indicating the harbor and illuminating the hazard.[58] Strabo indicates the same problem of a low and moving coast in the Rhone delta and refers to a network of towers built by the Massiliotes, possibly to address this problem in support of sailors, though, there is no archaeological evidence of the towers.[59] The Syrian lighthouses of Apamea and Laodicea ad Mare were located close to ancient Ugarit, on either side of the site, their presence suggesting both the need for lighthouses in the area.

Dual Function

The concept of lighthouses drew inspiration from classical signal towers and possibly from Bronze Age temples, where burning sacrifices may have been made at visible elevations, like on the Temple of Baal at Ugarit.[60] The elevation of altars for the purpose of visibility was common throughout antiquity, and the gap between Bronze Age temples and the first signal towers and sixth-century BCE lighthouses is significant, making the connection between lighthouses and Bronze Age temple difficult to prove. Signal towers did not disappear after the advent of the lighthouse, but some lighthouses

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[57] Supra n. 56.
[58] Rosen, B., E. Galili, and D. Zviely, 2012, "The Roman Lighthouse at Akko, Israel," *IJNA* 41, 1:172.
[59] Christiansen 2014, 234; Strab. *Geog.* 3.1, 8 (Jones 1924).
[60] Gordon, C.H., 1952, "Notes on the Legend of Keret," *JNES* 11, 3:212–13; Hooke, S.H., 2004, *Middle Eastern Mythology* (Mineola: Dover Publications), 89; Yon, M., 2006, *The City of Ugarit at Tell Ras Sharma* (University Park: Eisenbrauns), 111.

were possibly used for both functions, indicating the location of the harbor and operating a signal. According to Christiansen, like their coastal counterparts, lighthouses were used for two functions: (1) surveillance and communication, (2) observation and signaling.[61] As the coast was one of the more vulnerable points of a territory, a coastal tower could have been a strategic place of observation. If a harbor did not have both a lighthouse and a signal tower, the lighthouse could have taken on both functions. According to Bouchard, most lighthouses had more than one function. In her discussion, lighthouses primarily served as harbor markers and "warning signals."[62] She argues that lighthouses were expensive to build and maintain, so even if they were built to indicate the entrance to a harbor, they probably had a secondary role, such as to warn of manmade or natural danger like islands or reefs.[63] The Pharos of Alexandria, and the lighthouses at Gesoriacum in northern France, Dover, England, and Butte St. Antoine at Forum Julii in southern France are thought to have functioned as watchtowers, in addition to warning of coastal dangers and indicating harbor entrances.[64] Historical sources for Dover claimed that the two lighthouses served multiple roles: lighthouse, watchtower, and landmark.[65] Some locations had multiple structures and may not have needed the lighthouse to play multiple roles. For example, at Leptis Magna, where the harbor had both a lighthouse and signal tower, no records indicate that the lighthouse

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[61] Supra n. 56.
[62] Bouchard, R., 2007, "Lighting the Wine Dark Sea: A Typology of Ancient Lighthouses Based on Archaeological Evidences," (Master's thesis, University of Montreal), 51.
[63] Supra n. 56.
[64] Supra n. 56.
[65] Society of Antiquaries of London, 1770, *Archaeologia, or, Miscellaneous Tracts Relating to Antiquity* (London: The Society), 334

functioned as anything more than a beacon that indicated to ships the location of the harbor.[66] The island of Lefkada in the Ionian Sea (Fig. 1-11), on which the sixth century BCE lighthouse at Nydri was built, would at times become a peninsula of eastern, mainland Greece when sea level was low. The channel between the two bodies of land was a safer alternative to the windy coast on the western side of the island.[67] It is unknown whether the lighthouse had a dual function as a harbor indicator for the nearby Ellomeno and for signaling, perhaps, in conjunction with the nearby towers at Sollion on the mainland and Akeratos/Pyrgos on Thasos. The presence of several other towers on the island suggests it is unlikely that the tower at Nydri was anything other than a lighthouse. Not all harbors with lighthouses also had signal towers, however, in which case the lighthouses could have been used for both functions. The Torre de Hercules in Spain and the Lattara lighthouse in France, were likely singular lighthouses as there are no reported signal towers in those locations, although the lack of absence does not rule out the possibility.

[66] Bandinelli, R.B., 1966, *Buried City* (New York: Frederick A. Prager Inc.), 24.
[67] Morris 2001, 287.

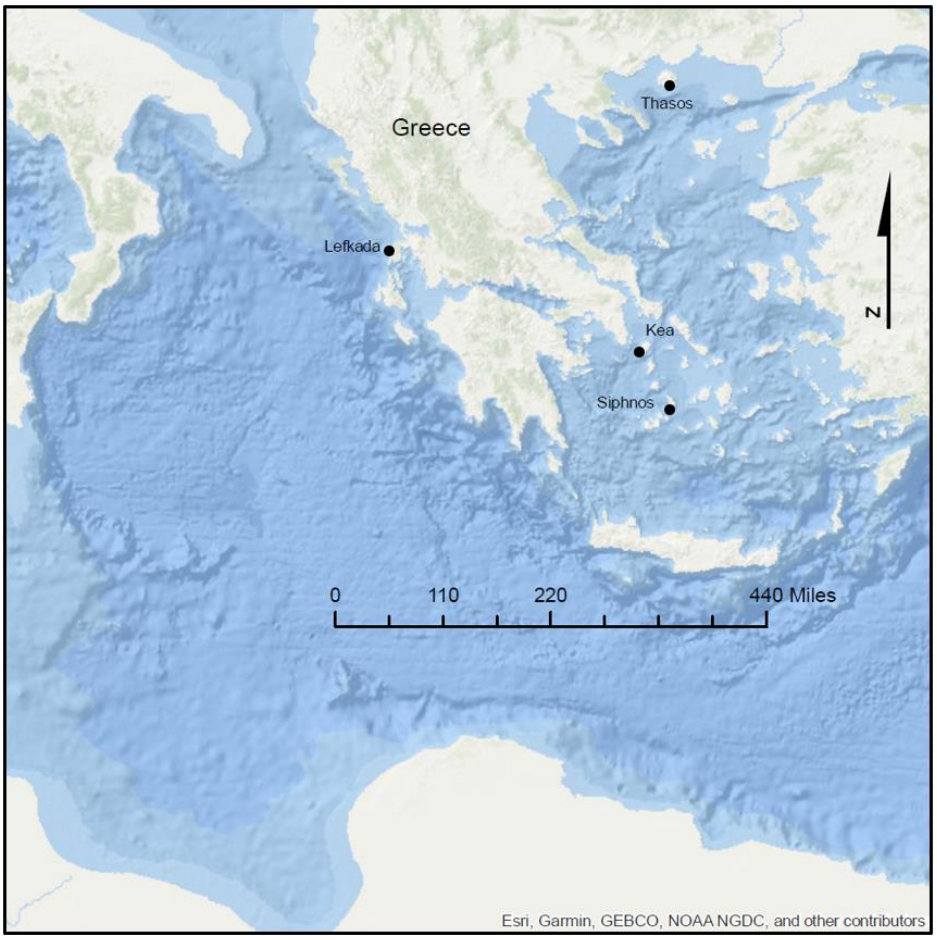

Fig. 1-11. Map of Greece showing the locations of islands discussed in Chapter I. Reprinted using Esri software.

The Pharos of Alexandria served not only a functional purpose, but possibly as a tourist attraction[68] and as a source of propaganda for the Ptolemaic rulers.[69] According to Christiansen, lighthouses were symbols of power and prestige, commercial success and vitality, making a coast more attractive and possibly indicating that the city had enough worth to merit the construction of a lighthouse to protect its assets from coastal

[68] Elnashai, A. and L. Di Sarno, 2006, "New Light on an Ancient Illumination: The Pharos of Alexandria," *International Journal of Nonlinear Sciences and Numerical Simulation* 7, 2:147.
[69] Bouchard 2007, 41.

hazards.[70] Such an approach may have been used at Alexandria, and perhaps at Patara, in its harbor restoration project, which was carried out around 64/65 CE.[71] If lighthouses guided ships to a good harbor, taxes were also collected at custom houses in the harbor. Lighthouses may have also been built to work with one another for navigational purposes. For example, Dover had two lighthouses, and Brundisium on the Italian Adriatic may have as well.[72]

The lighthouses that have been discussed here do not have the same features as the defensive towers discussed by Morris and Papadopoulos, such as narrow windows, elevated entries for reasons other than stability, and most are not located in hard-to-reach places. Many lighthouses were located on cliffs or promontories, but usually were linked to harbors,[73] as in the cases of Dover and La Tour d'Ordre at ancient Gesoriacum, France.

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[70] Christiansen 2014, 230.
[71] Christiansen 2014, 237; Şahin, S., 2009, "Patara Deniz Feneri: Eleştiriye eleştiri," in *Ancient History, Numismatics and Epigraphy in the Mediterranean World. Studies in Memory of Clemens E. Bosch and Sabahat Atlan and in Honour of Nezahat Baydur*, edited by O. Tekin and A. Erol, 331-44 (Istanbul: Ege Publications), 343.
[72] de Graauw, A., 2014, "Ancient Ports and Harbours, The Catalogue." 4th ed. Port Revel, pdf. downloadable from A. de Graauw, "Ancient Ports--Ports antiques." http://www.ancientportsantiques.com/docs-pdf.
[73] Morris, S.P. and J.K. Papadopoulos, 2005, "Greek Towers and Slaves: An Archaeology of Exploitation," *AJA* 109, 2:188.

Multiple Lighthouses

There are multiple instances in which it appears as if two to three lighthouses were positioned within range of each other and functioned together. Taposiris Magna was within 40 kilometers of the Pharos of Alexandria and it is likely that if Taposiris Magna was, in fact, a lighthouse, the lights of both would have been visible from the sea.[74] Similarly, the lighthouses at Dover may have been paired with Caligula's lighthouse at Boulogne. The placement of each pairing is different; Dover and Boulogne are across the straits from one another (33 km), while Taposiris Magna and Alexandria are spread along the southern Mediterranean coastline. In his study of lighthouses, Baldassare Giardina identified six potential instances of "triangulation" similar to those above. All of the lighthouses he noted are Roman and their pattern of placement varies between along the coastline, as at Portus-Cosa-Centumcellae in western Italy, and across from one another, as at Alexandria-Nea Paphos-Caesarea in the southeast Mediterranean.[75] Such a pattern might have been valuable in the sense that sailors could see multiple lights when approaching the coast and if they knew about the alignment, they could use it as a nighttime landmark. If triangulation was purposeful and not just a coincidence, it would seem that the function of a lighthouse was evolving into a more complex network.

[74] Giardina 2010, 35.
[75] Giardina 2010, 37.

Early Lighthouse Precursors

When trying to trace the inspiration of ancient lighthouses and their functions, there are a few likely candidates. During the Bronze Age, cities like ancient Ugarit burned sacrifices atop towers that may have been visible from a distance. The ancient site of Ugarit was located directly on the Mediterranean coastline. The Temple of Baal would have been monumental,[76] towering over the city (Fig. 1-12).

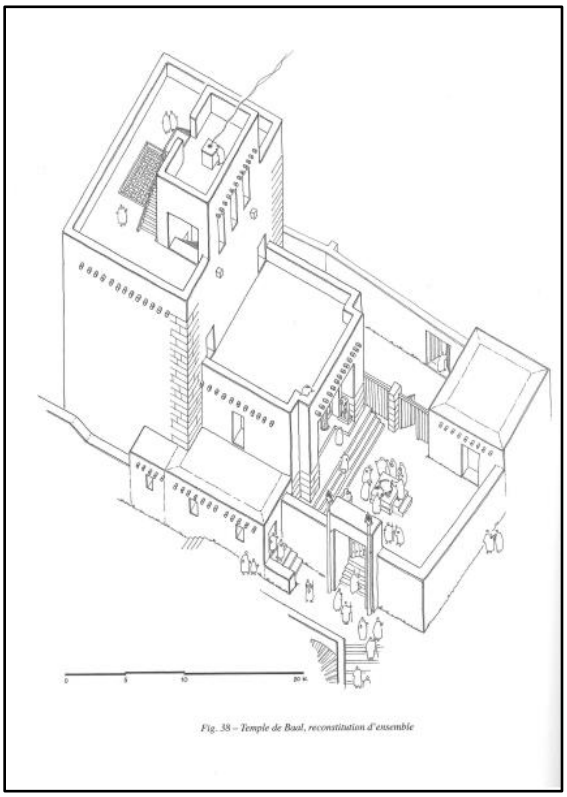

Fig. 1-12. Reconstruction of the Temple of Baal on the acropolis of Ugarit, modern-day Syria. Reprinted from Callot and Monchambert 2011.

[76] Yon 2006, 110.

The temple was located on the city's acropolis with architecture consisting of lower and upper terraces, including staircases leading to the upper terrace where ritual sacrifices were performed.[77] Ugaritic texts suggest as much in their description of an Ugaritic king, Keret, who offers a sacrifice "on the summit of the tower."[78] It should be noted, though, that this example is part of an epic poem that describes the king's misfortune. Scholars like Hooke and Gordon largely agree that he was a mythical figure.[79] It is possible that there is historical tradition within the tale, such as sacrifice on top of the temple.[80] Given its position above the city and location within a kilometer of the sea, the tower would have been visible to sailors coming into the harbors, although the fire as part of a sacrificial ritual would not necessarily have been very large and compared to a lighthouse, may not have been visible at as great of a distance. Yon posits that the temple may have been a landmark to sailors, similar to the lighthouse that would develop centuries later.[81] It is thought that the terraces could also have allowed for observation and perhaps communication using fire signals with other ports and settlements in the area, such as Minet el-Beida and Ras Ibn Hani.[82]

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[77] Yon 2006, 111.
[78] Supra n. 77; Gordon 1952, 212–13.
[79] Gordon, C.H., 1962, *The Common Background of Greek and Hebrew Civilizations* (New York: W.W. Norton and Company); Hooke 2004, 89.
[80] Hooke 2004; Margalit, B., 1999, "The Legend of Keret," in *Handbook of Ugaritic Studies*, edited by G.E. Wilfred, G. E. Watson, and N. Wyatt, 203-33 (Leiden: Brill Academic Publishers), 204-18.
[81] Supra n. 77.
[82] Supra n. 77.

Baal was a storm god, as well as a god of fertility, and there were 17 stone anchors found in the temple, possibly offerings of gratitude from sailors who had safely reached the port because of the recognizable landmark.[83] Ancient Greeks were also thought to have displayed lights in their temples, suspending fire from temple columns or placing fire near their altars, and sometimes used the illumination to navigate at night.[84] This idea may supported by a mosaic from Palestrina, Italy, which depicts an illuminated column near Athens's port, the Piraeus (Fig. 1-13). This image is an example of an open-air altar, however there is no evidence for a temple in the preserved fragment. Such a technique is reminiscent of Canaanite sacrifices carried out on the top of temples like at the ancient site of Ugarit, that could be seen from distances. Celtic poet Rutilius Namatianus writes in the fifth century CE that the Etruscans did not build temples like the Romans, but rather high towers within fortifications that had the dual function of a lighthouse and a fortress,[85] although today, we know that they did build temples, as well as fortification walls with towers.[86]

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[83] Yon 2006, 110; Frost, H. 1991, "Anchors Sacred and Profane: The Ugarit-Ras Shamra Stone Anchors Revised and Compared," *Ras Shamra-Ougarit IV: Arts et Industries de la Pierre*, 355-410 (Paris: ERC-ADPF).
[84] Giardina 2010, 7, 35.
[85] Rut. Namat. 405-410 (Rutilius Namatianus, *A Voyage Home from Gaul*, Published in the Loeb Classical Library, 1934 [Cambridge: Harvard University Press]).
[86] Banti, L., 1973, *Etruscan Cities and Their Culture* (Oakland: University of California Press), 31-2.

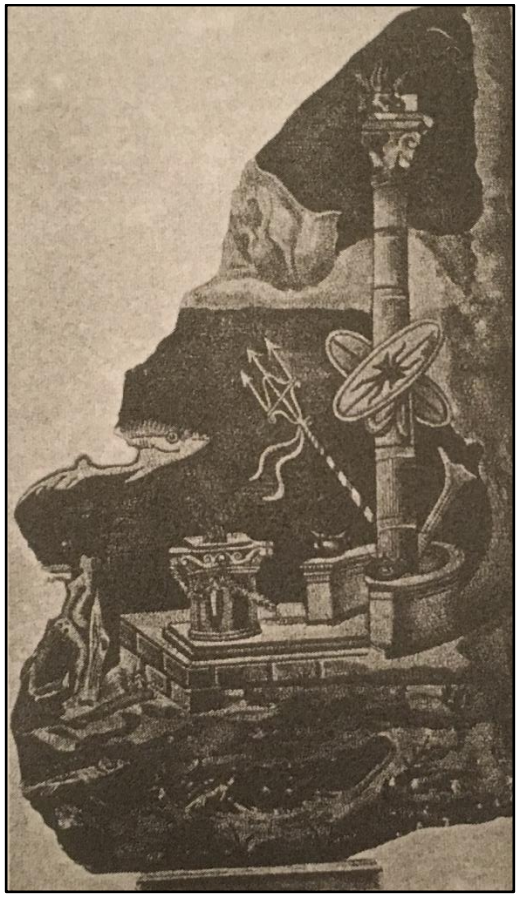

Fig. 1-13. Mosaic depicting an illuminated column with fire burning on an altar in front of it, on display at the National Archaeology Museum, Palestrina, Italy. Reprinted from Giardina 2010, 286, Fig. 112.

Although there may have been some similarities in the visual effects of fires burning in ancient temples and later lighthouses, overall, in form and function, there is little parallel between the two. For example, the function of a lighthouse is not ritualistic. There was likely no attempt at communicating with the gods through the simple act of building a fire to indicate the location of the nearby harbor.[87] The ritualistic actions of commitment

[87] Porter, A. and G.M. Schwartz, 2012, *Sacred Killing: The Archaeology of Sacrifice in the Ancient Near East* (University Park: Eisenbrauns), 292.

and gift-giving are not present.[88] While fire was thought to be a gift from the gods in antiquity,[89] lighthouses were likely strictly functional and there is little mention of religious or sacred function in contemporary texts and secondary scholarship. It is more likely that signal and defensive towers were a precursor or inspiration for ancient lighthouses, as they are closer in appearance. The function is similar in that the stewards of a lighthouse watch for ships and use fire to indicate the location of the harbor, while stewards of a signal tower watch for communication from other towers.

Classical and Hellenistic towers were some of the most common sights in ancient Greece. The following examples are limited to islands, as towers and fortress were common along inland borders as well.[90] The island of Lefkada in western Greece had 15 towers;[91] Kea, which is located south of Athens, had 27; Thasos in the northern Aegean had 33; Siphnos in the southern Aegean had 55;[92] (Fig. 1-11) and, according to Ashton, almost 200 towers are known in the Aegean Sea.[93] On some of these islands, the towers made up a network of inter-visible structures[94] and were used as part of a signaling technique that developed by the fourth century BCE. Individual studies of these towers provide useful information about distinguishing between lighthouses and watchtowers

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[88] Porter and Schwartz 2012, 295.
[89] Hes. *Theog*. 507 (Evelyn-White, H.G., ed. and transl., 1914, Hesiod. *The Homeric Hymns and Homerica. Works and Days* [Cambridge: Harvard University Press; London, William Heinemann Ltd.]).
[90] Ober, J., 1985, *Fortress Attica: Defense of the Athenian Land Frontier, 404-322 B.C.* (Leiden: Brill).
[91] Morris 2001, 290.
[92] Ashton, N.G., and E. Pantazoglou, 1991, *Siphnos: Ancient Towers B.C.* (Athens: Andromeda Books), 26.
[93] Supra n. 92.
[94] Morris and Papadopoulos 2005, 162.

from the Classical period, although in some cases, a lighthouse can be both.[95] The towers on Siphnos have been studied for over a century.[96] The island was at its most successful in the sixth century BCE and fell into poverty in the fifth century BCE. The wealth of Siphnos came from its silver mines which were flooded at some point, which, based on accounts in texts by Herodotus and Pausanias, may have occurred around 525 BCE.[97] Siphnos's wealth and economic downfall are important factors in the construction of its 55 towers.[98] The earliest towers were located near mining sites and dated using pottery evidence, perhaps built as watchtowers to send signals to the acropolis in response to the Samian raid of 525 BCE.[99] The network was expanded in the fifth century, possibly so a complete signaling system would exist for facilitating communication not only between the towers and the acropolis, but with each other as well.[100] This development corresponds with the emerging tactic of using fire signals mentioned by Thucydides in his fifth-century BCE *History of the Peloponnesian Wars* and Tacticus in his fourth-century BCE text, *How to Survive under Siege*. Communication may have also taken place during the day using reflective material like shields, similar to the Battle of Marathon in 490 BCE.[101] There is no archaeological evidence for the use of fire or reflective materials in the towers on Siphnos; it is primarily their locations that suggest

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[95] Christiansen 2014, 231.
[96] Ashton and Pantazoglou 1991, 21, 28.
[97] Hdt. 3.57 (Godley, A.D., ed. and transl., 1920, Herodotus, *Herodotus* [Cambridge: Harvard University Press]); Paus. 10.11 (Jones, W.H.S. and H.A. Ormerod, ed. and transl., 1918, Pausanias, *Description of Greece* [Cambridge: Harvard University Press; London: William Heinemann Ltd.]).
[98] Ashton and Pantazoglou 1991, 20.
[99] Supra n. 93.
[100] Supra n. 93.
[101] Hdt. 6.115 (Godley 1920); Hodge, A.T., 2001, "Reflections on the Shield at Marathon," *BHS* 96:237.

they were used as signal towers, although the later towers were likely farm towers instead, based on their rural locations and nearby farm buildings.[102]

The towers on Siphnos are all circular, like the earliest lighthouses located on Thasos and Lefkada. Alternatively, though, on the other islands where dozens of towers are observed, the majority are square or rectangular and only 12 are circular.[103] The earliest Siphnian towers date to the sixth century BCE, around the same time when the earliest lighthouses on Thasos and Lefkada are thought to have been built. The recorded towers share multiple characteristics with ancient lighthouses. The Siphnian towers are multi-storied with internal spiral staircases,[104] like that of the much later lighthouse at Patara. Many have attached cisterns like the possible Roman lighthouses at Canale S. Felice and Misenum, both in Italy.[105] Similar to most documented lighthouse ruins, what remains of ancient towers on the islands of Siphnos and Lefkada are primarily foundations. A majority of the towers on Lefkada seem to have been built for protection rather than communication,[106] although they follow the same development of round towers to square towers.[107] The Poros tower on Lefkada was later replaced by a square stone tower in the style of northwest Greece, which dates to the late Classical or Hellenistic

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[102] Ashton and Pantazoglou 1991, 112.
[103] Supra n. 93.
[104] Supra n. 93.
[105] Giardina 2010, 25.
[106] Morris 2001, 292.
[107] Morris 2001, 310. The transition from round towers to square towers is a familiar pattern on many islands, also observed with the tower complex at Cheimorrou on Naxos. See Haselberger, L., 1972, "Der Pyrgos Cheimarrou auf Naxos," *AA*:431-37, fig. 3.

periods.[108] The Kroupa tower on the southeast part of the island included a round platform, a feature also seen in later lighthouses. The tower was situated in a vital bay, suggesting it may also have functioned as a lighthouse.[109] Its sixth-century BCE date and circular form resemble that of a circular monument on the Greek mainland just east of Lefkada, above the village of Agios Nikolaos, that has also been called a lighthouse and would have served the ancient town of Sollion and its harbor, Palairos.[110] It is similar as well to the Akeratos tower on Thasos, which was devoted to an individual and is inscribed with the phrase, "σωτήριον," or *soterion,* meaning savior (to ships and sailors).[111] The Kroupa tower is understood to have been a harbor indicator for ships entering the ancient city of Ellomeno in the Bay of Nydri, with an upper structure reminiscent of the Thasos and Sollion towers.[112] The round tower at Cheimarrou on Naxos has the standard features associated with both signal towers and early lighthouses.[113] The tower is made of local marble and constructed using courses of stone. The construction indicates a late Classical to Hellenistic date.[114]

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[108] Supra n. 107.
[109] Morris (2001, 3) argues that a tower's location alone is not enough to claim a signal function. Another tower stands on the Lefkada coast, but she assumes that based on its rural isolation and fertile slopes, it was farm connected instead of for signaling. She assumes that fire signals from natural peaks were sufficient, such as when during the Peloponnesian War, Lefkada warned Corcyra during the night, that 60 Athenian ships were coming, rather than using signal towers for such a purpose, Thuc. 3.80.2 (Dent 1910).
[110] Morris 2001, 322.
[111] Supra n. 110; Kozelji, T., and M. Wurch-Kozelji, 1989, "Phares de Thasos," *BCH* 113:172-5; *IG* XII 8, 683.
[112] Morris 2001, 90.
[113] Morris and Papadopoulos 2005, 155.
[114] Supra n. 113.

The shift to square rural towers in the fourth century BCE accompanied the increase of urban fortifications using square towers, demonstrated by Morris and Papadopoulos.[115] The influence on tower shape is reminiscent of the construction of the Pharos of Alexandria and its impact on the lighthouses that were constructed after it. Similar to some of the lighthouses studied here, regional styles and availability of materials influence the abundance and variety of towers. The towers range in both size and material, but unlike lighthouses which had two to three functions, towers had a wider variety of functions. Common stone and marble were used where plentiful, also a pattern observed in the construction of ancient lighthouses.[116] In the case of Greek towers, the proliferation of towers was a sign of the intensification of exploitation of natural resources, as they were more than just signs of wealth and status, but a deliberate investment of financial resources and manpower.[117] The explosion of lighthouse construction is by extension, possibly a sign of the intensification of seafaring and exploitation of the sea. Both types of structures protect their resources: rural towers protect agricultural land[118] and coastal towers protect the nearby harbors and cities, while lighthouses protect ships using the harbors.

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[115] Morris and Papadopoulos 2005, 156.
[116] Morris 2001, 299; Morris and Papadopoulos 2005, 157. Some Classical towers on Lefkada may have been built with courses made of mudbrick.
[117] Morris and Papadopoulos 2005, 164.
[118] Morris and Papadopoulos 2005, 176-7.

Nuraghes from the Nuragic period, 1900-730 BCE,[119] on the island of Sardinia are also similar in shape to ancient lighthouses and have some of the same construction features (Fig. 1-14).[120] *Nuraghes* generally have inner and outer walls, and spiral staircases (Fig. 1-15), also observed in the lighthouse at Patara.[121] There are thought to have been 10,000 *nuraghes*,[122] but there is no consensus on their function. There are no confirmed ancient lighthouses on Sardinia. Because Sardinia is an island and a lack of lighthouses seems unlikely, it is possible that there is simply no record, or that none have survived.

Fig. 1-14. Santa Barbara Sindia, Nuoro, Sardinia. An example of a single tower *Nuraghe*. Reprinted from Cavanaugh et. al. 1987, Plate Ia.

[119] Depalmas, A. and R. T. Melis, 2010, "The Nuragic People: Their Settlements, Economic Activities and Use of the Land, Sardinia, Italy," In *Landscapes and Societies: Selected Cases*, edited by I.P. Martini and W. Chesworth (New York, NY: Springer Science and Business Media). The etymology of the term "*nuraghe*" is debated but it may mean "heap of stones" in the ancient Sardinian language.
[120] *Single tower nuraghes* are the most common type found and this is the type most similar to lighthouses. Earlier *nuraghes* lacked the circular room found in later *nuraghes*. Melis, P., 2003, *Civiltà Nuragica* (Sassari: Delfino editore), 10.
[121] Özkut, D., 2009 "Patara Deniz Feneri Mimari Belgeleme Çalışmaları," in *Kültür Varlıklarının Belgelenmesi*, edited by A. Cabuk and F. Alanyalı, 23-41 (Eskişehir: Anadolu Üniversitesi Yayınları).
[122] de Montis, A. and S. Caschili, 2012, "Nuraghes and Landscape Planning: Coupling Viewshed with Complex Network Analysis," *Landscape and Urban Planning* 105, 3:316-17.

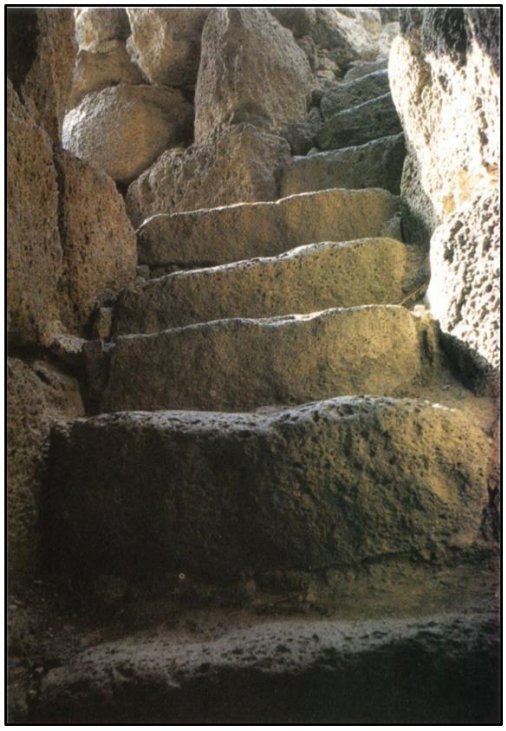

Fig. 1-15. Internal staircase of Nuraghe Santu Antine in Torralba, Sardinia.
Reprinted from Tykot 2001, 41.

Based on a short comparison between Sardinian *nuraghes*, Classical towers, and the earliest known lighthouses, there does not appear to be meaningful differences in construction. The precise function of both the Sardinian *nuraghes*, as well as Classical and Hellenistic Greek towers remains disputed.[123] In some cases, regarding ancient Greek towers, the same word is used to describe different types of structures, which complicates any study of these towers. The Greek word *pyrgos* is used widely in discussion of towers, meaning primarily stronghold and security. The term *pyrgos* can indicate a single tower, the use of which makes an island a *phrourion*, which is a

[123] Supra n. 113.

collection of fortified buildings used as a garrison.[124] The term carries the meaning of "a watching entity." *Pyrgos* can also mean two towers as part of a fort.[125] The word is also applied to lighthouses,[126] but the lighthouse on Thasos carries an inscription, which complicates terminology further.[127] The inscription calls the structure a *mnema* (μνεμα), or tomb, for Akeratos and a *soterion* or *naustathmon*, or safe harbor, for sailors. The inscription does not, however, refer to it as a *pyrgos*.[128]

Illumination

As the main function of the lighthouse in antiquity was guiding ancient mariners safely into harbors by indicating the harbor's location, there had to be a source of illumination to accomplish this purpose. In his 77-79 CE *Natural History*, Pliny the Elder writes that "at the present day, there are similar fires lighted up in numerous places, Ostia and Ravenna, for example,"[129] confirming that lighthouses were an important and widespread technology in the Roman Empire. Ancient coins and mosaics often depict fire on top of lighthouses and provide clues about how they were illuminated.

The use of fire as a beacon is known from centuries earlier than the construction of the Pharos of Alexandria in 280 BCE, with Homeric legend claiming that Palamidis of

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[124] Morris and Papadopoulos 2005, 207.
[125] Supra n. 124; Thuc. 3.51 (Dent 1910).
[126] Supra n. 124; Strab. *Geog*. 17.1.6, 17.1.9, 13.1.22 (Jones 1924).
[127] *IG* XXI 8, 683.
[128] Supra n. 124.
[129] Plin. *NH.* 36.18 (Bostock 1855); Hague, D., 1975, *Lighthouses: Their Architecture, History, and Archaeology* (Llandysul: Gomer Press), 3.

Naphplio was the inventor of the lighthouse.[130] Dionysius of Byzantium in the second-century CE refers to a "Timean" tower built for the safety of the navigator and kindled with fire.[131] Sprague de Camp theorizes that the tower was named after someone named Timaios who funded the construction.[132] According to Sprague de Camp, the most likely candidate is a Timaios of Kyzikos, a rich and ambitious individual who hailed from a city located just across the Sea of Marmara from the tower. Timaios of Kyzikos is thought to be a student of Plato, alluded to by Athenaeus and Diogenes Laertius in the third century CE.[133] If this Timaios of Kyzikos is the same man in both ancient texts and was a student of Plato, this would place him in the fourth century BCE. Using Sprague de Camp's tenuous correlation, it is possible that navigational beacons lit with fire were known in the fourth-century BCE, [134] especially combined with the evidence that the towers on Thasos and Lefkada were both used as lighthouses.

Fire signals, a technique invented by Greek strategist Aeneas Tacticus in the fourth century BCE, were used during the Hellenistic Period, to communicate, as discussed in Thucydides's *History of the Peloponnesian War*, Tacticus's *How to Survive under Siege*,

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[130] Eur. *Hel.* 766 (Oates W.J., and E. O'Neill, eds., 1938, Euripides, *The Complete Greek Drama*, translated by E.P. Coleridge (New York: Random House); Soph. *Fr.* 432.6 (Torrance, R., ed. and transl., 1966, Sophocles, *The Women of Trachis and Philoctetes* [Boston: Houghton Mifflin]).
[131] Dionysius wrote of the Bosporus region; however, the Greek text is lost. Translation of Gyllius's Latin translation of the fragment is found in Davenport Adams, W., 1871, *Lighthouses and Lightships from 1870*, (London: T. Nelson and Sons), 14.
[132] Sprague de Camp 1965, 427.
[133] Ath. 11.509a (Bohn, H.G., ed. and transl., 1854, Athenaeus, *The Deipnosophists. Or Banquet Of The Learned Of Athenaeus* [London: York Street, Covent Garden]); Diog. Laert. 3.46 (Hicks, R.D., ed. and transl., 1925, Diogenes Laertius, *Lives of Eminent Philosophers* [Cambridge: Harvard University Press]).
[134] Supra n. 132.

and Polybius's *Histories*. These sources date to the fifth, fourth, and third centuries respectively, corresponding to the construction of Classical and Hellenistic towers and the construction of the Pharos of Alexandria. The technique appears to have been altered by two Greeks in the third century BCE, Cleoxenus and Democleitus, whom Polybius claims made the method more effective.[135] The use of communicating through fire signals is mentioned in classical drama as well. In *Agamemnon* by Aeschylus, Pallamedes created a network of beacons to signal the fall of Troy to Mycenae.[136] Homer wrote about the same technique in the *Iliad* at least two centuries earlier than Aeschylus.[137] The use of fire signals and a network of towers supports Papadopoulos and Morris's discussions on inter-visible towers and the addition of a network on Siphnos.[138] It is reasonable that, considering the technology and tactics of using fire to communicate, existing towers could have developed into lighthouses, especially when comparing the sixth-century lighthouses on Thasos and Lefkada with the range of defensive, farm, and signaling towers discussed by Ashton, Morris, and Morris and Papadopoulos.[139]

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[135] Polyb. *Hist.* 10.45-47 (Shuckburgh, E.S., ed. and transl., 1962, Polybius, *Histories* [New York: Macmillan]).
[136] Aesch. *Ag*. 258-502 (Smyth 1926).
[137] Hom. *Il.* 18 (Murray, A.T., ed. and transl., 1924, Homer, *The Iliad* [Cambridge: Harvard University Press; London: William Heinemann, Ltd.]).
[138] Morris and Papadopoulos 2005, 162; Ashton and Pantazoglou 1991, 32.
[139] Morris and Papadopoulos 2005; Ashton and Pantazoglou 1991; Morris 2001.

Illumination Materials

For a lighthouse to operate effectively, its source of illumination would need space for circulation and the resources for a reliable burn as lighthouses would have likely burned for the duration of the night. Sources of fuel would have included wood, as well as possibly tar, resin, animal fibers, and olive oil.[140] The Delian Inventories,[141] Ugaritic texts,[142] and ancient drama mention similar materials,[143] however, most of the materials discussed were to be burned for sacrifices and would not have be suitable for lighthouse fuel, whether in religious context or material composition. For example, much of what is listed in the Delian Inventories is metallic, such as containers for holding materials for sacrifice,[144] and the dramas mention vegetal offerings of cakes and fruits.[145] Both the Delian and Acropolis Inventories mention pitch,[146] which is a likely lighthouse fuel, but there is not much detail listed, and pitch had a wide variety of uses. Aristophanes does mention laurel, which is an aromatic wood.[147] In most of these discussions, wood is either not specifically mentioned, or the wood that is discussed would not be appropriate to fuel a lighthouse. For example, wood is listed in the Acropolis and Delian Inventories,

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[140] Forbes, R.J., 1966, *Studies in Ancient Technology* XI, 2nd rev. ed. (Leiden: Brill), 124.
[141] Hamilton, R., 2000, *Treasure Map: A Guide to the Delian Inventories* (Ann Arbor: University of Michigan Press).
[142] Curtis, A., 1985, *Ugarit: Ras Sharma*, (Grand Rapids: William B. Eerdmans Publishing Company), 92; Yon 2006, 43-4. In the southwest Ugarit archives, some tablet fragments mentioning rituals were found, some mentioning trade, as well as some mentions found in the west archives. Some Ugaritic texts indicate sacrifices for specific occasions, specific deities, and the animals that were sacrificed.
[143] Naiden, F.S., 2013, *Smoke Signals for the Gods: Ancient Greek Sacrifice from the Archaic Through Roman Periods* (New York: Oxford University Press), 78-9; Hes. *Op*. 337-41 (Evelyn-White 1914).
[144] Naiden 2013, 71; also listed in the Acropolis Inventories, Hamilton 2000, 247-348.
[145] Hes. *Op*. 337-41 (Evelyn-White 1914); Soph. *Trach*. 238, 88 (Torrance 1966); Naiden 2013, 77.
[146] Hamilton 2000, 475.
[147] Ar. *Pl*. 1114 (O'Neill, E., ed., 1938, Aristophanes, *Wealth: The Complete Greek Drama*, Vol 2 (New York: Random House); Naiden 2013, 79-80.

but generally for items such as shields and wheels, rather than for burning in sacrifice or a lighthouse.[148]

None of the items would need to be specialty items to burn on a pyre. Fuel could have been easily gathered locally, as long as the area had the resources. If not, the resources were probably brought in as easily and cost-effectively as possible. For example, wood was rare on the North African coast by the time the Leptis Magna lighthouse was constructed in the third century CE, and as wood was used extensively throughout the city, it was likely imported.[149] According to Mattingly, olive oil was the prime fuel used for lighting[150] and the Roman Empire's reliance on olive oil and its economic importance were greater than estimated. He estimates 20 liters per capita for annual consumption and uses this figure as evidence for a market in surplus oil. If there was in fact a surplus of olive oil, it is possible that it was one of the fuels used in lighthouses. The importance of olive oil is further supported by dumps like the estimated 50 million amphorae dump at Monte Testaccio in Rome. Olive pomace, which was the remains of olives after pressing to extract the oil, such as the skins and pits, was used as a fuel sources in antiquity, especially in the Roman Imperial period,[151] and if olive oil was used as a lighthouse fuel, it is possible that the remains of the olive were as well.

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[148] Hamilton 2000, 43.
[149] Ward-Perkins, J.B., 1993, *The Severan Buildings of Leptis Magna*, edited by P. Kenrick (London: Society for Libyan Studies), 90-1.
[150] Mattingly, D.J., 1994, *Tripolitania* (London: Routledge), 140.
[151] Rowan 2013.

Fires in temples have been compared to lighthouses both in this chapter and in Giardina's book,[152] however, it is highly likely that people would have taken more care in acquiring fuel for sacrificial fires than for signal fires. It seems likely that they would not have wasted precious materials otherwise suitable for gods on a lighthouse fire, even that it may have angered the gods to do so.[153] Offerings also needed to smell good to please the gods and the burning of olive oil generally does not achieve this effect. I am led to conclude that while it is possible that great care was taken in selecting what was used for a lighthouse fire, the decision would have been made in terms of what burned best, what lasted, and what was easiest to access.

Our knowledge of illumination of ancient lighthouses is limited because many sources providing information date to the medieval period or later. According to medieval sources, portable braziers were common in the Middle East, and they are mentioned in both the Delian and Acropolis Inventories.[154] Giardina claims that braziers would have been used in the illumination of lighthouses, but the medieval sources do not indicate whether braziers were used in lighthouses in antiquity.[155] Medieval sources also mention the use of open fires usually burned in a fire basket or a grate, but once again, the evidence for this practice in antiquity is uneven.[156] Later lighthouses were often lit using

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[152] Supra n. 105.
[153] Leviticus 10.1 (Browning, W.R.F., ed., "Leviticus, book of," in *A Dictionary of the Bible*, Oxford Biblical Studies Online, http://www.oxfordbiblicalcstudies.com/article/opr/t94/e1120 [Accessed Oct 21, 2018]).
[154] Hamilton 2000, 456, 466.
[155] Supra n. 74.
[156] Hague 1975, 9.

machines that resemble medieval siege engines. If the top story of a lighthouse had enough space, the fire could be stoked and maintained from within the lighthouse itself. Otherwise, in some instances, an ancient lighthouse may have had ramps to get materials to the top story.[157]

The Pharos of Alexandria was an impressive structure in its entirety, but its illumination was a particular subject of interest. Flavius Josephus writes in the first century CE that the light of the Pharos could be seen from 300 *stades*, a distance that modern scholars use to reconstruct a height of 120 meters.[158] All knowledge of the Pharos's illumination comes from those who saw it in antiquity and in the medieval period. Many of the Arab accounts of the Pharos were written when it had already suffered significant earthquake damage,[159] so modern scholars have synthesized these accounts[160] to understand the configuration of the Pharos's top structure. Moorish travelers Yusuf Ibn al-Shaikh in the tenth century CE and al-Idrisi in the twelfth century record that the Pharos was 300 cubits high, and because the measurement of the cubit varied, the Pharos may have been between 140 and 183 meters tall.[161] The Pharos's top story had an open lantern that contained fireplaces, a mirror, and bronze columns supported a dome at the top.[162] The mirror is a particular source of interest and speculation. It would have functioned as a

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[157] The Pharos of Alexandria may have had a ramp to assist with fueling its illumination.
[158] Elnashai and Di Sarno 2006, 143; Joseph. *BJ*. 4.10.5 (Whiston et. al. 1895).
[159] Elnashai and Di Sarno 2006, 141.
[160] Hamarneh, S.K., 1971, "The Ancient Monuments of Alexandria According to Accounts by Medieval Arab Authors (IX-XV Century)," *FolOr* 13.
[161] Al-Shaik's Arabic text, *Kitab alif ba,* was discovered in Cairo in 1870.
[162] Elnashai and Di Sarno 2006, 142.

reflecting agent and could have been used during both the day and night to reflect sun rays and fire. There are several accounts regarding the mirror's composition. Arab geographer al-Masudi (956 CE) said it was constructed of translucent stone, possibly like alabaster; others said it was finely wrought glass, "Chinese iron",[163] or polished steel.[164] The reflecting agent was probably burnished and gilded bronze, as were most mirrors in antiquity.[165] Etruscan bronze mirrors were part of a large industry in the Classical and Hellenistic periods. Many mirrors were found in Etruscan tombs and across the Mediterranean, although Etruscan mirrors were not gilt. They were produced in the sixth century BCE through the second century BCE, so it is possible that the mirror of the Pharos could have been Etruscan. Although the most common of these products were hand mirrors,[166] it is possible the Etruscans were capable of producing a larger mirror to be used in the Pharos. It should be noted though that the technology survived, but the Etruscans were absorbed into the Roman Empire in the third century BCE.[167]

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[163] Taylor, S., 1988, "Early Chinese Iron Technology: Some Social and Historical Implications," in *30th European Conference of Chinese Studies Proceedings*, Torino, August 31-September 6, 1986, 319-38 (China: Istituto italiano per il Medio ed Estremo Oriente); Wertime, T.A., 1961, *The Coming of the Age of Steel* (Leiden: Brill), 82. Chinese iron is referenced by Arab geographers and they may have been misunderstanding the material and grouping several reflective materials under the term "Khar sini". Pliny (Plin. *NH*. 39.15, Bostock 1855) references "Seric iron" which may have been steel from India. Arab geographer Abū-I-Fidā recorded that the Pharos's mirror was made of "Chinese Iron". It is listed in the 976 CE text *Keys of the Sciences* as "foreign metal of unknown nature", and *al-hadid-al-Sini*.

[164] Elnashai and Di Sarno 2006, 143.

[165] Supra n. 164. Arab geographer Murtadi describes the illumination system as "a turret on pillars of copper gilt and set upon it a mirror consisting of divers materials." Davies, J., transl., 1672., Murtadi the Son of Gaphiphus. *The Egyptian History Treating of the Pyramids, The Inundation of the Nile, and other Prodigies of Egypt, According to the Opinions and Traditions of the Arabians,* (London: R. B. for Thomas Basset).

[166] Del Chiaro, M.A., 1974, "Etruscan Bronze Mirror," *Archaeology* 27, 2:120.

[167] Barker, G. and T. Rasmussen, 2000, *The Etruscans* (Hoboken: Wiley-Blackwell).

Illumination and Internal Construction

Illumination of lighthouses suggests the need for a specific type of construction. Illumination required a way to access the lantern story of the lighthouse, a visible location, and facilities for containing fuel sources. Lighthouse features provided by historical accounts, iconography, and archaeological remains, such as the ramps within the Pharos of Alexandria and the staircases seen on coins depicting the lighthouse of Laodicea ad Mare, are reminiscent of Egyptian pyramids and Bronze Age ziggurats. Perhaps these structures were a source of inspiration for how to access the upper structures of lighthouses. Lighthouse keepers would have accessed the illuminated section of the structure and they would have required room to move around. People or animals would have transported fuel to the top story, so there was also a need for a structure like a ramp or staircase. Pulleys may have also been used, similar to the system of hoisting anchors onto a ship.[168] There is archaeological evidence for staircases in lighthouses. All that remains of the ancient lighthouse at Patara, Turkey is a massive base and associated features, but most importantly, the remnants of an internal spiral staircase.

For a tower to function as a lighthouse, it would have needed to be positioned close to the sea for maximum visibility. Most ancient lighthouses that have been identified fit this criterion, either positioned on a hillside along the coast, as in the case of the

[168] Steffy, J.R., 1985, "The Kyrenia Ship: An Interim Report on its Hull Construction," *AJA* 89.

lighthouse at Gesoriacum, in northern France, on an island at the mouth of the harbor, like the Pharos of Alexandria, or on a harbor's breakwater, as at Leptis Magna. Most ancient lighthouses were identified as such primarily based on their location. The farther away from a coast an illuminated structure was, the fainter its beacon would have been. Visibility is also increased by height, so ancient architects likely would have taken this into consideration as well, either by constructing the lighthouse at a high elevation or building it to an impressive height, like the Pharos of Alexandria, which is thought to have been 120 meters.

Considering whether a structure had characteristics like a coastal location or staircases is an effective way of determining its function. Taposiris Magna, also known as the Tower of Abusir,[169] is located in Libya and was identified initially as a lighthouse. There are several elements of its construction, however, that make its function as a lighthouse less plausible. Although it is thought to have been built to resemble the Pharos of Alexandria, its top story does not have the space required to hold the fuel necessary to maintain a flame for the duration of the night and its internal staircase is too narrow to allow for easy movement, especially if one was carrying fuel for the tower's fire.[170] Its function is still debated, since it could have been supplied externally using pulleys or ramps.

[169] el Fakharani, F., 1974, "The "Lighthouse" of Abusir in Egypt," *HSCP* 78.
[170] Supra n. 169.

Conclusion

Iconography and textual sources support archaeology and often fill in the blanks it leaves, such as how lighthouses were illuminated, how far they could be seen, and some of their construction aspects for which there are no physical remains. Archaeology is still necessary, because it provides information that cannot easily be determined from iconography and texts, such as construction materials and their composition, which can be scientifically tested. Archaeological remains can be examined more closely to determine building patterns with more confidence, study aspects like the placement, and use modern techniques like photogrammetry and computer modeling. All three are valuable. The idea of using illuminated towers to communicate and indicate the nearby presence of a dangerous coast, as well as the concept that fire was visible on high places from a distance, was known as far back as the Bronze Age. It is likely that the inspiration for Classical and Hellenistic lighthouses came from these types of structures. The illumination of lighthouses can be deduced from textual sources and iconography. A thorough examination of both gives researchers a solid idea of how lighthouses fulfilled their purposes of guiding sailors safely into port. Studies of classical and Hellenistic towers elucidate a likely precursor to lighthouses and suggest that lighthouses could have performed a dual function if a harbor did not have both defensive and communicative structures. The overview of subjects discussed in this chapter will be applied individually to each of the three case studies that follow.

CHAPTER II

THE ROMAN LIGHTHOUSE AT DOVER, ENGLAND

By the time of the Roman Empire, there may have been upwards of 100 lighthouses in various areas of the Mediterranean, along the northern Atlantic coast, and in England.[171] Few have documented archaeological remains and countless lighthouses likely remain unidentified, or simply have not survived. The Roman lighthouse at Dover on the southeastern coast of Britain is the only ancient lighthouse to have survived nearly in its entirety. It is extremely well preserved, maintaining most of its original height and many of its Roman features. As one of the few lighthouses remaining from antiquity, and the best surviving example out of those that have archaeological remains, there is much that can be learned from the Dover lighthouse that can be applied to the study of other navigational beacons. This chapter discusses the historical and archaeological evidence of the lighthouse at Dover.

Historical Background

Dover is often referred to as the key to England and its value has been recognized for centuries. Individuals throughout history understood the importance of Dover for its access to England, from Julius Caesar and William the Conqueror to Napoleon and

[171] Giardina 2010; de Graauw 2014.

Hitler.[172] Dover is only 21 miles from the coast of France, making it a crucial point of passage. It was protected through the centuries by various fortifications, ranging from the first-century CE lighthouse and the third-century CE Saxon Shore forts to Dover Castle in the Middle Ages and the Western Heights fortifications in the 18th century.[173] The region was used as early as the Neolithic Period (4,000-2,500 BCE) by seagoing farmers, as shown by stone axes found in the region. Further occupation into the Bronze Age is supported by the discovery of the earliest sea-going vessel, the Dover Bronze Age Boat, found near the port and dating to 1500 BCE.[174]

Trading patterns that predated the Roman invasions of Britain by Caesar in 55 and 54 BCE and Claudius in 43 CE indicate that there was already a precedent for cross-channel relations between Britain and Northwestern Europe. Ancient Britain was rich in minerals, demonstrated especially in the mining of tin in Cornwall that was exchanged between the Atlantic communities during the Late Bronze Age.[175] Exchange networks existed along the European and British coasts, indicated by the distribution of metalwork from Britain along the Atlantic coast.[176] These networks, primarily in western Britain,

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[172] Dover Museum, 2018, "The History of Dover," *Dover Museum and Bronze Age Boat Gallery*, https://www.dovermuseum.co.uk/Dover-History/Dover-History.aspx (Accessed 7/19/2018).
[173] Peverley, J., 1996, *Dover's Hidden Fortress: The History and Preservation of the Western Heights Fortifications* (Dover: Crabwell Publications); English Heritage, 2002-2006, "History of Western Heights, Dover," *Western Heights, Dover*, www.english-heritage.org.uk/visit/places/western-heights-dover/history/ (Accessed 7/19/2018).
[174] Clark, P., 2004, *The Dover Bronze Age Boat*, (Swindon: English Heritage).
[175] Jones, J., 2012, *The Maritime Landscape of Roman Britain: Water Transport on the Coasts and Rivers of Britannia* (Oxford: Archaeopress), 19.
[176] Supra n. 175.

Portugal, and the northwestern coast of Europe, were presumably created through coastal journeys that established trading contacts in the centuries prior to the Roman invasions.[177] Pre-existing trade between Britain and continental Europe[178] is further supported by Julius Caesar[179] who mentions that the Veneti,[180] people inhabiting northern Gaul for centuries before the Roman Empire, were familiar with the British trading routes. After Claudius's invasion and settlement of "Britannia" beginning in 43 CE, trade, along with economic and political centers,[181] shifted to eastern Britain. These changes were accompanied by an increase of exports and imports with the Roman Empire, and the diversification of trade items.[182] Essential goods were both imported to and exported from Britain in support of the military. This exchange occurred by going through important ports in eastern Britain like Dover, highlighting the importance of cross-channel trade in the Roman Empire.[183] By the time Dover was established as a trading hub in the first century CE, trade had long been a crucial aspect of Roman Britain and was an asset requiring protection.

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[177] Supra n. 175. Sixth-century BCE *Massiliote Periplus* and fourth-century CE *Ora Maritima* (Avienus, translated by Murphy, J.P., ed. and transl., 1977, Rufus Festus Avienus, *Ora Maritima, or, Description of the seacoast (from Brittany round to Massilia*) [Chicago: Ares]) are both texts regarding trade and trade routes in ancient Western Europe, and are contemporary sources that support evidence for trade in Britain before the Roman Empire. Supposedly, *Ora Maritima* contained pieces of the *Massiliote Periplus*.
[178] Jones 2012, 20.
[179] Caes. *BGall*. 2.4 (McDevitte and Bohn 1869).
[180] Willis, S., 2016, "Constructing Identity: The Roman-Era Northwestern Adriatic Laced Tradition of Boatbuilding" (Ph.D. diss, Texas A&M University).
[181] Jones 2012, 20; Caes. *BGall*. 2.4 (McDevitte and Bohn 1869).
[182] Jones 2012, 21. The shift, increase, and diversification of trade is supported by the establishment of Roman control in Britain by 85 CE, the emergence of Dover and London as trading hubs, and the new markets in Britain that the Empire had gained, such as lead and other metals. Britain was especially rich in metals, which were in high demand in the Roman Empire.
[183] Strab. *Geog*. 4.5.2-3 (Jones 1924); Grainge, G., 2002, *The Roman Channel Crossing of A.D. 43* (Oxford: Archaeopress), 91.

Dover was first approached by the Romans during the first and unsuccessful invasions of Britain by Julius Caesar in 55 and 54 BCE. Caesar's lieutenant, Volusenus,[184] identified Dover as a natural harbor, but Caesar rejected Dover, possibly choosing the harbor of Richborough instead, which had a wider bay.[185] Dover was less secure and unfit for large shipping needs. Claudius returned to Britain in 43 CE for the only campaign of his career. Dover was thought in the 19th and 20th centuries to be one of multiple landing spots for Claudius's invasion of Britain, along with Lympne and Richborough. However, the topography of both the Dover and Lympne harbors was steep and would have hindered combat. Additionally, a lack of ceramic and coin evidence at Dover predating the Flavian dynasty suggests that it was not consistently occupied until at least CE 75.[186] Alternatively, archaeological evidence, such as defensive ditches and granaries that date to approximately 44-85 CE, and the suitability of the natural harbor for large trading vessels, support the likelihood that Richborough was the site of the invasion, early occupation, and initial location of the Roman fleet in Britain, the *Classis Britannica*.

The *Classis Britannica* and the Harbor at Dover

Richborough was most likely the initial base for the *Classis Britannica,* which was raised by Claudius to transport troops during his invasion and conquest of Britain. The fleet also ferried supplies along the coast and rivers and maintained cross-channel

[184] Caes. *BGall* 4.23 (McDevitte and Bohn 1869).
[185] Caes. *BGall*. 4.23, 21 (McDevitte and Bohn 1869); Philp 1981.
[186] Grainge 2002, 5.

communication.[187] The *Classis Britannica* was a necessity, since Roman power covered the English Channel and Gaulish coast[188] and, according to Tacitus, supplies sent by water were safer than by land.[189] After Claudius's invasion and the settlement of Britain, Dover had clear advantages over Richborough because of its proximity to Gaul. The military role at Richborough declined at the end of the first century CE with the emergence of Dover as a trading hub and an ideal haven for passage.[190] The fleet may have had multiple bases, including Boulogne-sur-Mer in northern France[191] and Portus Adurni in southern England.[192]

As it was also one of the major bases of the *Classis Britannica*, the harbor at Dover was vital. There was already a significant history of cross-channel trade, and as the base of the Roman fleet in Britain, the fleet, its trading assets, and the harbor had to be protected. After Claudius's invasion of Britain in 43 CE, two lighthouses were constructed at Dover. Modern sources, such as Wheeler and Philp,[193] refer to the lighthouses as "Pharos", but since there are no mentions of the lighthouses in

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[187] Jones 2012, 62-3.
[188] De la Bedoyere, G., 2013, *Roman Britain: A New History* (New York: Thames and Hudson), 106.
[189] Tac. *Ann.* 2.5 (Church, A.J., W.J. Brodribb, and S. Bryant, ed. and transl., 1942, Tacitus, *Complete Works of Tacitus*, [New York: Random House, Inc.]); Jones 2012, 1.
[190] Grainge 2012, 8.
[191] The fort at Boulogne-sur-Mer is larger than Dover, leading some scholars to believe it was the major base over Dover. Seillier, C. and J.Y. Gosselin, 1969, "Nouvelles estampilles de la flotte de Bretagne en provenance de Boulogne-sur-Mer," *Revue du Nord* 57:670; Seillier, C., 2014, "Des origines aux invasions du Ve siècle," in *Histoire de Boulogne-sur-Mer*, edited by A. Lottin, 17-44 (Villeneuve d'Ascq: Presses universitaires du Septentrion Serie: Histoire et civilisations), https://books.openedition.org/septentrion/7573?lang=en (Accessed 7/10/2018).
[192] Goodall, J., 2008, *Portchester Castle* (London: English Heritage), 23-4.
[193] Philp 1981; Wheeler, R.E.M., 1929, "The Roman Lighthouses at Dover," *ArchJ* 86, 1.

contemporary sources or epigraphy, it is unknown if the Dover lighthouses were called *Pharoi* in antiquity. The *Classis Britannica* protected its trading interests and the lighthouses protected the fleet from the dangers of the channel and harbor. The western Pharos, whose remains are often locally referred to as the Bredenstone (Fig. 2-1.), only survives at base level. Only the eastern lighthouse, also referred to as the Dover Pharos by modern and historical sources, survives above its base.

Fig. 2-1. Remains of the western Roman lighthouse at Dover, referred to as the Bredenstone and Devil's Drop of Mortar, Dover Western Heights. Reprinted under a Creative Commons license, Photo © Helmut Zozmann, licensed for further reuse. (Accessed 9/17/2018).

Excavations at Dover

Organized excavations were conducted at Dover throughout the 19th century.[194] Brian Philp carried out extensive excavations between 1970 and 1977. He published an excavation report in 1981, which covered the various constructions at the site including the lighthouse, materials that were used throughout the site, and a discussion of artifacts. He also wrote that there had been two Roman lighthouses and that the western lighthouse had been removed for the construction of the 19th-century fortifications.[195] The construction of two lighthouses in the same harbor, similar to the pairing of a lighthouse and signal tower near a harbor mouth, may have been fairly common in the Roman Empire. There were possibly two lighthouses at Brundisium in the Italian Adriatic, and possibly four at Forum Iulii in southern France.[196]

Dating of the Lighthouses

There are conflicting theories regarding the dating of the two lighthouses. Giardina writes that both lighthouses were constructed by Claudius around the time of his invasion in 43 CE.[197] However, the presence of stamped tiles in the western lighthouse suggests that it was built closer to the fourth century CE, although it is possible that the

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[194] Rigold, S.E., 1967, "Excavations at Dover Castle 1964-1966," *Journal of the British Archaeological Association* 30, 1; Threipland, L.M. and K.A. Steer, 1951, "Excavations at Dover, 1945-1947," *Archaeologia Cantiana* 64; Philp 1981.
[195] Philp 1981, 9.
[196] Supra n. 72.
[197] Giardina 2010, 120.

stamped bricks were part of later repairs.[198] The construction of the eastern lighthouse is commonly dated between 43 CE and 80 CE, established based on the date of Claudius's campaign, lack of pre-Flavian archaeological evidence at Dover, and unstamped Roman tiles in the construction.[199] The presence of unstamped tiles in the eastern lighthouse further supports a date before the stamping technique began during Trajan's reign in the second century CE.[200] The structures at Dover have frequently been dated using stamped Roman bricks and roof tiles with the mark of the *Classis Britannica,* CLBR (Fig. 2-2). The stamps found at Dover also support the fleet's existence at the harbor.[201]

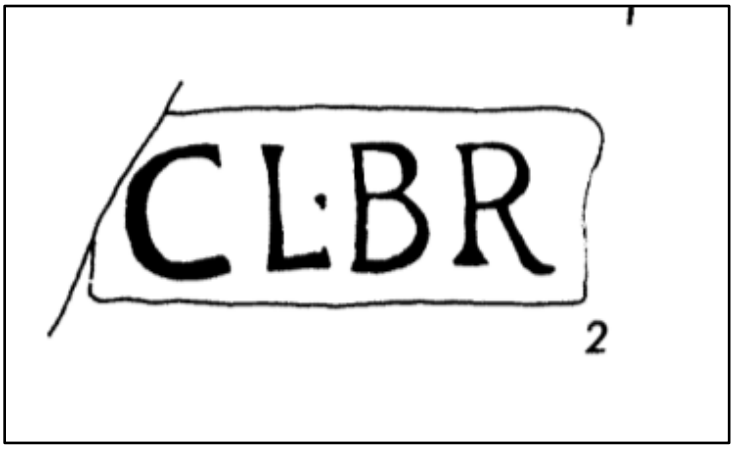

Fig. 2-2. CLBR stamp of the *Classis Britannica*.
Reprinted from Peacock 1977, 244, Fig. 4.

[198] Peacock, D.P.S., 1977, "Bricks and Tiles of the Classis Britannica: Petrology and Origin," *Britannia* 8:245; Wheeler 1929, 45.
[199] Peacock 1977, 244-5.
[200] Supra n. 199.
[201] Supra n. 188.

Placement

Both lighthouses were built on cliffs surrounding the mouth of the estuary leading to the Dour River.[202] In his *Commentaries on the Gallic Wars* and likely in reference to the attempted landing at Dover, Caesar mentions the enemy drawn up on the hills, indicating the elevation of the site.[203] The lighthouses would have dominated the port city, ideally positioned to illuminate the harbor. Estuaries were known to be dangerous parts of the coastline, due to varying currents from the different waters and weather patterns such as fog, posing significant risks to ships. The natural dangers of estuaries resulted in a common trend of lighthouses at river mouths, seen also in lighthouses of the north Adriatic.[204] The Dover lighthouses were constructed to help ships navigate the challenging harbor more safely, making the harbor more user-friendly. From its vantage point above the harbor, they could guide ships into the channel and potentially to guard it from outside threats, as maintaining the channel was crucial.[205] The eastern lighthouse may have had a dual function as a watch-tower from which guards watched for the approach of enemies. Significant populations in Britain made a living out of local trade, operating in the North Sea, and across the channel, indicated by the volume of Roman pottery being shipped into Britain.[206] The merchants took great risks to carry out trade in dangerous waters susceptible to storms and pirates. The Saxon Shore forts, some located at Dover, were built in the second and third centuries CE to address threats facing the

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[202] Johnson, S., 1976, *The Roman Forts of the Saxon Shore* (London: Harper Collins), 12.
[203] Caes. *BGall* 4.23 (McDevitte and Bohn 1869).
[204] Supra n. 105.
[205] Johnson 1976, 11-2.
[206] De la Bedoyere 2013, 177.

Roman Empire, such as the rise of seaborne piracy and maritime raiders from Northern Europe.[207]

The position of the Dover lighthouses was possibly chosen to create a triangular alignment with Caligula's tower, the *Tour d'Ordre,* which was erected in Boulogne, Northern France to commemorate his so-called victory following a campaign in Britain he never actually completed (Fig. 2-3).[208] Each of the three lighthouses could be seen from each other.[209] This alignment was not a feature of all lighthouses, but multiple lighthouses are thought to have been built with triangulation in mind. Some triangular groupings were formed across bays, including Tergeste-Aquileia-Pyrranheum in Northern Italy, along the coast at Ostia-Cosa-Centumcellae on the western coast of Italy, and between the coast and islands, with Misenum-Caprae-Athenaeum on the southwestern coast of Italy.[210]

The alignment could have functioned to help sailors identify where they were on the open sea. The pairing of a lighthouse with a tower, monument, or statue was an arrangement seen in harbors, including first-century BCE Forum Iulii in southern

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[207] De la Bedoyere 2013, 66.
[208] Giardina 2010, 23, 120; Suet. *Calig*. 46 (Reed and Thomson 1899). Suetonius indicates that Caligula built the lighthouse, but Tuck (Tuck, S.L., 2008, "The Expansion of Triumphal Imagery Beyond Rome: Imperial Monuments at the Harbors of Ostia and Lepcis Magna," *MAAR* 6:325) argues that while it is possible that Caligula began the construction of the lighthouse, Claudius was the one to complete it, based on the short duration of Caligula's reign.
[209] Supra n. 75.
[210] Giardina 2010, 37-8.

France,[211] first-century CE Ostia, and perhaps at second-century CE Ancona, both in Italy.[212] Nothing survives of the lighthouses at Ancona or Ostia, but Ostia is mentioned in contemporary sources and both are attested to in iconography. The tower at Forum Iulii, Lanterne d'Auguste still survives, and a cement base that may have been the lighthouse foundation, was found on the nearby island -- Lion de Mer.[213] It is possible that the triangulation of multiple lighthouses could have evolved from such a pairing. It could also indicate a development from signal towers. The possible use of triangulation supports the notion that lighthouses safely indicated harbor entrances and perhaps a development of technology to increase the effectiveness of lighthouses in aiding safe navigation.

[211] Supra n. 72.
[212] Giardina 2010, 24.
[213] Giardina 2010, 110.

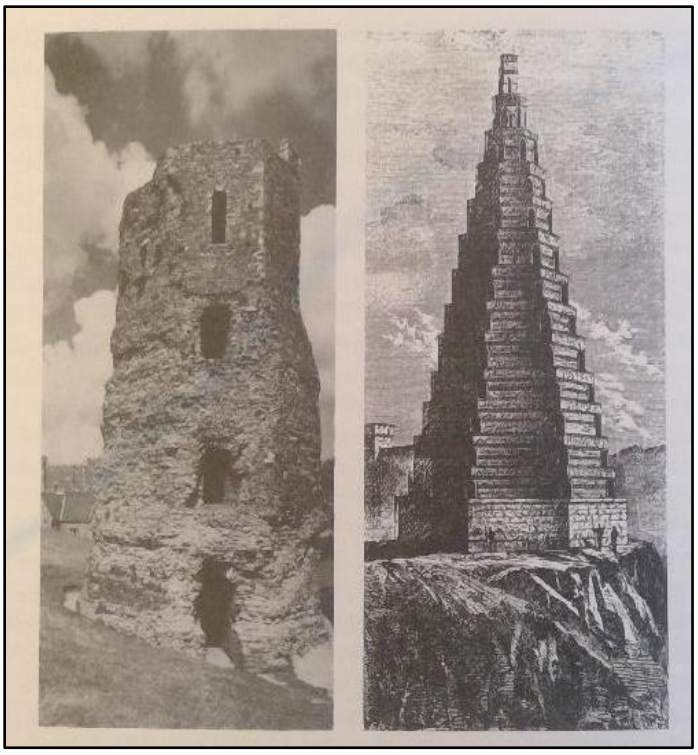

Fig. 2-3. Dover (left) and Boulogne (right) lighthouses.
Reprinted from: Johnson 1976, 12, Figs. 6 and 7.

Shape

Architecturally, the surviving Dover lighthouse is consistent with primary source descriptions and iconographic representations of other ancient lighthouses. The Dover example is thought to have been modeled after Caligula's *Tour d'Ordre*, which supposedly had 12 stories.[214] As seen in figure 2-3, the Dover lighthouse was eight stories tall, each story narrower than the one below. Most lighthouses in antiquity were widest at the base and narrowed with height, a structural necessity, which can be seen from the remains at Dover. The exterior has an octagonal shape and a square interior

[214] Suet. *Calig*. 46 (Reed and Thomson 1899); Giardina 2010, 23.

rather than circular,[215] (Fig. 2-4) which is unlike most other ancient lighthouses. Most common shapes appear to be square or built to resemble Alexandria.

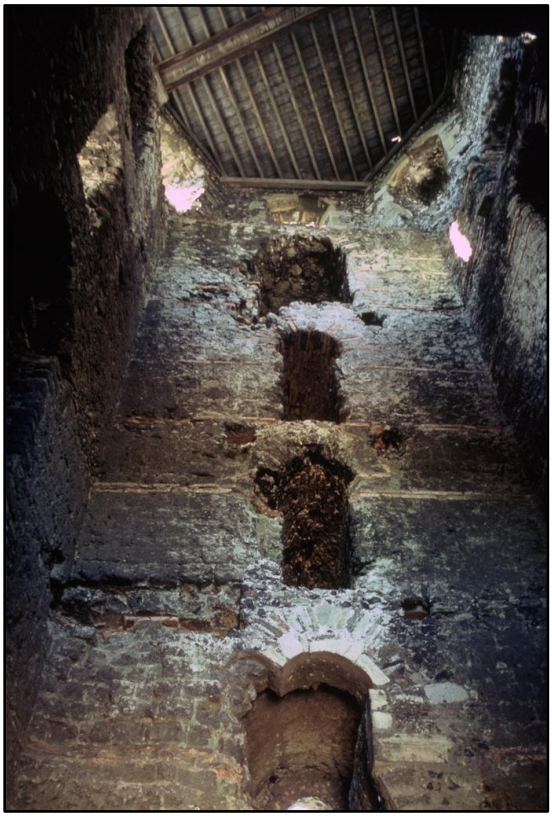

Fig. 2-4. Square interior of the Dover lighthouse.
Reprinted with permission from the Hartill Archive of Architecture and Allied Arts,
https://library.artstor.org/asset/HARTILL_12312440 (Accessed 10/23/2018).

The Pharos of Alexandria is depicted widely in iconography and mentioned by several ancient authors. Strabo writes that the Pharos had many stories, and depictions in iconography indicate that it had three to four stories, each of a different shape with a

[215] Wheeler 1929, 30; Philp 1981, 9.

cylindrical top story.[216] The shape has a precedent in the ancient world and is common outside of lighthouses. Theoretical reconstructions of the Mausoleum at Halicarnassus in southern Turkey (Fig. 2-6), built in the fourth century BCE, are reminiscent of reconstructions of the Pharos of Alexandria (Fig. 2-5), particularly in the tapering of the structure's roof and the monumentality.

Both the Mausoleum of Halicarnassus and the Pharos at Alexandria were massive structures, which would have required much structural stability provided by the tapering shape and wide base. The geology of the site also contributes to the necessity for stability. Both the Pharos of Alexandria and the Mausoleum of Halicarnassus were located at coastal sites that were prone to flooding and earthquakes, conditions that would have required stable foundations.[217] Lighthouse shape may have been influenced by where it was built within the harbor complex and constructed in a particular shape for structural stability. For example, Bouchard argues that lighthouses that were more exposed in a harbor, such as on a breakwater, were square in shape for stability,[218] although an octagonal shape may have reduced surface area and thus better absorbed or diffuse the force of breaking waves.

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[216] Strab. *Geog*. 17.1 (Jones 1924); Giardina 2010, 23.
[217] Abdelnaby, A.E. and A.S. Elnashai, 2013, "Integrity Assessment of the Pharos of Alexandria during the AD 1301 Earthquake," *Engineering Failure Analysis* 33: 119-38; Jeppesen K. and I. Zahle, 1973, "The Site of the Mausoleum at Halicarnassus Reexcavated," *AJA* 77, 3:336-38.
[218] Supra n. 69.

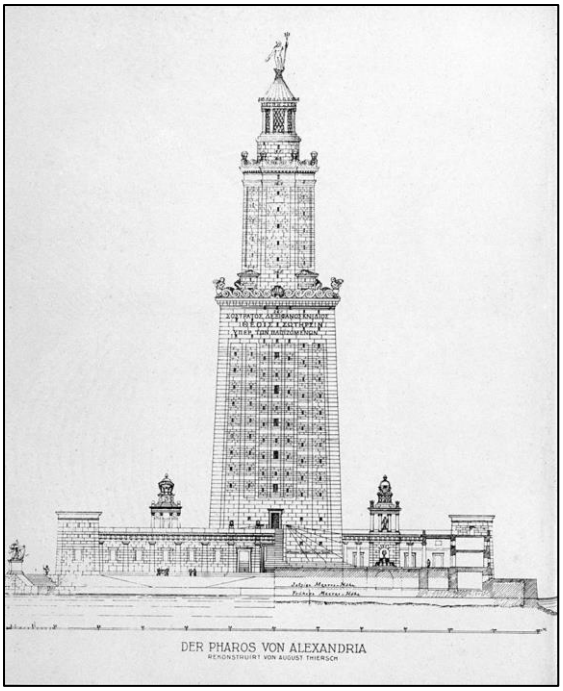

Fig. 2-5. Reconstruction of the Pharos of Alexandria by Hermann Thiersch.
Reprinted from Thiersch 1909.

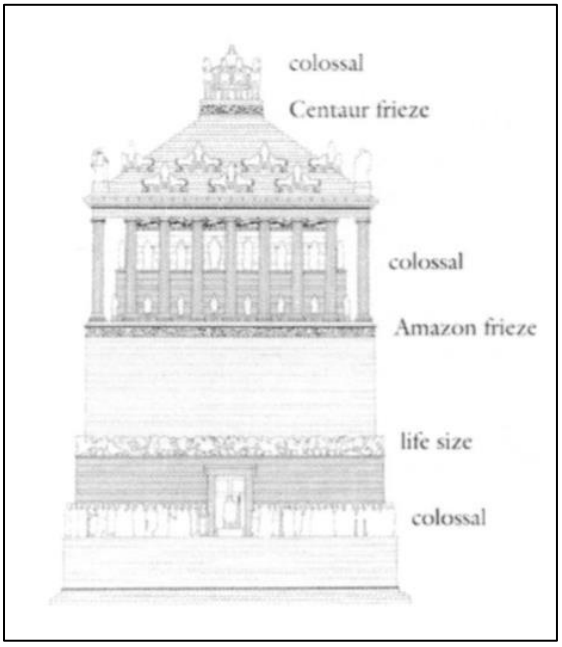

Fig. 2-6. Reconstruction of the Mausoleum of Halicarnassus according to K. Jeppesen.
Reprinted from Jenkins 2010, 124, Fig. 6.1.

Lighthouses placed at lagoon mouths often were square-shaped, a contrast to the Dover lighthouse, which was built at the mouth of the Dour River but was octagonal. The octagonal form of the Dover lighthouse appears to be common for lighthouses paired in formerly Celtic regions.[219] Two other lighthouses constructed in areas of Celtic origin are thought to have had the octagonal form of the Dover lighthouse -- Narbo Martius at the edge of Gallic territories in southern France, and Gesoriacum in northern France.[220] The shape of ancient lighthouses sometimes varied regionally,[221] suggesting that perhaps a lighthouse's form varied based on where it was located and the identity of the local culture, as in the case of the Dover lighthouse. Identity of local culture and regional influences on architecture are powerful factors. Augustus chose a cylindrical drum tumulus for his mausoleum and it is debated whether it was to mimic Etruscan tombs.[222] A lighthouse was one of the first things visitors would see when approaching the coast and several lighthouses, like the Pharos of Alexandria and the lighthouse at Leptis Magna, were built to communicate power, triumph, and propaganda.[223] According to Tuck, Roman emperors used harbors to project a unified view of the Empire[224] and

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[219] Supra n. 212.
[220] Supra n. 212.
[221] Supra n. 212. This classification is far from perfected, though, as some lighthouses are geographically distant from the others in the same shape category. For example, Leptis Magna and Sabratha, both in North Africa/western Mediterranean were likely rectangular, but so were the lighthouses of Campa Torres and Brigantium, across Europe in Spain.
[222] Rehak, P., and J. Younger, 2009, *Imperium and Cosmos: Augustus and the Northern Campus Martius* (Chicago: University of Chicago Press), 44.
[223] Tuck, S.L., 1997, "Creating Roman Imperial Identity and Authority: The Role of Roman Imperial Harbor Monuments" (Ph.D. diss, The University of Michigan), 1.
[224] Tuck 1997, 4.

lighthouses were effective tools to communicate the cultural identity of the Roman Empire.

Materials

The construction of the Dover lighthouse and its materials are well documented. The facing of the lighthouse construction is masonry in calcareous tufa, a type of limestone known to have been used widely in Britain during antiquity.[225] The Dover lighthouse is thought to be the best example of calcareous tufa masonry across Britain.[226] It was quarried most likely from the nearby Dour Valley, which is said to have exposed calcareous tufa even in the 19th century, long after it was thoroughly exploited in antiquity.

As a building material, tufa or tuff generally refers to a volcanic stone that comes from discrete locations like southern Italy and Greece,[227] creating the need for import of the material to places without direct access to volcanic stone. Along with other types of volcanic stone like pumice and scoria, which is a vesicular volcanic rock, tufa is found in Roman structures like the Baths of Trajan and the Pantheon (both second century CE),[228] where it was utilized to achieve vaulting, one of the most impressive feats of Roman

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[225] Wheeler, R.E.M., 1932, "Notes on Building-Construction in Roman Britain," *JRS* 22, 1:129.
[226] Williams, J.H., 1971, "Roman Building-Materials in South-East England," *Britannia* 2:174.
[227] Allen, S.R., 2001, "Reconstruction of a Major Caldera-forming Eruption from Pyroclastic Deposit Characteristics: Kos Plateau Tuff, Eastern Aegean Sea," *Journal of Volcanology and Geothermal Research* 105:141-162.
[228] Marder, T.A. and M. Wilson-Jones, 2015, *The Pantheon: From Antiquity to the Present* (Cambridge: Cambridge University Press), 153.

engineering. In the case of the Dover lighthouse, the tufa is not volcanic. This particular form of calcareous tufa has a low specific gravity and a vesicular nature or a porous texture, a quality it shares with volcanic tufa, which makes it an effective stone for building.[229] Tufa was well known to the Greeks and Romans in antiquity. It is documented as being easy to quarry and it hardens during the process, making it a useful and desirable stone for construction.[230] It was known to be durable, light, porous, and easy to use in the construction of arches and vaulting,[231] all of which made it a suitable stone to use in the construction of Dover lighthouses, especially considering the arched form of the windows. Calcareous tufa was likely used instead of importing volcanic stone because it was readily available, equally as useful, and shared several of the characteristics that made volcanic stone effective and widely used.[232]

Calcareous tufa was common on the European mainland as well, finding its place in a wide variety of architecture during antiquity.[233] There is evidence for the importation of volcanic stone into non-volcanic regions, but also the use of calcareous tufa.[234] Calcareous tufa was also used in a wide variety of structures across the Roman Empire, including the baths at the Newport villa on the Isle of Wight (280 CE), a vault in

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[229] Lancaster, L., 2015, *Innovative Vaulting in the Architecture of the Roman Empire* (New York: Cambridge University Press), 33; Philp 1977, 176.
[230] Jackson, M. and F. Marra, 2006, "Roman Stone Masonry: Volcanic Foundations of the Ancient City," *AJA* 110, 3.
[231] Philp 1977, 176.
[232] Lancaster 2015, 33.
[233] Supra n. 232.
[234] Lancaster 2015, 15.

Diocletian's fourth-century CE Palace at Split, Croatia, and the vault of the second-century BCE Agora Baths at Elaussa Sebaste in southern Turkey.[235] Similar to the Dover lighthouse, the tufa used in Diocletian's Palace and the Agora Baths was local.[236] It was common in structures that used vaults, due to its insulating properties and a light stone weight equal to the weight of volcanic tufa like that used in the Roman Pantheon.[237] The four aforementioned sites are all coastal, which may have been a consideration, although Lancaster writes that calcareous tufa was often used in non-volcanic zones.[238] The use of tufa over other building material may have at least partially depended on what was locally available. Particularly when used in vaulting, the use of calcareous tufa was determined by its availability. Tufa is also a rougher stone, so the choice to build with it may have depended on what was being constructed and the level of craftsmanship that was desired.

The rest of the lighthouse was constructed using flint, brick-dust, and greensand (a green sandstone with marine sediment).[239] Flint was collected from streambeds or banks and used in limited quantities throughout the site, especially in building foundations and in metaled roads (roads with gravel applied on the surface) inside the fort.[240] Flint is the

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[235] Supra n. 232.
[236] Supra n. 232.
[237] Lancaster 2015, 32.
[238] Supra n. 237.
[239] Gallois, R.W. and Edmunds, M.A, 1965, *The Wealden District, British Regional Geology Series* (University of Chicago: British Geological Survey); British Geological Survey, 2017, "Upper Greensand Formation," *BGS Lexicon of Named Rock Units*, https://www.bgs.ac.uk/ (Accessed 7/15/2018).
[240] Philp 1981, 69.

only readily available stone in southeast Britain. It is found in irregularly-shaped nodules and must be carefully compacted in lime mortar to be of use.[241] Brick and tile are common in buildings using flint, which are built in courses and create a frame for flint walls, encouraging stability.[242] Brick-dust is known to have been added into later Roman constructions, but was not often seen in other early first and second CE constructions, making it a unique material in the Dover lighthouse.[243] The core of the lighthouse walls was cemented with hard, white mortar,[244] while higher-quality brick-dust was found in the exterior face. According to Wheeler, the early use of brick-dust occurred when either a finer construction was required or contact with water was more frequent, calling for a higher quality of mortar.[245] Brick-dust functions the same way pozzolana, Roman hydraulic concrete, does chemically, because of a high silica content.[246]

The remains of the surviving Dover lighthouse in particular are an excellent example of lighthouse construction material that can inform our understanding of other lighthouses of the time. Because so little remains from other ancient lighthouses in the Mediterranean, it is often difficult to determine what materials were used. For most other lighthouses, textual references, what materials are available locally, and the stone used in other constructions must be relied on to hypothesize about construction material. When

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[241] De la Bedoyere 2013, 169.
[242] De la Bedoyere 2013, 120.
[243] Wheeler 1923, 121.
[244] Wheeler 1923, 126.
[245] Supra n. 244.
[246] Oleson, J. et. al., 2004, "The ROMACONS Project: A Contribution to the Historical and Engineering Analysis of Hydraulic Concrete in Maritime Structures," *IJNA* 33, 2:199-200.

Pliny the Elder wrote on marble, he mentioned its use in the Pharos at Alexandria.[247] Suetonius indicated that Caligula's first-century CE tower was constructed of tufa like the Dover lighthouse.[248] The materials of other lighthouses must be conjectured, based on the mentions of stone used in local construction.

Common Roman building trends are seen in the construction of the eastern Dover lighthouse. The lighthouse's windows show a common Roman pattern of alternating stone and brick[249] (Fig. 2-7) that is paralleled in the late third-century CE Richborough fortress in the alternation of light and dark stone,[250] as well as in Roman houses excavated at Colchester, England.[251] The alternating of stone and brick is referred to as *opus vittatum*[252] and it was a technique used across the Empire, like in Croatia and Italy, especially in the voussoirs of arches.[253] The polychromatic effect is seen later in Carolingian architecture, such as in the seventh-century CE cathedral Notre-Dame-de-la-Basse at Beauvais, which was designed in the Roman style. The polychromatic effect is however rarely seen in Saxon architecture.[254] There may have been *pilae* or *suspensurae* at the base of the lighthouse (Fig. 2-8), which are pilings under Roman structures, especially at bath complexes and granaries (*horrea*) that allowed water and air to pass

[247] Plin. *NH*. 34 (Bostock 1855); Strab. *Geog*. 17.1.6 (Jones 1924).
[248] Giardina 2010, 27. Suet. *Calig.* 46 (Reed and Thomson 1899).
[249] Wheeler 1923, 133.
[250] Supra n. 244.
[251] Supra n. 249.
[252] Coarelli, F., 1974, *Guida archeologica di Roma* (Milano: Arnoldo Mondadori Editore), 340.
[253] Supra n. 244.
[254] Supra n. 244.

underneath without compromising the stability of the structure. However, this feature has received little attention in other sources that discuss the lighthouse at Dover, so its distinction remains uncertain.

Fig. 2-7. Alternating stone and brick in the arch of a window in the Dover lighthouse. Reprinted with permission from the Hartill Archive of Architecture and Allied Arts, https://library.artstor.org/asset/HARTILL_12312439 (Accessed 10/23/2018).

Fig. 2-8. Possible *pilae* of the Dover lighthouse. Left: reprinted under a Creative Commons license (https://creativecommons.org/licenses/by-sa/4.0), photograph by Chris McKenna (Thryduulf), 2004. Right: reprinted from Giardina 2010, 24 Fig, 18.

The lighthouse at Dover underwent several changes over the centuries that are thought to have contributed to its preservation, including the construction of Dover Castle around it, the addition of a belfry, and the blocking up of the windows and encasing the lines of the original lighthouse in stone and squared flint.[255] These alterations are well documented throughout historical sources and archaeological remains.[256] In his 1929 report on the Dover lighthouse, Wheeler includes images from 1868 that show the blocked windows (Fig. 2-9). Other ancient lighthouses known across the Mediterranean

[255] Peck, E., 1872, *Archeologia: or Miscellaneous Tracts Relating to Antiquity, 1770-1992* (British Periodicals), 333-34.
[256] Peck 1872, 333.

world also underwent changes over the course of history, but none was preserved as extensively as the lighthouse at Dover. The second-century CE Ã Coruna lighthouse in northern Spain was largely reconstructed in the 18th century.[257] The Pharos of Alexandria underwent several modifications as it changed hands, including the modification into a fortress during the reign of Justinian (527-565 CE), and then later Islamic modifications before its destruction by earthquake in the fourteenth century CE.[258] The seismic activity of the British coasts is not as dangerous as the Mediterranean, which also likely contributed to the preservation of the Dover lighthouse.

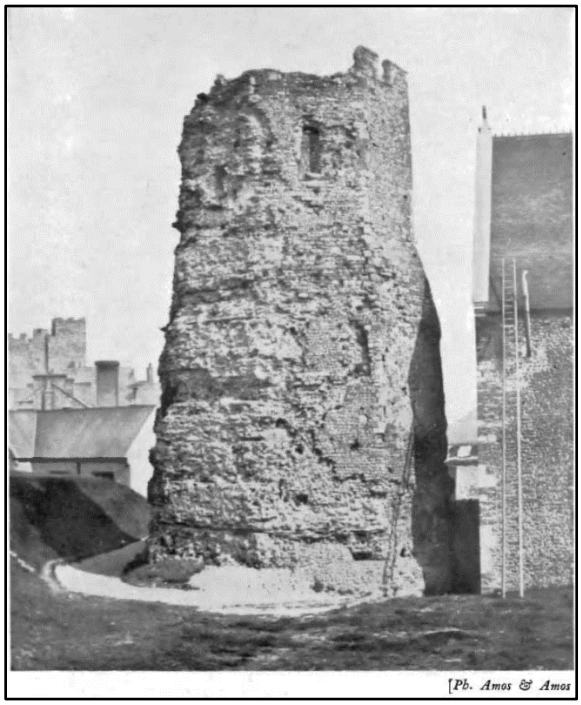

Fig. 2-9. South view of the Dover lighthouse in 1868 showing windows blocked with medieval and later masonry. Reprinted from Wheeler 1929, Plate IV.

[257] Supra n. 1. Neoclassical elements were added to the Ã Coruna lighthouse and the Roman masonry primarily survives only on the interior of the structure.
[258] Giardina 2010, 57.

Contemporary Sources and Epigraphy

Ironically, although the Dover lighthouse is the best archaeologically preserved lighthouse from antiquity, there are few textual references to the Dover harbor and none that refer to the lighthouse itself. Regarding the Dover port complex, only five epigraphic inscriptions have been found at the port. Two were found in 1971 and 1976 on altars, one in 1976 on a building stone, and two stone fragments -- one limestone fragment in 1976 and one of white marble in 1970.[259] None directly mentions the port or the lighthouse. Thus far, there are only three mentions of the port in ancient texts. All of the contemporary sources date to at least 100 years after the construction of the lighthouse, from the late second century CE to the seventh century CE. Dover is mentioned in the second-century CE Latin *Antonine Itinerary*, which refers to the port as *Dubris* and indicates that it is 66,000 paces from London (*Londinium*).[260] *Dubrae* is mentioned in the *Notitia Dignitatum*, a military inventory that lists Romano-British forts, and survives only as a 15th-century manuscript, but likely dates to the fourth century CE.[261] Finally, Dover is listed in the *Ravenna Cosmography*, a list of Roman towns and road stations written in the seventh century CE.[262]

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[259] Tomlin, R.S.O., R. P. Wright, and M. W. C. Hassall, 2009, *The Roman Inscriptions of Britain* (Oxford: Oxbow Books), 47-50.
[260] *Itin. Ant*. 473.1-2, 5 (Haseler, M. and K. White, 2018, "The Antonine Itinerary," *Roman Britain*, http://roman-britain.co.uk/antonine_itinerary [Accessed July 12, 2018]).
[261] Johnson 1977, 65; *Not. Dig. Occ*. 28.4, 14 (Fairley, E., ed., 1899, *Notitia Dignitatum* [Philadelphia: The Department of history of the University of Pennsylvania]).
[262] *Ravenn.* 106, 35 (Haseler, M. and K. White, 2018, "Ravenna Cosmography," *Roman Britain*, http://roman-britain.co.uk/ravenna-cosmography [Accessed July 12, 2018]).

Suetonius documents Claudius's campaign in Britain in *The Twelve Caesars* but makes no mention of Claudius's lighthouse. Baldassare Giardina theorizes that any mention of the Pharos is absent because the structure was not grandiose enough to merit attention,[263] which may be supported by Suetonius's declaration that the campaign to Britain itself, the only campaign Claudius conducted, was of no importance-- although he later goes on to say that Claudius's triumph was splendid and he had succeeded in forcing much of Britain into submission.[264] Tuck, however, claims that the lighthouse at Dover was one in a series of lighthouses that marked Claudius's successful campaign and return to Rome, along with Boulogne, Ravenna, Brundisium, and Portus.[265] If this were the case, the Dover lighthouse was presumably considered a triumphal monument and would mirror the use of lighthouses as markers for imperial movement and the expansion of the empire. It should be noted that Claudius's building program focused on buildings that were functional, which stands in stark contrast to Caligula's building program that was characterized as extravagant and selfish.[266]

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[263] Giardina 2010, 16.
[264] Supra n. 263; Suet. *Claud*. 17 (Reed and Thomson 1899).
[265] Tuck 2008, 325.
[266] Thornton, R.L. and M.K. Thornton, 1989, *Julio-Claudian Building Program: A Quantitative Study in Political Management* (Mundelein: Bolchazy-Carducci Publishers), 51, 93. Caligula's actions led to his death and according to Dio, he "learned by actual experience that he was not a god." Cass. Dio. 59 (Cary et. al. 1914).

Historical Sources

Historical sources discussing the lighthouse at Dover contribute knowledge of its features. The Dover lighthouse is mentioned more frequently much later, over the course of the 18th and 19th centuries. Edward Hasted, an English antiquarian, studied the lighthouse at the turn of the 19th century, noting the Roman brick and tiles intermixed with flint.[267] Some key features noted by Halsted include the varied color of the bricks, "bright red, with the blue flinty grit in the middle; others are of a cream-colour, or white", and the three-foot-long bricks near the base of the lighthouse, which were "marked with stria, or flutings, strait or chequered, strongly glazed, and having more flint in their composition."[268] He also discussed the placement of the lighthouse and its role in protecting the harbor. William Stukeley, an antiquarian in the 18th century, studied the history and archaeology of his native Britain, including the lighthouse at Dover.[269] These sources were well-informed of the strength of the lighthouse's building materials, the distribution of the materials across Britain, the European mainland, and its history of use.[270] Lieutenant Emerson Peck noted in an 1872- report for Queen Victoria that the masonry of the lighthouse was tufa, like that found in the local valley,[271] further supporting the idea of local sourcing of materials. Brick and tile could be manufactured

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[267] Hasted, E., 1800, "The Town and Port of Dover," in *The History and Topographical Survey of the County of Kent: Volume 9*, 475-548. British History Online, http://www.british-history.ac.uk/survey-kent/vol9/pp475-548. Originally published by Canterbury: W Bristow (Accessed 7/8/2018).
[268] Supra n. 267.
[269] Society of Antiquaries of London 1770.
[270] Supra n. 65.
[271] Supra n. 256.

on-site, as long as suitable clay and water were present.[272] 19th- century sources maintain that due to its position on the high point of the Dover harbor, overlooking both the channel and the nearest point of the French coast, the structure functioned as a landmark, lighthouse, and a watch tower.[273] 18th and 19th-century studies of the lighthouse and its characteristics are supported by modern research and the excavations that Philp conducted in the 1970s.

Conclusion

Dover may have originated as a port of little importance but later grew in prominence due to trade and the presence of a Roman naval base. The Roman port and city of Dover are good examples of the transition from local culture to Roman and, later, an important Saxon town. The Dover lighthouse follows localized trends, from the use of its local stone to the purported inspiration of its construction from Caligula's tower in Boulogne. The octagonal shape of the Dover lighthouse is attributed to cities of Celtic origin. If the lighthouse at Dover was begun by Caligula and finished by Claudius, it may have been part of a series of lighthouses/triumphal monuments marking Claudius's successful campaign and triumphal return to Rome. The lighthouse may have stood as functional propaganda architecture, although its function far outlived the symbolism of Roman imperial power. The Roman lighthouse at Dover is a testament to Roman engineering

[272] De la Bedoyere 2013, 175.
[273] Supra n. 270.

and an important example of physical remains that provide valuable information about the construction, materials, and function of ancient lighthouses.

CHAPTER III

THE ROMAN LIGHTHOUSE AT PATARA, TURKEY

The city of Patara, located in modern-day Turkey, was the capital city of the Lycian League and a major port city during the Classical, Hellenistic and Roman Imperial periods. Patara was also the location of a temple of Apollo and the oracle of Apollo, second in importance only after Delphi on mainland Greece.[274] Excavations conducted by Turkish archaeologists began at Patara in 1988, and in 1993, a Roman milestone called the *Stadiasmus Patarensis* was revealed on which was inscribed a dedication to Claudius (41-54 CE) by the Lycians, and lengths of roads constructed by emperors.[275] The milestone also announced the construction of roads by the governor Quintus Veranius Nepos, who was responsible for the organization of Lycia as a new province under Claudius.[276] The mile marker is one of the oldest known imperial honors in Patara.[277] Excavations in 2003 unearthed the base and part of the tower of the Patara lighthouse, which has since been hailed as the oldest standing lighthouse.[278] This chapter

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[274] Hdt. 1.182 (Godley 1920). Herodotus (484- 425 BCE) indicates that the oracle was delivered at specific times during the year.
[275] Şahin, S., 1997, "Ein vorbericht uber den Stadiasmus Provinciae Lyciae," *Lykia* 1; Jones, C.P., 2001, "The Claudian Monument at Patara," *ZPE* 137:161.
[276] Şahin, S., 2008b, "Kaiserbauten Und Kaiserehrungen in Patara," In *Vom Euphrat bis zum Bosporus: Kleinasien in der Antike: Festschrift für Elmar Schwertheim zum 65. Geburtstag (Asia Minor Studien 65)*, edited by E. Winter, 597-610 (Bonn: Habelt), 597.
[277] Şahin 2008b, 602.
[278] Özkut 2009, 23; The lighthouse at Patara is 60 years older than the Tower of Hercules in Spain, which has been considered the oldest. İşkan-Işik, H., W. Eck, and H. Engelmann, 2008, "Der Leuchtturm Von Patara Und Sex. Marcius Priscus Als Statthalter Der Provinz LyciaVon Nero Bis Vespasian," *ZPE* 164: 91-2.

discusses the historical and political background that led to the construction of the lighthouse, and its physical and functional characteristics.

Historical Background

Patara was located in the region, and later Roman province, of Lycia. Control of Lycia shifted between different empires in the Mediterranean and in Asia Minor for centuries, beginning with the Persian Empire in the sixth century BCE. The involuntary incorporation of Lycia into the First Persian Empire, the Achaemenid Empire, led to the influx of Persian speakers at the expense of speakers of the native Luwian language.[279] Under the close scrutiny of the Persian Empire, Lycia was a client state ruled by a single monarch who was most likely a local, native Lycian dynast, at the inland city of Xanthos.[280] The city of Patara originated as a port serving the city of Xanthos[281] and housed the Lycian fleet[282] in the fifth century BCE under Xerxes,[283] although the entire fleet was sunk at the Battle of Salamis in 480 BCE.[284]

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[279] Bryce, T., 1983, "The Arrival of the Goddess Leto in Lycia," *Historia* 32, 1:7-8.
[280] Keen, A.G., 1998, *Dynastic Lycia: A Political History of the Lycians & Their Relations with Foreign Powers, c. 545 - 362 BC* (Leiden: Brill), 84, 87.
[281] App. *BCiv*. 4.10.81 (White et. al. 1912).
[282]; Bryce, T. and J. Zahle, 1986, *The Lycians*, (Copenhagen: Museum Tusculanum Press), 204; Keen 1998, 84.
[283] Hdt. 7.98 (Godley 1920).
[284] Aesch. *Pers*. 345 (Smyth, H.W., ed. and transl., 1926, Aeschylus, *Persians* Vol. 1 [Cambridge: Harvard University Press]); Hdt. 8.70-95 (Godley 1920); Hammond, N.G., 1956, "The Battle of Salamis," *JHS* 76:48.

Lycia briefly held membership in the Delian League, which, under the leadership of the Athenians, attempted to push back the Persians in Anatolia. Lycia seceded from the Empire in 431 BCE and became independent, then defaulted from the Delian League during the Peloponnesian War (431-404 BCE).[285] After another brief period of Persian rule and the conquering of Lycia by Mausolus of Caria in the mid-fourth century BCE, Lycia then came under the Macedonian hegemony, which led to an influx of Greek speakers and left few Lycian speakers.[286] This led to the disappearance of the Lycian[287] language from coinage and inscriptions, and a strong Hellenistic influence in some of the architecture at Patara, such as the podium of the lighthouse. Rock-cut tombs near other Lycian cities like Xanthos, Tlos, and Myra, (Fig. 3-1) display a mixture of Greek, Oriental, and Anatolian influence.[288] Other examples of Hellenistic influence in Lycia include polygonal masonry in the second-century CE granaries of Patara and Andriake.[289]

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[285] Larsen, J., 1945, "Representation and Democracy in Hellenistic Federalism," *CP* 40, 2:71; Lendering, J., 2018, "Lycia," *Articles on Ancient History*, www.livius.org/articles/place/lycia, (Accessed 9/1/2018): There was no non-secede clause to prevent Lycia from leaving the Athenian Empire.
[286] Işik, F., 2000, *Patara: The History and Ruins of the Capital City of Lycian League*, Translated by M. Çobanoğlu (Antalya: Universal Holding), 7; Stark, F., 1958, *Alexander's Path* (San Diego: Harcourt, Brace & Co.), 107.
[287] Supra n. 279. The Lycian language followed the Luwian language in the Iron Age.
[288] Çevik, N., 2003, "New Rock-Cut Tombs at Etenna and the Rock-Cut Tomb Tradition in Southern Anatolia," *AnatSt* 53:97, 113-14.
[289] Waelkens, M., 1989, "Hellenistic and Roman Influence in the Imperial Architecture of Asia Minor," *BICS* Supplement 55: Plutarch Life of Kimon 36, S55:77.

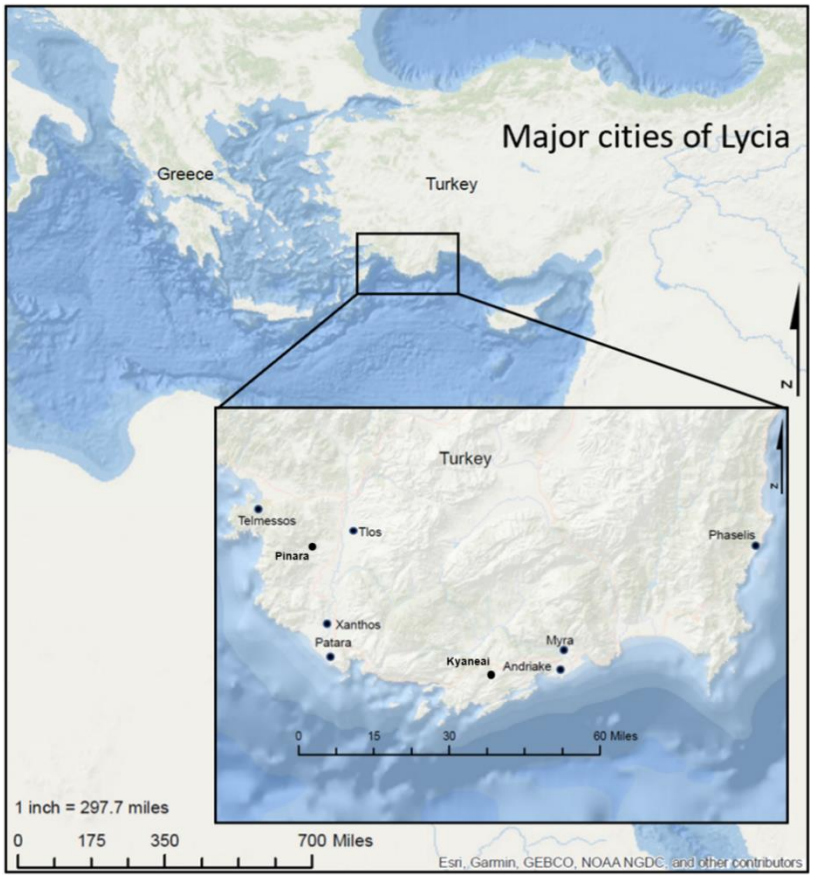

Fig. 3-1. Map of major cities in the region of Lycia. Reprinted using Esri software.

After the death of Alexander the Great in 323 BCE, Lycia experienced a quick series of leaders from Antigonus (304-301 BCE) and Lysimachus (301-281 BCE), who were both successors of Alexander, to the Ptolemaic Kingdom (240-200 BCE) and the Seleucids (200-190 BCE).[290] Finally, Lycia was given to Rhodes by Rome in 188 BCE for 20 years under the Treaty of Apamea.[291] The citizens of Lycia claimed that Rhodes oppressed and enslaved them, and Polybius wrote that in response, Rome sent envoys to

[290] Işik 2000, 8.
[291] App. *Syr*. 39 (White, H., ed. and transl., 1899, Appian, *The Foreign Wars* [New York: The Macmillan Company]); Polyb. *Hist*. 21.42 (Shuckburgh 1962).

Rhodes to communicate that Lycia had been handed over to be treated like friends and allies, not as a gift.[292] Rome established home rule[293] in 168 BCE, giving the Carians and Lycians their freedom and returning to Lycia a level of independence and solidarity that it had not seen since its defeat by the Carians under Mausolus in the fourth century BCE.[294] Lycia remained a Roman protectorate until Claudius annexed it to the Empire and organized it as a province in 43 CE.[295] Finally, Vespasian joined Lycia and Pamphylia into one province in 74 CE.[296]

There is conflicting information regarding why Lycia was annexed by Claudius. Rome commonly annexed client states in response to internal strife, loss of stability, or the end of a dynasty within the state.[297] A 45/46 CE inscription found at Perge[298] and the contemporary writers Suetonius (69-122 CE) and Cassius Dio (155-235 CE), indicate that Lycia needed Roman intervention to reestablish stability and offset internal conflict.[299] Suetonius writes that "Claudius deprived Lycia of its independence because

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[292] Polyb. *Hist.* 25.3 (Shuckburgh 1962); According to Livy (*Ab urbe cond*. 42.14.8, Roberts 1912), Rhodians said that the Lycians were stirred up against Rhodes by Eumenes, the king of Pergamon.
[293] Home rule: self-government granted by the Roman Empire with limited autonomy.
[294] Between 168 and 167 BCE, Polybius (*Hist* 30.5.12, Shuckburgh 1962) records a decree given by the Roman Senate which freed the two regions from Rhodian control as a result of the strained relationship between Rome and Rhodes. Livy, *Ab urbe cond.* 44.15.1 (Roberts 1912); Bryce and Zahle 1986, 102.
[295] Jones 2001, 161. A protectorate is a state that is controlled and protected by another power.
[296] Özer, E., 2013, "The Lycian League and Olympus in Eastern Lycia," *Mediterranean Journal of Humanities* 3, 1:214.
[297] Kantor, G., 2006, "Ancestral Laws under the Roman Rule: The Case of Lycia," (Ph.D. diss, Balliol College Oxford), 16.
[298] Onur, F., 2008, "Two Procuratorian Inscriptions from Perge," *Gephyra* 5; Şahin, S. and M. Adak, 2007, *Stadiasmus Patarensis: Itinera Romana Provinciae Lyciae* (in German) (Istanbul: Ege Yayınları). In the inscription, the Lycians praise Claudius for freeing them from lawlessness and for restoring their ancestral law, and reference the transfer of power to councilors from the multitudes.
[299] Cooley, A.E., S. Mitchell, and B. Salway, 2007, "Roman Inscriptions 2001-2005," *JRS* 97:181; The inscription on Face A of the Roman milestone is by the Lycians who indicate themselves as "'Rome- and

of deadly internal feuds,"[300] and according to Cassius Dio, Claudius "reduced the Lycians to servitude because they had revolted and slain some Romans and he incorporated them in the prefecture of Pamphylia."[301] On the other hand, the claim that Claudius was the one to combine Lycia and Pamphylia is refuted by the fact that Lycia had provincial governors with propraetorial rank (*legati Augusti pro praetore Lyciae* or ex-consuls whose power to control an army extended beyond their regular term), such as Sextus Marcius Priscus (63-71 CE), while Pamphylia's governors were prefects.[302] The move to annex Lycia could also have been a military strategy, as Patara was a supply port and the headquarters of the Lycian League.[303]

History of the Lycian League

The formation of the Lycian League in the second century BCE marked a major development of the region by giving the Lycians a level of solidarity and expanding their political and economic ties.[304] The Lycian League, whose name *Lukiakou systema,* means "standing together,"[305] was known for its stability and for achieving independence from Rome in 167 BCE.[306] The League is also significant today for being

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Caesar-loving' allies of Rome, to Claudius, honouring him as 'the saviour of their nation' who has freed them 'from faction, lawlessness and brigandage through his divine foresight'".
[300] Suet. *Claud*. 23.3 (Reed and Thomson 1899).
[301] Cass. Dio. 60.17.3-4 (Cary et. al. 1914).
[302] Supra n. 301; Syme, R., 1937, "Pamphylia from Augustus to Vespasian," *Klio* 30, 30.
[303] Supra n. 276.
[304] Bryce and Zahle 1986, 102.
[305] Supra n. 304.
[306] Supra n. 304; Polyb. *Hist*. 30.5.12 (Shuckburgh 1962) and Livy, *Ab urbe cond*. 44.15.1 (Roberts 1912).

the first democratic union, an early federation with republican principles.[307] During Lycia's tenure as a territory of Rhodes, the Lycian Embassy complained of Rhodian tyranny, and the League may have been formed to persuade Rome to reverse the Lycian annexation to Rhodes.[308] It is unknown, though, if the League was formed before or after Lycia was removed from Rhodian control.[309] The first mentions of the Lycian League are found in two inscriptions from the second century BCE that honor two citizens by the League.[310]

The Lycian League was made up of 23 cities that met in a general assembly.[311] Coins were minted to represent each member city.[312] The League did not have freedom over matters regarding war and peace, but they were allowed to choose a head of the League, referred to as a *Lyciarch*, and to retain their ancestral laws and customs, as was characteristic when the Romans annexed regions.[313] The Lycian League was allowed to exist after Lycia was annexed in 43 CE, as was self-governance regarding local traditional law and League authority over its local courts, though they were not allowed to keep their army.[314]

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[307] Larsen 1945, 87-8, 91. A reference to the Lycian democracy is listed in *TAM* (*Tituli Asiae Minoris*) II 582.
[308] Supra n. 304.
[309] Supra n. 304.
[310] Supra n. 304. The first inscription dates to between 188 and 181 BCE and honors a Ptolemaic official, the second was found in the ancient Lycian city of Araxa, dates to 180 BCE, and honors a citizen hailing from the city.
[311] Strab. *Geog*. 14.3.3 (Jones 1924).
[312] Troxell, H.A., 1982, *Coinage of the Lycian League. NNM* 162 (New York: American Numismatic Society); Özer 2013, 217.
[313] Supra n. 311.
[314] Supra n. 313; Kantor 2006, 20.

A treaty of alliance (*foedus*) between Rome and the Lycian League was signed by Caesar in 46 BCE and nearly the full text is preserved on a first-century BCE bronze tablet.[315] The treaty established the framework for judicial distinction under the Lycian League and the Roman chief justice for foreigners, and was used to settle how legal questions were to be resolved between the Roman provincial governor and the Lycian League.[316] This treaty was a reciprocal agreement between Rome and Lycia that declared the preeminence of Rome and required the support of one another during times of conflict, determined how members charged with crimes in the other region were to be dealt with, and the remission of captive prisoners, ships, animals, and territories.[317] An inscription from the site of Tyberissos near the city of Myra, which possibly dates to the first or second century BCE, describes an earlier agreement between Lycia and Rome with similar content, though the context and date are uncertain.[318] The earlier treaty also detailed peace and loyalty between Rome and Lycia, stipulating that neither party was allowed to let enemies cross territory that was controlled by the other or to give them aid, that if either party was to be engaged in war, the other was to give aid, and that any changes to the treaty could be made together.

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[315] Kantor 2006, 10. The tablet is in the Martin Schøyen collection, P.Schøyen I 25, 175-78 (Mitchell, S., 2005, "Papyri Graecae (Schøyen I)" in *Papyrologica Florentina XXXV*, edited by R. Pintaudi, 163-258. [Firenze: Edizioni Gonnelli]).
[316] Kantor 2006, 11.
[317] Derow, P., C. Smith, and L.M. Yarrow, 2012, *Imperialism, Cultural Politics, and Polybius* (Oxford: Oxford University Press), 136.
[318] Marek, C. and P. Frei, 2016, *In the Land of a Thousand Gods: A History of Asia Minor in the Ancient World* (Princeton; Oxford: Princeton University Press), 229, 277. There is very little known of Tyberissos and the city itself is only known from inscriptions.

Historical Background of Patara

In the first century CE, Patara was the capital of both the Lycian and Pamphylian provinces, the seat of the Roman provincial governor of the region, and Lycia's primary seaport.[319] Patara was also the capital of the Lycian League,[320] and as one of the leading cities, it had the maximum three votes.[321] Patara was the base for a Roman fleet, *Classis Syriaca,* which was established under Vespasian during the Jewish War (66-73 CE). The port of Patara was used by the fleet to keep in contact with the Empire's eastern provinces, though the fleet's main base was at Seleucia Pieria in modern-day Syria.[322] Strabo claims the city of Patara was founded by Patarus, the son of the Olympian deity Apollo and Lycia, either a nymph or daughter of Xanthos in Greek mythology, who may have been the local river god.[323] The origin of Patara is dated to at least the seventh century BCE by ceramics and coins,[324] though it may have been occupied as early as the

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[319] Işik 2000, 10.

[320] The following contemporary sources support Patara as one of the principal cities of the Lycian League: App. *BCiv*. 4. 52.81 (Denniston and Robson 1912); Cic. *Flac*. 32 (MacDonald, C., ed. and transl., 1976, Cicero, *In Catilinam 1-4. Pro Murena. Pro Sulla. Pro Flacco* [Loeb Classical Library]); Dionys. *Per*. 129.507 (Lightfoot, J., ed. and transl., 2014, Dionysius Periegetes, *Description of the Known World* [Oxford: Oxford University Press]); Livy, *Ab urbe cond*. 33.41 [37 15.6], 38. 39 (Roberts 1912); Polyb. *Hist*. 22.26 (Shuckburgh 1962); Plin. *NH*. 2.112.28 (Bostock 1855); Ptol. 5.3.3, 8.17.22 (Grieningerus, I. and I. Koberger, ed. and transl., 1525, Ptolemy. *Claudii Ptolemaei Geographicae enarrationis libri octo* [John Boyd Thatcher Collection, Library of Congress]).

[321] Strab. *Geog*. 14.3.3 (Jones 1924); Işik 2006, 272.

[322] Tac. *Ann*. 2.78 (Church et. al. 1942); D'Amato, R., 2016, *Imperial Roman Warships 27 BC–193 AD,* (New York: Bloomsbury USA Publishing), 23.

[323] Strab. *Geog*. 14 (Jones 1924); Bryce, T., 2009, *The Routledge Handbook of the Peoples and Places of Ancient Western Asia: The Near East from the Early Bronze Age to the fall of the Persian Empire* (London, New York: Routledge, Taylor and Francis Group), 534.

[324] Hill, G.F., 1897, *Lycia, Pamphylia and Pisidia, BMC* Greek (London: British Museum), xxvi, xxii, xxiii. Coin Series I of the British Museum, bearing the KUB, is dated by Hill to the window 520-480, somewhat less precisely than the 520–500. Işik 2000, 6; Işik 2006, 265; Işin, G., 2010, "The Building Complex on the Tepecik Acropolis at Patara," *AnatSt* 60:96. The 1998 excavations at Patara revealed seventh-century Ionian ceramics on the surface layer of Tepecik Hill.

early Iron Age (12th -eighth centuries BCE) or even Late Bronze Age (1600-1200 BCE), based on the excavations at Patara that began in 1988.

There is considered to have been a "dark age" in Lycian cultural history, during the same period as the Greek Dark Ages, ca. 1100-900 BCE.[325] The excavations at Patara unearthed Late Bronze Age and early Iron Age artifacts, such as a stone axe and pottery sherds, which suggested that a "lightening of this dark age" occurred before the early Iron Age, and that Patara was occupied earlier than originally thought.[326] Ceramics with Protogeometric circles were found in Patara's necropolis, located near Tepecik Hill (Fig. 3-3), in 1992, which is a style consistent with the early Iron Age.[327] A Bronze Age stone axe was found in 1993, and Bronze Age pottery sherds were documented in 1999 under the southwest terrace wall of the Tepecik building complex.[328] Considering the early artifacts, it seems likely that Patara was occupied during the Bronze Age.

Işik argues that Patara should have been connected to other Mediterranean countries and ports before the Iron Age because of its wide bay in which ships could take refuge during storms and to resupply.[329] Using the examples of the Cape Gelidonya (1200

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[325] Mellink, M., 1998, *The Ages of Homer*, edited by J. Carter and S. Morris (Austin: University of Texas Press), 34.
[326] Işik 2006, 264.
[327] Işik 2006, 265.
[328] Supra n. 327; Işin 2010, 96.
[329] Işik 2006, 264-5.

BCE)[330] and Uluburun (1325 BCE)[331] shipwrecks, which were discovered and excavated on the nearby coast by the Institute of Nautical Archaeology at Texas A&M University, Işik maintains that ships would have had to stop at Patara for food, water, and shelter from dangerous storms.[332] The use of this coast during the Bronze Age is further substantiated by the identification of the city of Patara and a "Mount Patar" in Luwian hieroglyphics inscribed on orthostats (large, slab-shaped stones that have been purposely set upright) that were found in the Hittite spring sanctuary of Yalburt, which was an Imperial Hittite water monument in central Turkey (Fig. 3-2). The name of the Late Bronze Age Hittite king, Tudhaliya IV, was found in the inscription, which reads, "Opposite the Mount Patar, I gave votive offerings and gifts, erected stelae and sacred rooms."[333] Işik theorizes that because both the city and mountain have a similar name and because Hesychius of Alexandria wrote in the fifth century CE that "Patara is mountain and city,"[334] the king is referring to the hill southeast of the city, referred to today as the *Doğucasarı,* (Fig. 3-3).

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[330] Bass, G. et. al., 1967, "Cape Gelidonya: A Bronze Age Shipwreck," *TAPS* 57, 8. Cape Gelidonya is located south of the later Lycian city of Phaselis (Fig. 3-1).
[331] Aruz, J.K., Benzel, and J.M. Evans, eds., 2008, *Beyond Babylon: art, trade, and diplomacy in the second millennium B.C.* (New York: Metropolitan Museum of Art); Katz, H., 2008, "The Ship from Uluburun and the Ship from Tyre: An International Trade Network in the Ancient Near East," *Zeitschrift des Deutschen Palästina* 124, 2; Pulak, C., 1988, "The Bronze Age Shipwreck at Ulu Burun, Turkey: 1985 Campaign," *AJA* 92. The Uluburun shipwreck was found just east of the site of Patara (Fig. 3-1).
[332] Supra n. 329.
[333] Supra n. 329.
[334] Bryce and Zahle 1986, 220.

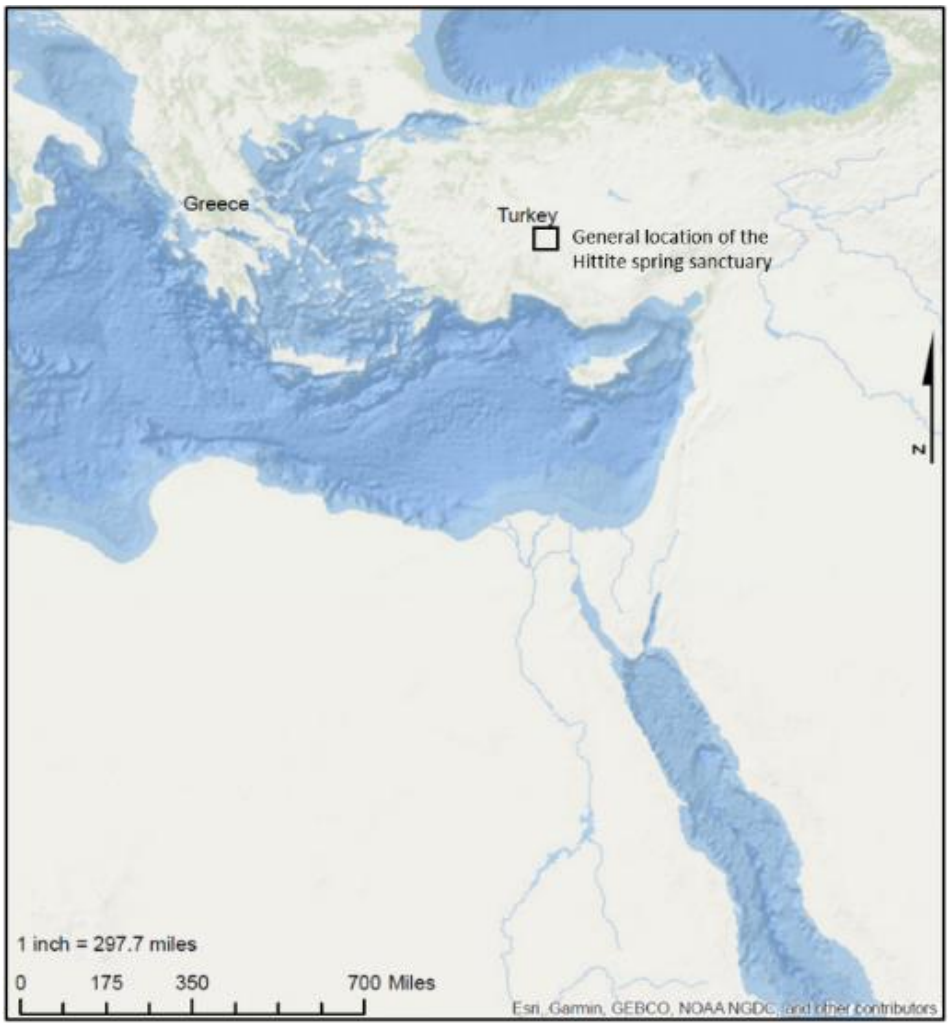
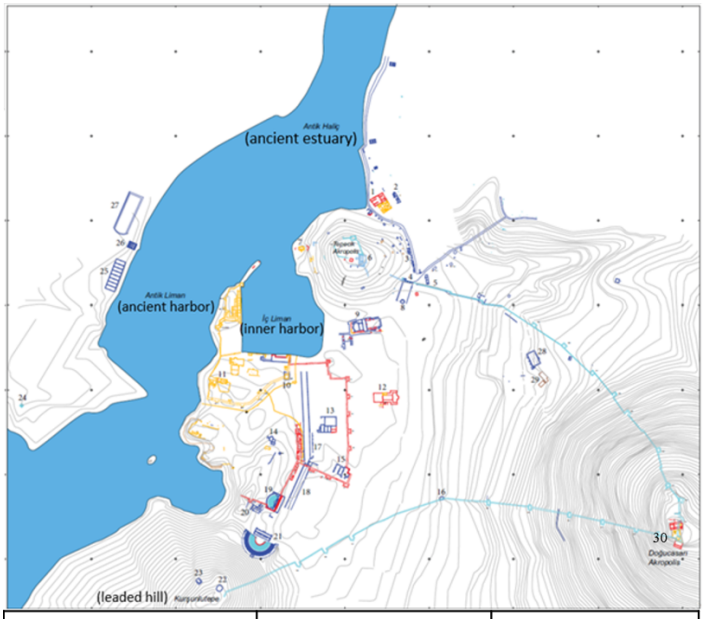


Fig. 3-2. Location of the Hittite spring sanctuary, Turkey. Reprinted using Esri software.



1. Cemetery/church	11. Walled city church	21. Theater
2. Ceramic ovens	12. Basilica	22. Cistern
3. Tepecik Necropolis	13. Central bath	23. Mausoleum
4. Mettius modestus jewelry	14. Small bath	24. Lighthouse
5. Waterway trenches	15. Vespasian bath	25. Granarium
6. Tepecik building complexes	16. Maslak II	26. Temple grave
7. Port church	17. Main street	27. Stadium
8. Octagonal pool	18. Agora western portico	28. Main water tank
9. Port bath	19. Bouleuterion	29. House excavation
10. Prostyle temple	20. Prytaneion?	30. Doğucasarı

Fig. 3-3. Map of the site of Patara. Adapted from İşkan 2013, 20, Fig. 3.

Constructing the Patara Lighthouse

The construction of the Patara lighthouse was likely part of a large project designed by the governor Mucianus on the orders of the Emperor Nero (54-68 CE) for the rehabilitation of the port.[335] Five main figures are associated with the harbor renovations

[335] Şahin, S., 2008a, "Der Neronische Leuchtturm und die vespasianischen Thermen von Patara," *Gephyra* 5:19; Şahin 2008b, 600; Şahin 2009, 343.

and construction of the lighthouse: the emperors Claudius, Nero, and Vespasian, and the government officials Sextus Marcius Priscus and Gaius Lucinius Mucianus. The preparation work for the lighthouse may have occurred under Claudius (41-54 CE), as the construction of utilitarian/civic buildings was characteristic of his building program.[336] For example, he built roads, canals, and the harbor and lighthouse at Portus.[337] Claudius was also responsible for building an aqueduct in Patara which was damaged by an earthquake in 68 CE and repaired under Vespasian.[338] Nero (54-68 CE) was emperor when the lighthouse at Patara was constructed, but it is unclear whether he was directly involved beyond ordering its construction. Sextus Marcius Priscus was Vespasian's legate of Lycia with propraetorian rank from 68-70 CE.[339] An inscription dating to Vespasian's reign indicates that Priscus's reign may have been eight years, which would have lasted from 63/64 CE to 70/71, uninterrupted.[340] His term was unusually long, possibly because of political turmoil in 68/69 CE, and special circumstances like the earthquake in 68 CE that damaged the aqueduct in Patara.[341] Priscus may have been responsible for a large project related to the port rehabilitation.[342]

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[336] Şahin 2008b, 600.
[337] Supra n. 336.
[338] Şahin 2008b, 598. There were two inscriptions found on the aqueduct that confirm that it constructed by Claudius and was damaged by an earthquake in the first century CE, and credit Vespasian with the repairs. The inscriptions also state that the repairs were paid for through the poll tax. English translation of the inscriptions by İşkan-Işik et. al. 2008.
[339] *Legatus Augusti pro praetore* (propraetorian legate of the emperor) was the official title for governors of certain provinces, including Lycia. *CAH* X 369, Table 2.
[340] İşkan-Işik et. al. 2008, 114.
[341] Supra n. 340: The years between the end of Nero's reign and the beginning of Vespasian's were full of conflict between emperors and the senatorial ruling class. Şahin 2008b, 599.
[342] Şahin 2009, 343.

Mucianus was a figure in the reigns of all three emperors associated with Patara.[343] He served as a governor in Lycia-Pamphylia[344] under Nero in 58, 59, or 60 CE,[345] then progressed to serve as consul either in 64 CE or one of the following years, and in 67, Nero made him the suffect consul of Syria.[346] Vespasian (69-79 CE) came to power in 69 CE, only a year after Nero's death, the last in a quick succession of emperors that year.

The harbor restoration and lighthouse construction may have been included in the framework of the Lycian Customs Act, proof of which was found at the port city of Andriake in 1999.[347] The Customs Act was likely issued by Nero between 62 and 65 CE during the consulship of Mucianus, and it would have been posted at important ports in the region like Andriake, Patara, Phaselis, and Telmessos (Fig. 3-1).[348] The Customs Act may also be parallel to the Customs Law of Asia, or *Lex Portorii Asiae,* evidence of which was found at Ephesus in 1976.[349] The *Lex Portorii Asiae*[350] was legislated and amended by various consuls and curators (legal guardians or trustees) from 75 BCE to

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[343] Levick, B., 1999, *Vespasian* (London: Routledge), 29; Syme, R., 1977, "The March of Mucianus," *Antichthon* 11.
[344] Ash, R., 2007, "The Wonderful World of Mucianus," *BICS* Supplement 100: 2.
[345] de Kleijn, G., 2009, "C. Licinius Mucianus, Leader in Time of Crisis," *Historia* 58, 3:315.
[346] Supra n. 345; A suffect consul was a Roman governor who completed the term of a consul who vacated before the end of the year.
[347] Takmer, B., 2007a, "Lex Portoii Provinciae Lyciae: The Customs Law from Andriake," in *13th International Congress of Greek and Latin Epigraphy*, Oxford, September 2-7, 2007, 65-6 (Oxford: Oxford University Press).
[348] Supra n. 342; Takmer, B., 2007b, "Lex Portorii Provinciae Lyciae Ein Vorbericht über die Zollinschrift aus Andriake aus neronischer Zeit," *Gephyra* 4; *SEG* 57-1666.
[349] Şahin 2009, 334.
[350] Cottier M. et. al. eds., 2008, *The Customs Law Of Asia* (Oxford: Oxford University Press), 8-10.

62 CE. The latter date is close to the possible initial date of construction of the lighthouse at Patara (62/63 CE).[351]

Ancient customs laws primarily concerned dues owed for imports and exports on both land and sea,[352] specifying even the exact number of customs posts—one per harbor.[353] Although the customs laws primarily apply to taxation, the customs post specifications suggest the laws extended to architectural matters as well.[354] Thriving port cities like Patara were important as they handled the magnitude of maritime trade occurring in the Roman Empire. It was easier and cheaper to transport over water than land, even accounting for threats from pirates and storms,[355] and port cities could exact customs taxes from ships coming into the harbor.[356] Giardina theorizes that several lighthouses, Fos-Sur-Mer (in France), Canale S.Felice (first or second century CE) near Venice,[357] Baro Zavalea in the Commacchio Valley (first century BCE),[358] and Torre di Caligo in

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[351] Supra n. 342.
[352] Ogereau, J.M., 2012, "Customs Law of the Roman Province of Asie (lex Portorii Asiae)," in *New Document Illustrating Early Christianity*, Vol. 10, edited by S.R. Llewelyn and J.R. Harrison, 95-109 (Grand Rapids: Eerdmans), 96.
[353] Ogereau 2012, 97.
[354] Supra n. 354. The core clauses of the law regarding taxes on both maritime and terrestrial imports and exports in and out of the province of Asia are detailed in the first 30 paragraphs of the *lex portorii Asiae*.
[355] Thornton and Thornton 1989, 79.
[356] The Customs Law of Asia, found at Ephesus, discusses the customs system in the province of Asia, including the harbor taxes levied against ships, imports, exports, and slaves. See Cottier et. al. 2008.
[357] Canal, E., 1998, *Testimonianze archeologiche nella Laguna di Venezia, L'Età Antica* (Venizia: Cavallino di Venizia), 74; D'Agostino, M. and S. Medas, 2010, "Roman Navigation in Venice Lagoon: the Results of Underwater Research," *IJNA* 39, 2:290; Giardina 2010, 85.
[358] A base of sesquipedal bricks were found dating to the Augustan period that were thought to be the Baro Zavalea lighthouse, although most of the remains of the supposed Baro Zavalea tower were destroyed in 1982. D'Agostino and Medas 2010, 290; Giardina 2010, 86; Uggeri, G., 1975, "Baro Zavalea, near Comacchio. Torre Romana," *FA* 2, 30-31:795.

the Jesolo valley near Venice,[359] functioned as both lighthouses and customs houses and he identifies this as a pattern of lighthouses at river mouths.[360] Whether or not the harbor of Patara had a designated customs house is not known. Considering Giardina's hypothesis, it is possible that the lighthouse at Patara also functioned as a customs house.

Epigraphy

Epigraphy has proved an important source of evidence for the city of Patara and its architecture. The *Stadiasmus Lyciae* or *Patarensis* milestone found in 1993 listed provincial cities and itineraries, or roads, that began at Patara.[361] Three inscriptions were found in Patara that date to the last years of Nero's reign and the first year of Vespasian's. The inscription found near the lighthouse at Patara[362] (Fig. 3-4) records the building of the lighthouse by Nero between 64 and 65 CE through Priscus, and is dated to Nero's eleventh tribunician power (from October 64 to October 65).[363] The lighthouse may have been finished by this date, for the inscription was to be attached to the body of the lighthouse (See Fig. 3-7 for a model of the lighthouse with the inscription).[364] The letters were originally of gilded bronze, which has been lost, but the outlines and holes remain, and it is possible that the absence of the bronze lettering is a result of the

[359] The exact date of the port is unknown, and the lighthouse may have been medieval though it was constructed using Roman bricks. D'Agostino and Medas 2010, 290; Giardina 2010, 84.
[360] Supra n. 212.
[361] Dueck, D., 2012, *Geography in Classical Antiquity* (Cambridge: Cambridge University Press), 116.
[362] *TAM* II, 399.
[363] Jones, C.P., 2008, "The Neronian Inscription on the Lighthouse of Patara," *ZPE* 166:153.
[364] İşkan-Işik et. al. 2008, 111.

damnatio memoriae (condemnation of memory) placed on Nero in 68 CE.[365] The second inscription, likely dating to between 71 and 72 CE, honors Priscus for governing justly for eight years, and for his construction of the lighthouse and a signal tower. The third, which is undated, records the repair of an aqueduct by Vespasian.[366] The first two are important because they confirm Priscus's proconsulship under both Nero and Vespasian, which had previously been doubted.[367] İşkan-Işik, Eck, and Engelmann argue that the signal tower and lighthouse would have been constructed at the same time and because of this there would have also have been an inscription on the signal tower.[368]

Construction and Funding of the Lighthouse

The text of the inscription that was found near the lighthouse, as translated by İşkan-Işik, Eck and Engelmann, reads:

> Nero Claudius Caesar Augustus Germanicus, son of the deified Claudius, grandson of Tiberius Caesar Augustus and Germanicus Caesar, great-grandson of the deified Augustus, supreme priest, owner of the tribunician force for the eleventh time, consul for the fourth time, ruler/victor over the earth and the sea to the [x.] Father of the Fatherland, has this lighthouse built for the protection of seafarers by Sextus Marcius Priscus, the imperial legate in propraetorian rank who has the building carried out.[369]

[365] Giardina 2010, 72.
[366] Şahin 2008b, 609.
[367] Supra n. 363; Eck, W., 1970, "Die Legaten von Lykien und Pamphylien unter Vespasian," *ZPE* 6.
[368] Supra n. 364.
[369] İşkan-Işik et. al. 2008, 108.

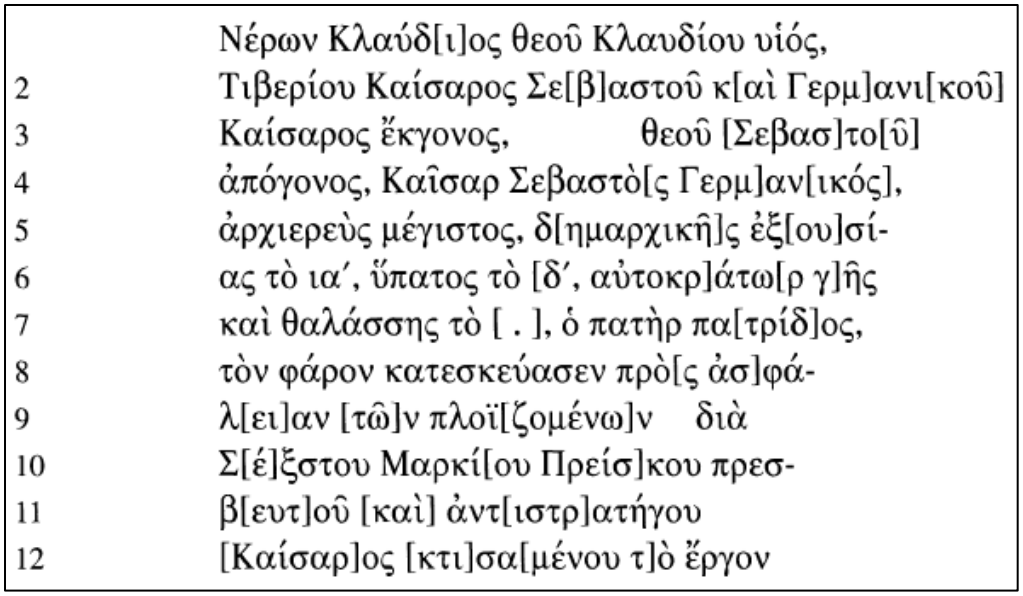

Fig. 3-4. Greek text of the Patara lighthouse inscription. Reprinted from İşkan-Işik et. al. 2008, 108.

Assuming that the translation by İşkan-Işik, Eck, and Engelmann is correct, the inscription indicates that Nero commissioned the lighthouse and ensured that there were funds for it, while Priscus oversaw the actual construction. İşkan, Eck and Engelmann reconstruct the word "[κτί] σα[μένου τ]" in line 12 of the inscription, (Fig. 3-4),[370] whereas Jones argues that the word actually reads "[κτί] σα[ντος]," and that this phrase means that Priscus is credited with "having built" the lighthouse, and Nero credited with constructing the lighthouse,[371] suggested by the translation of "κατεσκεύασεν" in the eighth line, as meaning "constructed". The present participle neuter "κατασκευάσαντα" is used in the 71 CE inscription in reference to Priscus's activity and may mean "prepare, equip, or practice", whereas the lighthouse inscription credits him only with

[370] Supra n. 369.
[371] Jones 2008, 154.

"having built" the lighthouse. İşkan-Işik, Eck, and Engelmann argue that Nero had an active role based on the nomative in the emperor's name, but that the funds for the lighthouse construction did not come from the imperial treasury.[372] They instead propose that Priscus could have asked the emperor for certain funds for the construction, or that it was funded by the people, similar to the construction of the aqueduct.[373]

Based on this discrepancy in the lighthouse's inscription, the construction was either a government-funded or privately funded project.[374] Christiansen argues that the construction of the lighthouse was funded privately and provides three examples of what he believes to be private financing of lighthouse construction: on the Greek island of Kos in the eastern Aegean, a bilingual inscription in Phoenician and Greek was found that alludes to towers for seamen in the harbor,[375] and the Phoenician text mentions fires for the safety of the seamen.[376] The inscription names Abdalonymos, son of the last king of Sidon, as the benefactor.[377] Similar inscriptions were found with the Ã Coruna

[372] Supra n. 364. Financing from the treasury would have been arranged in a different way.
[373] İşkan-Işik et. al. 2008, 110-11. The inscription on the aqueduct is similar to the lighthouse inscription in how it describes the role of the emperor. The inscription indicates that Vespasian built the aqueduct and brought water into the city.
[374] For example, the Pantheon was privately funded by the Roman statesman Marcus Agrippa. Cass. Dio. 53.23.3 (Cary et. al. 1914); Thomas, E., 1997, "The Architectural History of the Pantheon from Agrippa to Septimius Severus via Hadrian," *Hephaistos* 15:165.
[375] Kantzia, C. and M. Sznycer, 1980, "Une inscription bilingue gréco-phénicienne de Cos," *ArchDelt* 35. There is in the Phoenician text a Semitic term translated as "beacons".
[376] Christiansen 2014, 236. These three inscriptions are similar to the inscription of the Pharos of Alexandria in that each inscription states that the lighthouses were built for the protection of sailors.
[377] Supra n. 376.

lighthouse in Spain and the lighthouse at Patara.[378] Lupus of Corunna is named as the architect of the Ã Coruna tower.[379] Neither Lupus nor Abdalonymos was a native of the city in which they built or funded their lighthouses. Christiansen argues that the inscriptions indicate these figures both constructed and paid for the lighthouses, and asks whether the governor of Patara would have had the means to fund the construction of the lighthouse.[380] The statue base dating to Vespasian's reign with the inscription honoring Priscus,[381] states that the consul of Patara erected the statue to honor Priscus for his successful term and for the construction of the lighthouse built for the safety of sailors, which may support the idea that Priscus both funded and oversaw the construction.[382] İşkan-Işik, Eck, and Engelmann argue, however, that a governor did not invest his personal funds in a province, and suggest that Priscus may have been in the province prior to 64/65 CE if he was in fact directly involved in the funding.[383]

The construction of the lighthouse may also have been funded through taxes, like the Colosseum in Rome (first century CE) and the repair of the aqueduct by Vespasian, both indicated by inscriptions.[384] Both Claudius and Nero were under less pressure than

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[378] Ã Coruna inscription: Le Roux, P., 1992, "Le phare, l'architecte et le soldat. L'inscription rupestre de La Corogne (CIL, II, 2559)," in *Miscellanea greca e romana* 15 (Rome: Istituto italiano per la storia antica); *CIL* II, 2559=5639; Patara inscription: Jones 2008; İşkan-Işik et. al. 2008, 118-21.
[379] Supra n. 376.
[380] Supra n. 376.
[381] Supra n. 365.
[382] İşkan-Işik et. al. 2008, 108-9; Christiansen 2014, 236.
[383] Supra n. 364.
[384] An inscription on the Colosseum indicates that it was built on war spoils and taxation. Szilovics, C., 2018, "Public Construction Projects and Public Funds in the Roman Republic," *Journal on European History of Law* 1:185.

previous emperors to strengthen the political ties of the empire and could give more support for riskier projects. Claudius's projects were major undertakings to support Roman citizens, like feeding the empire during the grain shortages that occurred during his reign, while Nero's projects were more extravagant and funded by an increase in taxes.[385] Around the same time as the construction of the lighthouse at Patara, Nero constructed the gymnasium (dedicated in 62 CE), baths (62 CE), and amphitheater (64 CE), and rebuilt the Circus Maximus, all at Rome.[386] He also attempted to cut a canal across the Corinthian Isthmus in 67 CE.[387] Both Patara and Corinth were also strategically located for shipping and grain supply, which supports the nature of the projects. The personality of the emperor was key in the character of the building program. According to Thornton and Thornton, though extravagant, Nero's building programs were logical, reasonably well-timed, and responsive to the city's needs, which fits the character of the harbor restoration and lighthouse construction.[388]

If the construction of the Patara lighthouse was a government-funded project, it would have been paid for by taxes. Provincial cities could petition for imperial resources to partially or fully subsidize new buildings.[389] Depending on size and needs, on a small scale, local cities released financial and human resources to carry out political and

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[385] Thornton and Thornton 1989, 93; regarding Nero's finances, see Griffin, M., 1984, *Nero: The End of a Dynasty* (London: Batsford).
[386] Thornton and Thornton 1989, 96.
[387] Thornton and Thornton 1989, 97; Joseph. *BJ*. 3.10.10 (Whiston et. al. 1895).
[388] Thornton and Thornton 1989, 97.
[389] İşkan-Işik et. al. 2008, 110-11; Burton, G.P., 2004, "The Roman Imperial State, Provincial Governors and the Public Finances of Provincial Cities, 27 B.C.-A.D. 235," *Historia* 53, 3:314.

administrative activities.[390] Public building projects were expensive, making them a matter of civic expenditure, especially since local benefactors usually covered only a portion.[391] There is a long pattern of involvement of imperial agents in public building, financing, and the administration of projects through public expenditure.[392] Provincial governors conducted personal inspections, organized finances, and approved and initiated projects;[393] and epigraphy shows that provincial governors like Mucianus were highly involved in organizing, financing, and maintaining public buildings like those in the harbor of Patara.[394] The documentation of the construction of the lighthouse in epigraphy and evidence of government regulation in the inscription suggest the lighthouse may have been funded through public expenditure, though this fact is difficult to confirm.

If the lighthouse was completed under Nero, it may have been damaged by the 68 CE earthquake like Patara's aqueduct,[395] and if this were the case, Priscus's task would have been to repair the lighthouse, with funding from a public surcharge.[396] According to

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[390] Supra n. 389. For the routine mobilization of human resources see the *lex Irnitana*, ch. 83 (Metzger, E., 2009, "Lex Irnitana," in *The Oxford International Encyclopedia of Legal History* Vol. 6, edited by S.N. Katz, [Oxford: Oxford University Press]). The *Lex Irnitana*, which discusses Roman municipal laws and is dated to 91 CE, was found in fragments and had been inscribed on a collection of six bronze tablets found in 1981, cf. González, J. and M. Crawford, 1986, "The Lex Irnitana: A New Copy of the Flavian Municipal Law," *JRS* 76.
[391] Burton 2004, 330.
[392] Supra n. 391; Mitchell, S., 1987, "Imperial Building in the Eastern Roman Provinces," *HSCP* 91.
[393] Burton 2004, 324, 330: The governors had to receive permission from the central government for projects using public funds, which was established to prevent the raising of local taxes or the diverting existing revenues from traditional purposes.
[394] Burton 2004, 326.
[395] Şahin 2008b, 600; Şahin 2009, 336.
[396] İşkan-Işik et. al. 2008, 114; Şahin 2008b, 599-600; Şahin 2009, 341.

Ulpian (170-228 CE), "a governor should visit sacred and public buildings in order to check whether they are sound in roofs and walls or need any repair; and if they have been started, he should ensure that they are completed insofar as the resources of the community allow and should appoint formally diligent overseers."[397] There is no exact date for the destruction of the lighthouse, though based on the archaeological remains and the discovery of a human skeleton under some of the lighthouse blocks, it is thought that the lighthouse was damaged by a tsunami or earthquake during antiquity.[398]

Placement

Patara was an active commercial port from which merchant ships would depart for Rhodes and Alexandria, with trading interests to be protected.[399] Livy (59 BCE-17 CE) writes that with favorable weather and winds, navigation along the coast of Asia Minor was easy, but a change in weather and an unexpected shoal could put ships at risk.[400] The construction of the lighthouse and signal tower would have mitigated the risks of the coast by helping ships navigate more effectively.[401] Based on the dangers of the cliffs in front of the *Doğucasarı*, İşkan-Işik, Eck, and Engelmann believe that it was imperative that the signal tower and lighthouse be constructed at the same time.[402] The lighthouse

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[397] Ulp. *Digest* 1.16.7.1 (Watson, A., ed., 1998, Ulpian, *The Digest of Justinian* [Philadelphia: University of Pennsylvania Press]); Burton 2004, 331. Ulpian's writings make up approximately 1/3 of the *Digest of Justinian*.
[398] Özkut 2009, 25.
[399] Giardina 2010, 71.
[400] Livy, *Ab urbe cond*. 37.16 (Roberts 1912).
[401] *TAM* II, 1, 131; İşkan-Işik et. al. 2008, 109. An inscription honoring Priscus indicates that there was also a signal tower built in the Patara harbor.
[402] Supra n. 364.

was built directly on the coast at the southwestern tip of the port of Patara[403] in front of the harbor entrance to signal its location (Fig. 3-3).[404] The river and harbor are completely silted up today, with little trace of the river that once flowed directly by the lighthouse; and, as a result, the lighthouse is no longer directly on the coast. Parts of the lighthouse's tower had been overturned toward the west-northwest, and the southeastern corner of the lighthouse, which is directed towards the sea, experienced more damage than the other corners, leading scholars to believe that an earthquake and/or tsunami hit the tower from a line extending south to north-northwest.[405]

Shape

The Patara lighthouse is cylindrical in shape with a square stepped podium (Fig. 3-5). Bouchard argues that most lighthouses within harbor facilities are square in shape, and the Patara lighthouse is one of the few that break this pattern.[406] She argues that square lighthouses weathered the elements better with only one side facing the sea, however, octagonal and cylindrical lighthouses like those at Dover and Patara, respectively, may have better diffused the force of breaking waves by having less surface area. Depictions of the Ostia lighthouse on coins issued by Commodus (177-192 CE) (Fig. 3-6) suggest that the Ostia lighthouse was round, though in the Torlonia relief, the lighthouse appears

[403] Özkut 2009, 24; Şahin 2008b, 599.
[404] Cavalier, L., 2007, "Horrea d'Andriakè et Patara: Un nouveau type d'Édifice fonctionnel en Lycie à Époque Impériale," *REA* 101, 1:53; *TAM* II, 36.
[405] Supra n. 398.
[406] Supra n. 69.

to be rectangular or square.[407] The lighthouse also could have had a square base and cylindrical tower like the Patara lighthouse. These discrepancies may be due to perspective, and the small amount of available space on a coin. A reconstruction of the lighthouse of Patara (Fig. 3-7), which is on display at the Antalya Archaeological Museum, shows an open story for the lantern, though because the upper stories of the lighthouse do not survive and there is no known iconography, this is merely conjecture, possibly based on iconography such as the Torlonia relief, or reconstructions of other lighthouses like the Pharos of Alexandria and the lighthouse at Ostia.

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Fig. 3-5. Stepped platform and cylindrical tower of the lighthouse at Patara, 2012. Reprinted with permission from Deborah Carlson.

[407] Giardina 2010, 102-3.

Fig. 3-6. Coin issued by Commodus depicting the lighthouse at Ostia.
Reprinted from: Meiggs 1973, Plate XVIII.

Fig. 3-7. Model of the lighthouse at Patara, on display at the Antalya Archaeological Museum.
Reprinted with permission from Cees W. Passchier, Driek van Opstal, and Wilke D. Schram,
©2004 – 2018. Photo by H. Geiger. (Accessed 10/3/2018).

Construction and Materials

The podium of the Patara lighthouse was built on bedrock and was constructed without mortar.[408] The centering of the cylindrical tower on the podium functioned as a sort of keystone to stabilize the structure without mortar, although the deterioration of the podium has affected the stability of the superstructure.[409] Rubble stone filled the spaces between the ashlar masonry and on the edges of the platform, also seen in the fifth-century BCE terrace walls in the Tepecik building complex at Patara (Fig. 3-3), and in walls of the Lycian sites of Xanthos (mid-seventh century- mid-fifth century BCE), Pinara (fourth century BCE- third century CE) and Kyaneai (Fig. 3-1).[410]

The tower of the lighthouse was made up of a braided system of convex and concave stones with double shells and interstitial rubble stone fillings, similar to the platform.[411] The core is made up of convex blocks,[412] and the inner cylinder has inner and outer stair blocks (Fig. 3-8). Stone blocks in situ on the northern edge of the lighthouse may have formed the exit.[413] The construction of the arched stones that make up the body are

[408] Özkut 2009, 29.
[409] Özkut 2009, 25, 29.
[410] Supra n. 398; Işin 2010, 101; Marksteiner, T., 1997, *Die befestigte Siedlung von Limyra. Forschungen in Limyra 1* (Vienna: Phoibos), 122. There is no written record for the city of Kyaneai and the exact dates of its Roman structures are uncertain.
[411] Supra n. 398.
[412] Supra n. 398.
[413] Özkut 2009, 26.

rougher than the podium stones.[414] There may have been a cistern located near the base to supply water.[415]

Fig. 3-8. Inner and outer cylinders and staircase of the Patara lighthouse. Reprinted from İşkan-Işik et. al. 2008, 120.

As previously mentioned, the growth of port towns like Patara facilitated the spread of Greek culture and influence, which can be seen in the construction of the lighthouse's podium (Fig. 3-5). The stepped podium is an element that was common in Greek temples and mausoleums like the Mausoleum at Halicarnassus, and spread into Roman

[414] Özkut 2009, 38.
[415] Supra n. 105.

Asia Minor by the early Imperial period.[416] Stepped podiums were common in Pergamon, particularly in the second century BCE,[417] and a 100 BCE Doric temple at Sagalassus (modern-day Turkey), which had a small podium and staircase, is evidence of the diffusion into Asia Minor.[418]

The main building stone of the lighthouse was sandstone, which has contributed to the rapid deterioration of the lighthouse since its exposure in 2003.[419] Extensive measures are being taken to document and preserve the structure, such as laser scanning, photogrammetry, Geographic Information Systems (GIS) to map the structure, and podium repair work which started in 2010.[420] The durability of sandstone depends on a variety of qualities, such as water content, mineralogy, and texture.[421] Sandstone survives better when the structure is farther from the sea, as the main cause of deterioration of the material is the absorption of water and salt crystallization, though this is also possible with ground water and salt.[422]

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[416] Waelkens 1989, 85.
[417] Waelkens 1989, 84.
[418] Supra n. 416.
[419] Supra n. 413.
[420] İşkan, H., 2015, "1988 – 2013 Patara Kazılarının 25 Yılı," in *Proceedings of the International Symposium: From Sand Into a City, 25 Years of Patara Excavations*, 1-21, Antalya, November 11-13 2013 (Istanbul: Oksijen Basım ve Matbaacılık San. Tic. Ltd. Şti. 16).
[421] Xeidakis, G.S., and L.S. Samaras, 1996, "Durability of a Sandstone Used as a Principal Building and Decorative Material in Ancient Abdera, Xanthi, N. Greece," *Bulletin of the International Association of Engineering Geology* 54:137.
[422] Supra n. 421.

Other examples of the use of sandstone for ancient buildings include the Marmarokopio tower on the Greek island of Rhenia, near the island of Delos, which exhibits a rare sandstone hearth and may also have been a lighthouse (possibly fifth century BCE);[423] within the ancient city of Abdera, Greece (seventh century BCE), at Leptis Magna, temples in the Nile Valley in Egypt (Early Dynastic Periods: 3100-2686 BCE and New-Kingdom: 16th -11th centuries BCE), and the city of Petra (300 BCE) in Jordan. Sandstone was used extensively in the ancient city of Abdera, Greece. Xeidakis and Samaras showed that a wide range of sandstone types was used in this site. The characteristics of each type of sandstone were determined by how each type formed, and their range of deterioration varied. The buildings that were located farther from the sea weathered better, and builders likely learned over time and gathered the more durable stone from the local deposit.[424] The lighthouse at Patara likely would have experienced the same weathering effects since it was built right on the coast. Most of the stones survived well, in part because the lighthouse was buried in sand for millennia. There are sandstone beds in southern Turkey as well as extensively in Egypt, which was quarried and exported for building within Egypt,[425] so it is possible that the sandstone for the lighthouse at Patara was either quarried locally or imported.

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[423] Hdt. 6.97 (Godley 1920); Christiansen 2014, 232.
[424] Xeidakis and Samaras 1996, 146.
[425] Harrell, J.A., 2016, "Varieties and Sources of Sandstone Used in Ancient Egyptian Temples," *Journal of Ancient Egyptian Architecture* 1:11.

Contemporary and Historical Sources

The city of Patara is discussed significantly more in primary sources than was Dover. At least eight primary sources mention Patara: Appian's *Civil Wars*, Diodorus's *Histories*, Livy's *Histories*, Luke's account of Acts in the Bible, Pliny's *Natural Histories*, *Scylax Periplus*, the *Stadiasmus*, and Strabo's *Geographies*. [426] Like the other lighthouse examples discussed here, however, there is no mention of the lighthouse in any of the texts, and there is no known iconography depicting the lighthouse at Patara.

Several British and French scientists traveled to Asia Minor during the 19th century and recorded their observations. Irish hydrographer Captain Francis Beaufort explored Anatolia and rediscovered many classical cities, including Patara. During his survey of Patara, he noted that the name Patara was still attached to several of the city's ruins, and that their location was on the shore near the river Xanthus.[427] He recorded Patara's theater, a small temple, and a deep pit which may have been the seat of the oracle of Apollo, though the temple and oracle have not been found. British archaeologist Sir Charles Fellows made multiple expeditions to what is now Turkey between 1838 and 1841 and recorded in detail his observations. He also led archaeological excavations of cities in Asia Minor and shipped artifacts to Britain, such as the Nereid monument from

[426] App. *B.Civ*. 4.10 (White et. al. 1912); Diod. Sic. 20.93 (Bekker et. al. 1903); Livy, *Ab urbe cond*. 37.17 (Roberts 1912); Luke, Acts 21.1; Pliny, *NH*. 5.33 (Bostock 1855); Scylax, *Peripl* (Shipley 2011); Stadiasmus 246 (Müller 2010); Strab. *Geog*. 14.3 (Jones 1924).
[427] Beaufort, F., 1818, *Karamania, or a Brief Description of the South Coast of Asia Minor, and of the Remains of Antiquity* (London), 2, 6.

Xanthos.[428] In 1839, he published *A Journal Written during an Excursion in Asia Minor* and, in 1841, published *An Account of Discoveries in Lycia, being a Journal Kept during a Second Excursion in Asia Minor*.[429] His texts discuss the ruins at Patara but there is no mention of the lighthouse. French archaeologist Charles Texier is credited with the 1834 discovery of the Hittite capital Hattusa and, as a result, published *Description de l'Asie Mineure faite par ordre du Gouvernement français*, which included descriptions of ruins in Patara.[430] Finally, in 1843, Spratt and Forbes published a book on their travels in Lycia, in which were recorded their observations of several Lycian cities, including Patara.[431] Spratt and Forbes also identified the pit, agreeing that it may have been the seat of the oracle. They did not mention the lighthouse but noted that the harbor was then a marsh blocked by sand hills and that it would be unrecognizable as the harbor mentioned by Luke in the book of Acts.[432] Based on the historical sources that discuss the city of Patara and the absence of any discussion of the lighthouse, it is likely that the lighthouse was buried in sand at this time.

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[428] Chisholm, H., ed., 1911, "Fellows, Sir Charles," in *Encyclopædia Britannica*, 11th ed. (Cambridge: Cambridge University Press).
[429] Fellows, C., 1839, *A Journal Written during an Excursion in Asia Minor* (London: John Murray, Albemarle Street); Fellows, C., 1841, *An Account of Discoveries in Lycia, being a Journal Kept during a Second Excursion in Asia Minor* (London: John Murray, Albemarle Street).
[430] Texier, C., 1839, *Description de l'Asie Mineure, faite par ordre du gouvernement français de 1833 à 1837, et publiée par le Ministère de l'instruction publique... Beaux-arts, monuments historiques, plans et topographie des cités antiques* (Paris: Typ. de Firmin Didot Frères).
[431] Spratt, T.A.B. and E. Forbes, 1847, *Travels in Lycia, Milyas, and the Cibyratis* (Oxford University), 31.
[432] Spratt and Forbes 1847, 32.

Conclusion

The lighthouse at Patara is an important recent discovery because it is one of the few surviving lighthouses with archaeological remains and now may be the oldest standing ancient lighthouse. Because there is so little supporting evidence for the lighthouse outside of archaeology, its archaeological remains are important in determining its history and architectural and functional characteristics. The construction of the lighthouse is attested to in a 64/65 CE inscription which had letters of gilded bronze and is further evidence of the lighthouse's imperial construction. Considering the lighthouse inscription, the construction of the Patara lighthouse may have been outside the range of monuments that were imperially funded. The lighthouse at Patara was constructed in the same century as the lighthouse at Dover but the two are entirely different in their material, construction, and shape. The material at Patara is primarily sandstone, which is an unusual material for a lighthouse and has contributed to the lighthouse's deterioration now that it is exposed, but it is not known if the sandstone was quarried locally or imported. Its square base is similar to multiple lighthouses in the eastern Mediterranean such as those of the Pharos of Alexandria, the lighthouse at Ostia, and the lighthouse at Leptis Magna, all of which, based on modern reconstructions and contemporary sources, are thought to have stood on islands near the coast or on moles in the harbor, and would have been subject to the elements. The base of the Patara lighthouse would have provided necessary stability against the elements, although its tower was cylindrical, which separates it from the lighthouse at Leptis Magna, that also had a podium but a square tower. The stepped characteristic of the podium is a clear indication of Hellenistic

influence, which was common in ancient architecture across Asia Minor during the first century CE, especially in the region of Lycia. Physical remains of ancient buildings are important because they provide valuable construction and material details. The study of physical remains can also provide knowledge about a region and time period that may not otherwise be found, especially in the case of the Patara lighthouse for which there is no iconography and no direct references in contemporary texts.

CHAPTER IV

THE ROMAN LIGHTHOUSE AT LEPTIS MAGNA, NORTH AFRICA

The settlement of Leptis Magna in modern-day Libya was founded as early as the seventh century BCE,[433] and came to be the site of one of the most important harbors of Roman North Africa. The natural harbor and nearby islands that provided protection for ships, the proximity to fertile farmland that was already being exploited prior to the establishment of Roman Empire, and the opportunity for trade with local inland tribes were all factors that led to the establishment of Leptis Magna as a key city in North Africa.[434] Trade expanded significantly during the Roman Empire, which led to the construction of an impressive harbor and a lighthouse to manage and safeguard the valuable trade interests of the region, as well as to establish the identity of the imperial authority at Leptis Magna. This chapter discusses the historical events that led to the construction of the lighthouse, the excavation of the site, and the physical and functional aspects of the lighthouse.

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[433] Schorle, K. and V. Leitch, 2012, "Report on the Preliminary Season of the Lepcis Magna Coastal Survey," *LibSt* 43:151.

[434] Matthews, K.D., 1957, *Cities in the Sand: Leptis Magna and Sabratha in Roman Africa* (Philadelphia: University of Pennsylvania Press), 19; Mattingly 1994, 117. The natural harbor and nearby islands provided protection to Phoenician ships and the Phoenician occupation may have depended on this protection.

Historical Background

According to Sallust (first century BCE), Leptis Magna was founded by Phoenicians from Sidon.[435] The original names of the city were *Lubta* and *lpqy*, which have Berber and Neo-Punic origins respectively,[436] indicating the heritage of the region and city. Local epigraphy and contemporary sources also indicate the name as Lepcis Magna,[437] and its Greek name, first mentioned in the fourth-century BCE Periplus of Scylax,[438] was Neapolis. The city was strong enough by the sixth century BCE to push back the Spartan king Dorieus when he attempted to establish a Greek colony nearby in 515 BCE.[439] Carthage controlled coastal North Africa in the sixth century BCE and likely used Leptis Magna as a trading station, or *emporium*, during the Carthaginian Empire's duration as a Mediterranean power until it was defeated by Rome, at the end of the Second Punic War in 202 BCE.[440] At the end of the war, new markets developed because the region was no longer controlled by Carthage, and as a result, trade and agriculture advanced.[441] The

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[435] Sallust (*Iug*. 78.1, Watson, J.S., ed. and transl., 1899, Sallust, *The Jugurthine War* [New York and London: Harper & Brothers]) indicates that Sidonians founded Leptis Magna but a century later, Pliny (*NH*. 5, 76, Bostock 1855) writes that Tyre was its mother city.
[436] Brogan, O. and T. Wilson, 2012, "Lepcis," in *The Oxford Classical Dictionary*, 4th ed., edited by S. Hornblower and A. Spawforth (New York: Oxford University Press), 821; Lipiński, E., 2004, *Itineraria Phoenicia* (Leuven: Peeters Publishers), 345.
[437] Epigraphy: Mattingly 1994, 116. The topographical sources, *Tabula Peutingeriana* (Weber, E., 1976, *Tabula Peutingeriana: Codex Vindobonensis 324* [Graz: Akademische Druck- u. Verlagsanstalt]) and section 93 of the *Stadiasmus Maris Magni* lists the city's name as 'Lepcis'.
[438] Barrington Atlas 35 G2- Neapolis/Lepcis Magna (Talbert, R.J.A. and R.S. Bagnall, 2000, *Barrington Atlas of the Greek and Roman World* [Princeton: Princeton University Press]); Bartoccini, R., 1961, "La missione archeologica italiana nel porto di Leptis Magna. La V campagna 1958," in Atti del settimo congresso internazionale di archeologia classica III (Rome), 233, 239–40; Birley, A.R., 1999, *Septimius Severus. The African Emperor* (London: Routledge), 2; Desanges, J., 1978, *Recherches sur l'activité des Méditerranéens aux confins de l'Afrique.* Vol. 38 (Rome: École Française de Rome), 100.
[439] Hdt. 5.43 (Godley 1920); Brogan and Wilson 2012, 821; Mattingly 1994, 50.
[440] Schorle and Leitch 2012, 152.
[441] Mattingly 1994, 50-51.

expansion of trade and agriculture was also observed at the nearby city of Sabratha.[442] After the destruction of Carthage in 146 BCE, Leptis Magna was given as a gift to the Numidian kingdom,[443] to which it paid tribute, and it later allied with Rome during the Jugurthine War from 112 to 105 BCE.[444] In the aftermath of the conflict, Rome claimed the city, and possibly the nearby cities of Oea and Sabratha.[445] By 27 BCE, the North African provinces of Africa Vetus, in which Leptis Magna was located, and Africa Nova, were combined under the name *Africa Proconsularis.*[446] During the reign of Augustus (27 BCE-14 CE), Leptis Magna was classified as a *Civitas libera et immunis*, or a free community that did not have to pay taxes, was minimally controlled by a Roman governor,[447] and retained a few of its own local government positions. The local positions were still in operation when Nero made Leptis Magna a *Municipium,*[448] the Latin term for a Roman city, between 61 and 68 CE, and the city was given some Roman rights and privileges.[449] Under Trajan in 110 CE, Leptis Magna was given the title *Ulpia Traiana Fidelis Lepcis Magna* with the rank *colonia*, which granted Roman citizenship to its residents,[450] and in 203 CE, Septimius Severus gave the city the prestigious privilege of *ius italicum,* (Italic law), which provided the city with a tax exemption and

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[442] Supra n. 440.
[443] Menen, A., 1972, *Cities in the Sand* (London: Thames and Hudson Ltd.), 75.
[444] Matthews 1957, 19-20.
[445] Marzano, A., D. Soren, and R. Polidori, 1995, "Splendors of Lepcis," *Archaeology* 48, 5:32.
[446] Fishwick, D. and B. Shaw, 1977, "The Formation of Africa Proconsularis," *Hermes* 10, 3:369.
[447] Supra n. 437.
[448] Garnsey, P., 1987, *The Roman Empire: Economy, Society, and Culture* (Oakland: University of California Press), 27.
[449] Mattingly 1994, 116; Mattingly, D.J., 1995, *Roman Tripolitania* (London: Batsford), 116-22.
[450] Birley 1999, 22.

was the highest available honor for a provincial town.[451] Finally, after Diocletian reorganized the administration of the provinces of the Roman Empire in 303 CE, Leptis Magna became the capital of the new province of Tripolitania and was put under the control of *a praeses et comes*, which was a rural, regional government position.[452] Leptis Magna may have been the administrative center, suggested by inscriptions that mention officials coming from the city.[453]

Excavations at Leptis Magna

Leptis Magna was initially excavated in the early 20th century by Italian archaeologists, and the original Italian excavation report was published in 1958 by Renato Bartoccini.[454] The preliminary excavations uncovered the street plan and public monuments and determined that the original Phoenician settlement was likely located on the promontory where the lighthouse was later built.[455] The earliest dated levels of Leptis Magna are on the west side of the natural basin, today referred to as Wadi Lebda, at the site of the seventh-century BCE Old Forum, and contain Phoenician material from 650 – 500 BCE, followed by "Punic" and "Neopunic" levels dating to 500 – 241 BCE and 241 – 118 BCE, respectively.[456] Further excavations were undertaken by the French in the 1970s,

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[451] Birley 1999, 146; Mattingly 1994, 54, 116.
[452] De Miro, E. and A. Polito, 2005, *Leptis Magna. Dieci anni di scavi archeologici nell'area del Foro Vecchio. I livelli fenici, punici e romani* (Roma: L'Erma di Bretschneider).
[453] Sjöström, I., 1993, *Tripolitania in Transition: Late Roman to Early Islamic Settlement* (Glasgow: Archaeological Services and Publishing), 31.
[454] Bartoccini, R., 1958, *Il porto romano di Leptis Magna*, *Bolletino del Centro Studi per La Storia dell'Architectura, supplement 13* (Roma: Azienda Beneventana Tipografica Editoriale).
[455] Bandinelli 1966, 23; Giardina 2010, 53.
[456] Bandinelli 1966, 23; Mattingly 1994, 117.

and surveys of the coastline took place soon after the Italian excavations were published. There were plans in place for a longer span of research to be carried out over several years; however, the 2011 Libyan revolution interrupted the work.[457] Further excavations at Leptis Magna have been sporadic due to unrest in Libya.

The results of a survey of Tripolitania conducted in 2011 indicated that settlement and economic activity around Leptis Magna advanced significantly during the Roman period.[458] The wealthy coast, which was made up of Leptis Magna and its neighboring complex of villas, had an important economic role within the Roman Empire and its broad maritime trade network.[459] The region was densely occupied with a high production capacity, made possible by its fertile farmland known as the Gebel, a favorable coastal climate that sustained cultivation, and the maritime resources available for exploitation.[460] The high levels of activity are indicated by archaeological evidence such as kilns where amphorae were produced for olive oil transportation, olive oil presses, and fish processing installations located in both the city and the nearby villas. The luxury villas that bordered Leptis Magna have been linked with agricultural areas, as the two overlap geographically.[461] Within the local trade network, these villas

[457] Schorle and Leitch 2012, 149.
[458] Supra n. 440.
[459] Schorle and Leitch 2012, 153.
[460] Supra n. 457.
[461] Mattingly 1994, 141, 155.

transmitted their goods through the harbor at Leptis Magna to larger Mediterranean ports like Portus and Ostia at Rome.[462]

Trade Interests of Leptis Magna

In the years following Carthaginian control, Leptis Magna quickly became an important trading post and leading city in Roman Africa because of its olive oil production.[463] A road linked Leptis Magna to the foothills south of the city which were known as the Gebel.[464] The fertile farmland there was used to grow olives, one of the most important commodities to Rome and one of the greatest exports of the Roman Empire.[465] By the time the Romans conquered Tripolitania in the first century CE,[466] the olive was already being cultivated, and the production of olive oil for export increased during the Roman Empire.[467] The region of Leptis Magna came to have hundreds of oil presses, and Mattingly estimates that it produced millions of liters of olive oil in good years.[468] Not every year would have seen a surplus, and rich landowners would have controlled the volume of oil going into internal markets with their own financial benefit in mind.[469]

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[462] Supra n. 440.
[463] Menen 1972, 104.
[464] Mattingly 1994, 1.
[465] Supra n. 463.
[466] Caes. *BAfr*. 97.3 (McDevitte, W.A. and W.S. Bohn, ed. and transl., 1865, Julius Caesar, *The African Wars* [Harper & Brothers: New York]); Mattingly 1994, 3; Sjöström 1993, 17.
[467] Mattingly 1994, 138, 144.
[468] Mattingly 1994, 141, 155; Mattingly, D.J., 1988, "The Olive Boom. Oil Surpluses, Wealth and Power in Roman Tripolitania," *LibSt* 19:36-8.
[469] Mattingly 1994, 143.

Leptis Magna was also an important node in the network of inland trading routes from the African interior that supplied the Roman Empire with exotic and luxury goods like gold and ivory, and wild animals for the amphitheaters.[470] The elephant was a civic symbol of both Leptis Magna and Sabratha and, when paired with inscriptions of the dedication of elephant tusks to deities in the city, suggests that Leptis Magna traded in wild animals.[471] There is also evidence at nearby Sabratha for olive oil production, the success of which is suggested by the development of its harbor facilities such as moles, quays, artificial breakwaters, and a lighthouse, as well as the existence of an office at Ostia.[472] These loosely connected similarities suggest that the region's internal, inland trade was as strong as its maritime trade.

The prestigious reputation and wealth that Leptis Magna earned through its agricultural productivity and the favoritism showered on it by Roman emperors is indicated by both the promotions it received and also by the disgraces it suffered. In the first century BCE, Julius Caesar imposed a fine of three million pounds of olive oil per year on Leptis Magna as punishment for supporting Pompey in the Civil Wars,[473] and reduced the city

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[470] Mattingly 1994, 157.
[471] Meiggs, R., 1973, *Roman Ostia* (Oxford: Clarendon Press), 283, 287; Mattingly 1994, 4, 157; record of inscriptions: *IRT* 231, 295.
[472] Mattingly 1994, 127.
[473] Caes. *BAfr*. 97 (McDevitte and Bohn 1865); Mattingly 1994, 51. Olive oil was measured in liquid units; however, Caesar's original text uses the word "pondo", which has been translated to pound. Furthermore, some sources say the fine was 3 million pounds a year (Mattingly 1994, 51; Matthews 1957, 34) while translations of Caesar's text indicate the fine was 300,000 pounds a year (translation by McDevitte and Bohn, 1865).

to a *stipendiaria*, or tributary state, the lowest status of autonomy. The magnitude of the fine and the city's ability to pay it hint at the region's great wealth.

The increase in imports and exports[474] was likely a factor in the expansion of the city, and the harbor that was undertaken by the Roman emperor Septimius Severus (193-211 CE) in the third century CE. Leptis Magna's increasing involvement in Mediterranean trade networks and the high volume of commodities that were being exported through Tripolitanian ports indicate that there were significant trade interests to be protected, particularly when considering its challenging harbor.[475]

The Building Program and Harbor Expansion of Septimius Severus

Septimius Severus was born in Leptis Magna in 145 CE, and advanced quickly through the *cursus honorum*, or succession of offices.[476] He seized power after the assassination of the emperor Pertinax in 193 CE,[477] and used the building program he carried out at Leptis Magna as a show of power to solidify his rightful place as the next emperor. Leptis Magna owes much of its prominence to the success of Severus's reign, which was characterized by a large amount of activity across the empire,[478] especially the massive building program that he began around 198 CE.

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[474] Mattingly 1995, 141.
[475] Section 93 of the third-century CE *Stadiasmus Maris Magni* (Müller 2010) stated that Leptis Magna had no harbor and Lipiński (2004, 347) believes that the *Stadiasmus* used first-century BCE sources. Wadis are also irregular, and the harbor had a tendency to silt, both of which made the harbor challenging.
[476] Birley 1999, 163.
[477] Menen 1972, 137.
[478] Menen 1972, 143.

As it was his hometown, Severus lavished resources upon Leptis Magna, launching a building program that lasted 20 years and made it the second largest city in Roman Africa. As a result, Leptis Magna rivaled Carthage and Alexandria in size and splendor.[479] The program included the addition of monumental architecture to the city, such as a new forum, basilica and temple complex, a colonnaded boulevard, a quadrifrons arch, a temple to the Syrian god of Jupiter Dolichenus (Fig. 4-1) which faced the harbor on the southwestern shore, and an enlargement of the harbor that included warehouses, a signal tower (Fig. 4-2),[480] and the famous lighthouse of Leptis Magna.

Fig. 4-1. Temple to Jupiter Dolichenus, Leptis Magna.
Reprinted from: Brouquier-Reddé 1992, 121, Fig. 64.

[479] Ward-Perkins 1993, 91; Sjöström 1993, 39.
[480] Supra n. 66.

Fig. 4-2. Signal tower in the harbor of Leptis Magna.
Reprinted with permission from the William L. MacDonald Collection,
Department of Art and Archaeology, Princeton University.

The North African coast was flat with few natural harbors, so ports had to be developed from what little was available on the coast. Leptis Magna was initially thought to have been a poor harbor due to winds oriented north-east, the same direction as the outlet of the sea-facing port, which would have made navigation difficult.[481] The harbor also had a problem with continuous flooding that was caused by the rise of the Wadi Lebda. Wadis are also dangerous in that they are irregular, and subject to violent streams in the winter. Mattingly mentions a second-century BCE source that stated that Leptis Magna lacked a true harbor, and referenced a better harbor at Cape Hermaion 15 *stades* or 2.7

[481] Laronde, A., 1988, "Le port de Lepcis Magna," *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres* 132, 2:343.

kilometers west of Leptis Magna.[482] The nearby ancient cities of Sabratha and Oea (modern-day Tripoli) had better natural harbors,[483] but the fertile lands near Leptis Magna provided an advantage for creating the settlement in this location, despite the poor natural anchorage and lack of a suitable year-round harbor.[484] The nearby Cape of Homs and Wadi Lebda's offshore islands may also have provided protection against the winds.[485]

The Phoenician port at Leptis Magna was originally located near the mouth of the Wadi Lebda, which had over time, created an inlet in the shore bank.[486] Reefs were located offshore that acted as breakwaters.[487] Giardina claims that the lighthouse at Leptis Magna was already in existence during the Phoenician period and that what remains was the part of the Severan expansion.[488] In its early phase, the Roman harbor was located southeast of the city center and consisted of an embankment along the western edge of the Wadi.[489] Nero (54-68 CE) incorporated the three nearby islands by connecting them to the land with a northern pier, which also provided the port with protection from northern winds. Nero erected several buildings and structures along the natural

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[482] Mattingly 1994, 118.
[483] Mattingly 1994, 122. The harbors of Oea and Sabratha were not created by developing a wadi like at Leptis Magna and did not suffer the same silting issues. Protection from prevailing northwest winds was also provided by an offshore reef west of the natural promontory at Oea.
[484] Mattingly 1994, 117.
[485] Mattingly 1994, 50.
[486] Giardina 2010, 53; Lipiński 2004, 346.
[487] Romanelli, P., 1961, "Leptis Magna," in *Enciclopedia dell'Arte Antica, Classica e Orientale, IV, 572-94* (Roma: Istituto della Enciclopedia Italiana Giovanni Treccani), 91.
[488] Giardina 2010, 55.
[489] Giardina 2010, 53.

anchorage in the northwestern part of the harbor, including quays and warehouses.[490] The early Imperial harbor likely included the signal tower and a small, stepped temple behind it, which modern sources like Bartoccini and Laronde believe to be in the Doric style,[491] and may have been dedicated to a water deity such as Neptune.[492]

As part of Severus's building program, which may have begun in 198 CE, he enlarged the harbor, built the quay of the eastern pier, and equipped it with mooring blocks. To address the lack of a suitable harbor, the flooding, and the irregularity of the wadi, he diverted the Wadi Lebda[493] and created an inner harbor basin of 13-21 hectares in its previous mouth (Fig. 4-3).[494] The wadi's new outlet into the Mediterranean may have been northwest between Leptis and the modern city of Homs.[495] Research by Andre Laronde also showed that the harbor extended beyond Severus's basin, with an outer harbor, piers in front of the lighthouse that are now submerged, and further eastern piers.[496] Instead of fixing the flooding problem, the harbor enlargement created a closed structure and exposed it to the tide, causing the sand brought into the basin by the sea to silt instead of being carried back out to sea by the pressure of the water.[497] The damned

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[490] Menen 1972, 102.
[491] Bartoccini 1958, 173.
[492] Supra n. 491; Laronde 1998, 331.
[493] Blackman, D., 1982b, "Ancient Harbors in the Mediterranean, Part 2," *IJNA* 11, 3:193.
[494] Carayon, N. and S. Keay, 2017, "Lepcis Magna," *Portus Limen – Rome's Mediterranean Ports*, portuslimen.eu/site/lepcis-magna/ (Accessed 9/15/2018).
[495] Laronde 1988, 342.
[496] Laronde, A., 1994, "Nouvelles recherches archéologiques dans le port de Lepcis Magna," *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres* 138, 4.
[497] Supra n. 495; Kenrick, P., 2009, *Lybian Archaeological Guides: Tripolitania* (London: Silphium Press), 90.

wadi ruptured in the fourth century CE, which then led to the siltation of the harbor.[498] After the harbor silted, ships were prevented from entering, which limited Leptis Magna's ability to export and import trade products.

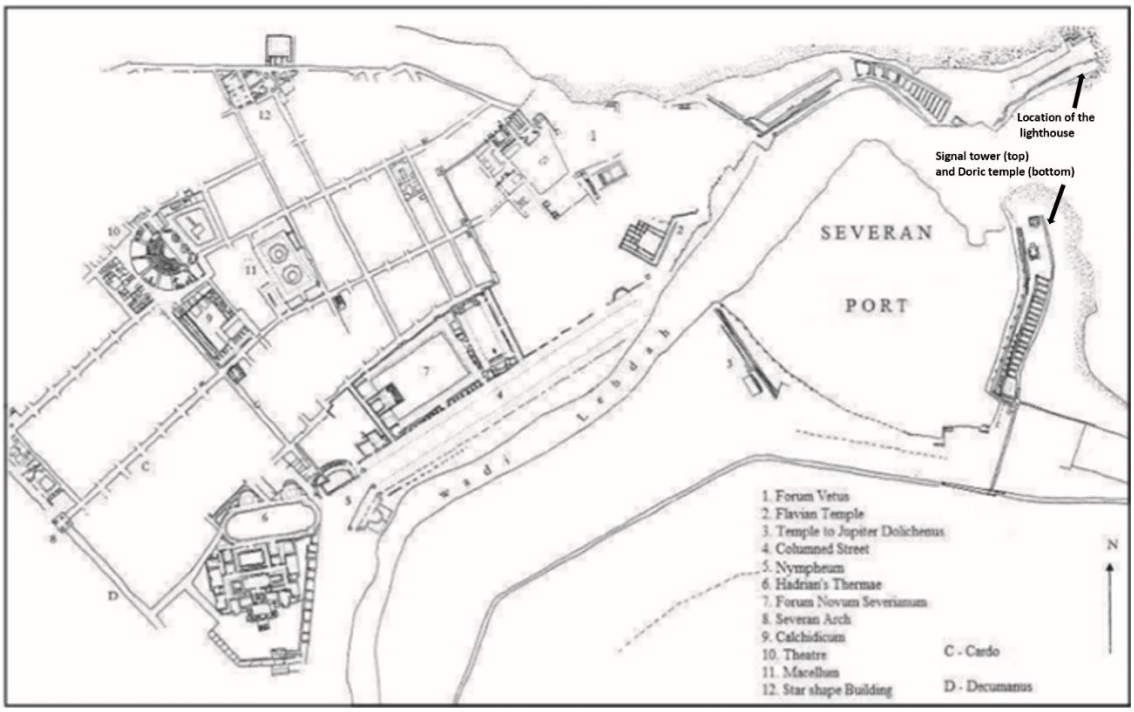

Fig. 4-3. Map of the city and harbor of Leptis Magna, with the location of the Flavian temple. Modified from Cordovana 2012, 57, Fig. 1.

Decline and Destruction

A series of catastrophes followed the silting of the harbor and decline of the city, which can be observed in the archaeological remains of Leptis Magna. A devastating earthquake and tsunami occurred in 365 CE, followed by disastrous floods and mobile

[498] Beltrame, C., 2012, "New Evidence for the Submerged Ancient Harbour Structures at Tolmetha and Leptis Magna, Libya," *IJNA* 41, 2:322.

sand dunes that covered and preserved the site.[499] The Vandal conquest in 455 CE and the Byzantine conquest in 534 CE also contributed to the decline of the city. Sabratha and Leptis Magna both show signs of significant earthquake damage, possibly from the earthquake of 365 CE.[500] The British excavations at Sabratha unearthed extensive evidence of earthquake damage at Sabratha, such as to the basilica, curia (public place of assembly), forum colonnades, capitolium, several temples, and the theater.[501] Two phases of earthquake damage at Leptis Magna are indicated in the Flavian temple[502] and amphitheater. Renovations in the Flavian temple, the Basilica Ulpia, the schola (ancient Roman school), and the amphitheater dating to the first quarter of the fourth century are attested to archaeologically and epigraphically.[503] There was damage in the harbor of Leptis Magna as well. The dam shows evidence of a partial collapse,[504] and it is likely that there was damage from this event to the lighthouse as well.

The silting of the harbor resulted in excellent preservation of the eastern wharves, including the arrangements for berthing individual ships, steps, and mooring rings.[505] The lighthouse still stands at the northern end of the western pier, and warehouses survive along the eastern (both piers shown in the right corner of Fig. 4-3), together with

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[499] Sjöström 1993, 134.
[500] Mattingly 1994, 180. Ancient scholars record a catastrophic earthquake on July 21, 365 CE, but a single earthquake could not have caused all the damage at the two sites.
[501] Mattingly 1994, 181.
[502] See Fig. 4-3 for the location of the Flavian temple.
[503] Supra n. 500.
[504] Supra n. 501.
[505] Supra n. 490.

the Doric temple (Fig. 4-4) and signal tower (signal tower and Doric temple indicated in Fig. 4-3). The outer harbor structures, which are discussed by Laronde, were absorbed into the fifth-century CE Byzantine fortifications, demonstrating that the basin was still important despite the fact that it was silted.[506]

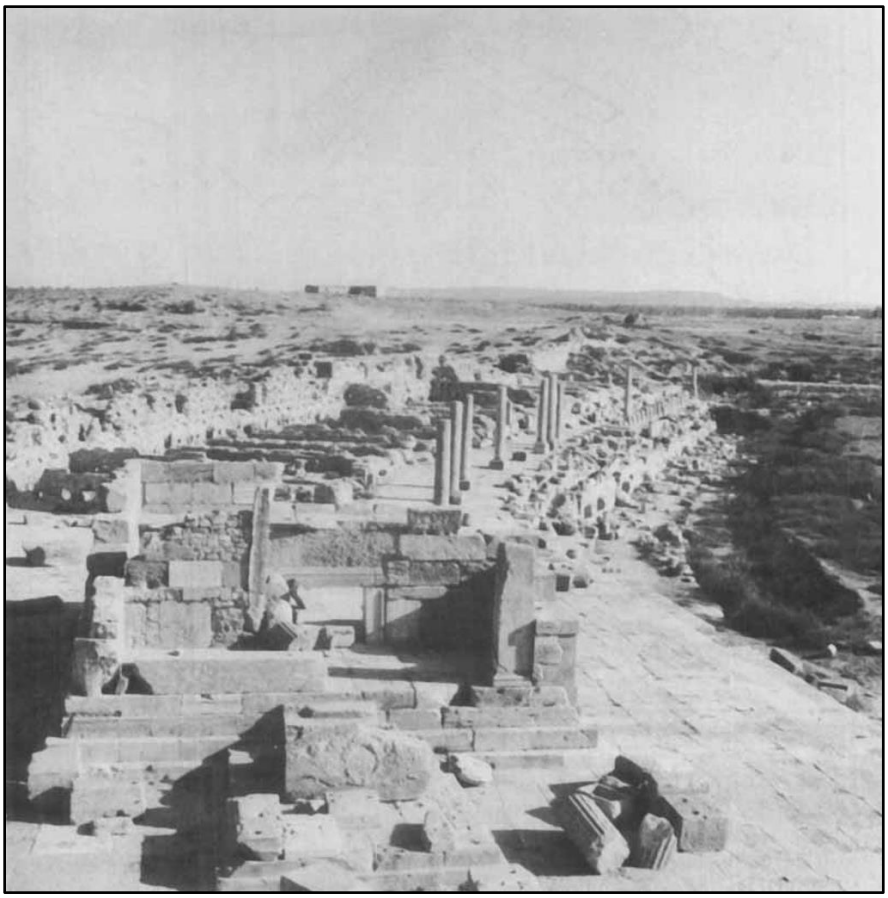

Fig. 4-4. View of the Doric Temple and warehouses from the signal tower, eastern pier, Leptis Magna. Reprinted from Blackman 1982a, 86, Fig. 4.

[506] Laronde 1994, 991.

Contemporary and Historical Sources

Like the lighthouses at Dover and Patara, the lighthouse at Leptis Magna is not discussed in contemporary sources.[507] The first summary plan of Leptis Magna was published in 1694 in the *Mercure Galant* (Fig. 4-5) which primarily concerned the port.[508] Later studies were also done in 1816 by H. W. Smyth and by H. Mehier de Mathuisieulx in 1846.[509] The lighthouse is not discussed in ancient or historical sources, which shows the limitations of relying solely on texts when studying ancient architecture.

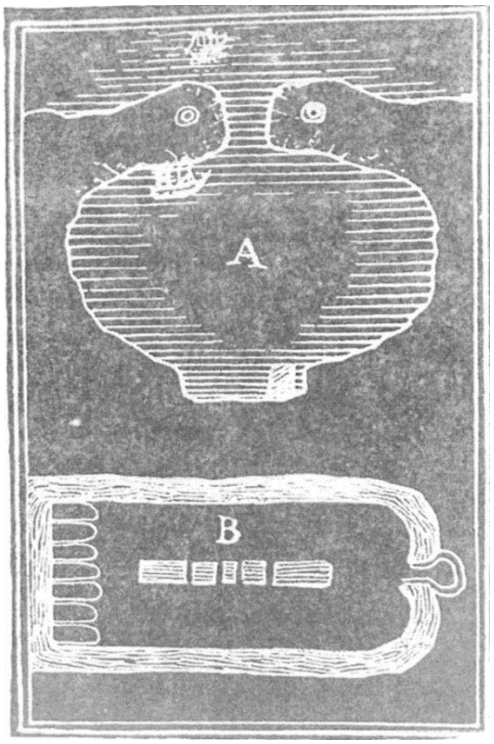

Fig. 4-5. Leptis Magna harbor summary plan
from the *Mercure Galant*, 1694.
Reprinted from Laronde 1988, 338, Fig. 1.

[507] Bouchard 2007, 32.
[508] Laronde 1988, 337.
[509] Supra n. 508.

Iconography

The lighthouse of Leptis Magna is depicted in few known iconographic representations, the most useful being the Severan Arch at Leptis Magna (Fig. 4-6).[510] Two triumphal arches were commissioned during Severus's reign (193-211 CE), one in Rome in 203 CE[511] that commemorated his visit that year, and one in Leptis Magna, also believed to be built to honor Severus's 203 CE visit to Leptis Magna, thought the exact date of construction is not known. The two arches are entirely different in their construction and decoration, which is in part a result of the geographical distance between them.[512] The Severan Arch in Leptis Magna is a massive quadrifrons arch located south of the main street at the intersection of two main roads,[513] centrally located to advertise Severus's military triumphs, his return home, and divine iconography.[514] Several pieces of reliefs from the arch were found buried in the sand near the arch during the excavations.[515] In a central scene of what is referred to as frieze A, the lighthouse is depicted in the background of the triumphal procession. The lighthouse is the only depicted architectural element,[516] and it functions to establish the location of the triumphal procession and indicates that the relief represents an actual historical event.[517] The

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[510] Bartoccini 1961, 233, 239–40.
[511] Birley 1999, 155; Gregorovius, F., 1895, *History of the City of Rome in the Middle Ages* (Cambridge: Cambridge University Press), 541; Ward-Perkins, J.B., 1951, "The Arch of Septimius Severus at Lepcis Magna," *Archaeology* 4, 4.
[512] Brilliant, R., 1967, *The Arch of Septimius Severus in the Roman Forum. Memoirs of the American Academy in Rome, Volume 29* (Roma: Istituto Grafico Tiberino di Stefano Luca), 39.
[513] Bandinelli 1966, 67.
[514] Supra n. 513; Brilliant 1967, 351.
[515] Menen 1972, 71.
[516] Tuck 2008, 339.
[517] Supra n. 516.

depiction shows the lighthouse to have had arched openings functioning as windows in each story of the lighthouse and may also indicate barrel-vaulted chambers (Figs. 4-7 and 4-8).[518]

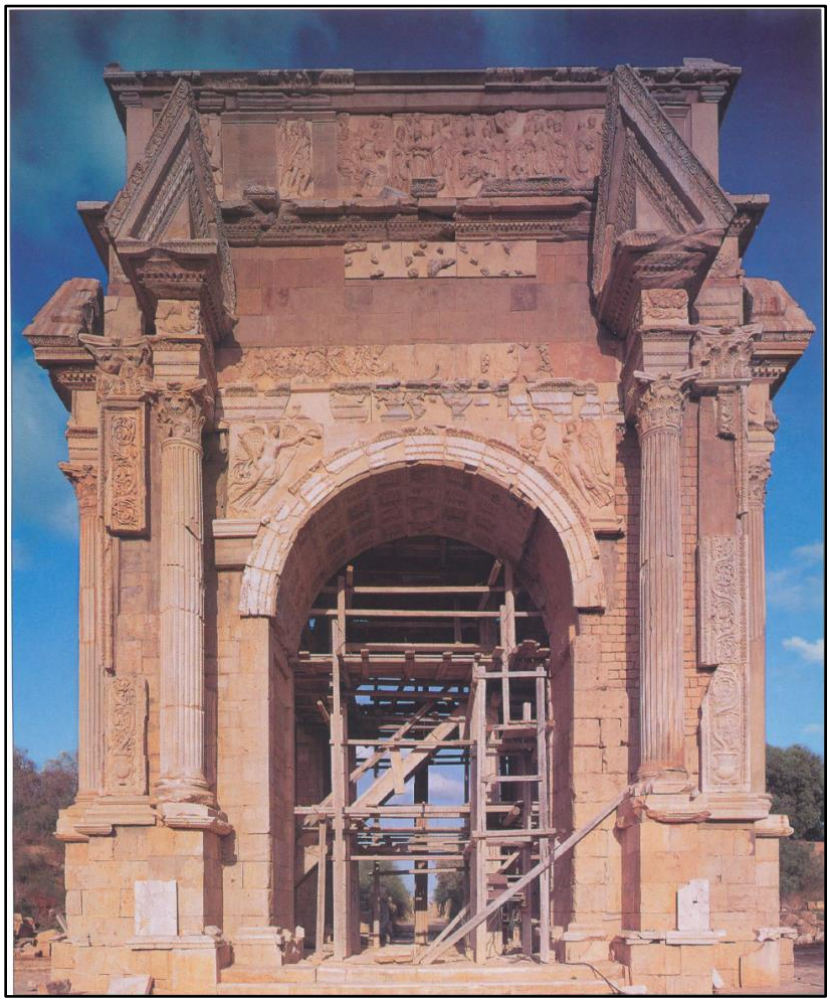

Fig. 4-6. Severan Arch at Leptis Magna. Reprinted from Marzano 1995, 35.

[518] Supra n. 516.

Fig. 4-7. Frieze A, central portion of the Severan Arch at Leptis Magna.
Reprinted from Ward-Perkins 1948, Plate X.

Fig. 4-8. Close-up of the Leptis Magna lighthouse
as depicted on the Severan Arch at Leptis Magna.
Reprinted from Ward-Perkins 1948, Plate X.

Archaeological Remains and Dating the Lighthouse

The lighthouse was built sometime during Severus's building program, possibly early in 198 CE, based on the slightly later dates for the Forum and Basilica, as indicated by inscriptions.[519] The lighthouse at Leptis Magna represents the second tallest Roman ruins after the lighthouse at Dover, England. Based on the depiction of the lighthouse on frieze A of the Severan Arch at Leptis Magna (Figs. 4-7 and 4-8) and its remains, it was square in shape with multiple levels, high arches, barrel vaults, and may have been as tall as 35 meters.[520] The body of the lighthouse was built on a platform that is 21.20 meters high.[521] Based on the archaeological remains, Bartoccini presents isometric and axionometric reconstructions of the lighthouse (Figs. 4-9 and 4-10) and suggests that the lighthouse was constructed as such: two staircases led to the platform and two ramps led into the lighthouse. There were a series of complicated corridors within the first story of the lighthouse, which were accessible through an atrium or small entrance corridor.[522] The atrium was divided by two corridors that were covered by a northern and a southern barrel vault.[523] Two sets of opposing staircases led to the upper stories of the lighthouse. There are two large, arched windows that survive on the first story in the eastern wall of the lighthouse that were likely the ends of the barrel vaults. Based on the remains of the first story, there may have been also been barrel vaults within the second and third

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[519] Cordovana, O.C., 2012, "Between History and Myth: Septimius Severus and Leptis Magna," *GaR* 59 1:56; *IRT* 428. Construction of the Forum and Basilica likely began in 203 CE.
[520] Bartoccini 1958, 68.
[521] Supra n. 520.
[522] Bartoccini 1958, 59-61.
[523] Bouchard 2007, 33.

stories, and at least two more arched windows in the eastern wall. Bartoccini also theorizes that cornices adorned the exterior of the two top levels.[524] The internal layout of the lighthouse is complicated and Giardina theorizes that this may have been to keep the interior accessible only to authorized personnel.[525]

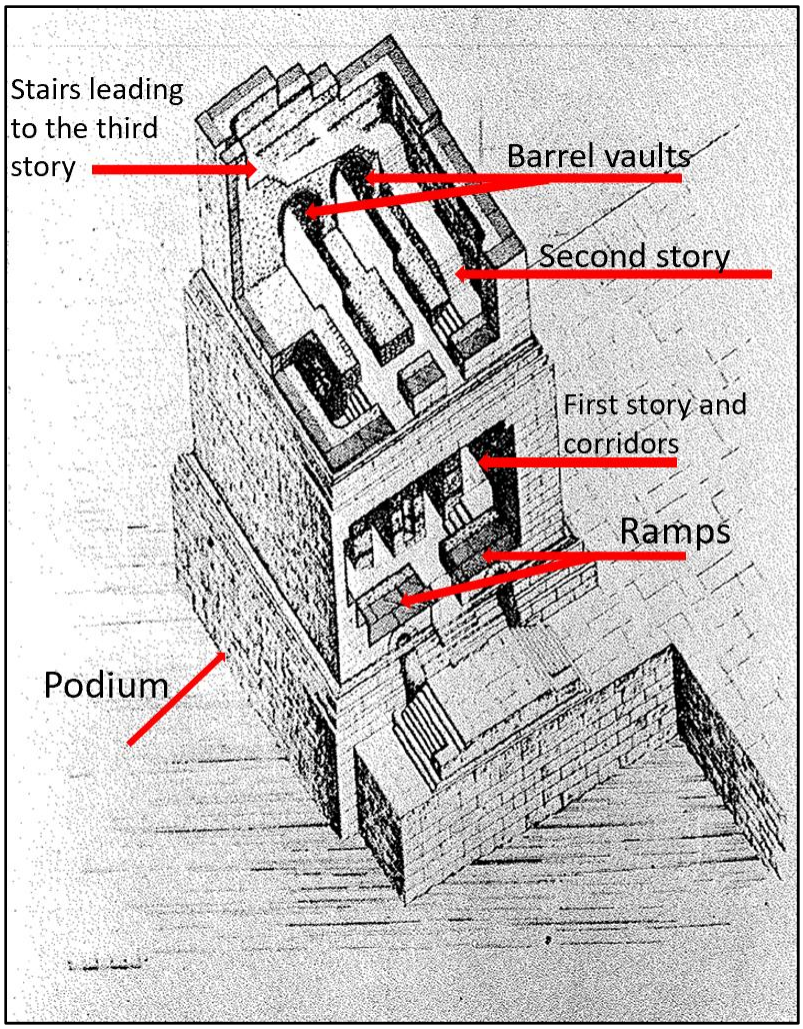

Fig. 4-9. Isometric drawing of the Leptis Magna lighthouse
showing the northern and western walls. Adapted from Bartoccini 1958, Plate XXVIII.

[524] Supra n. 522.
[525] Giardina 2010, 54.

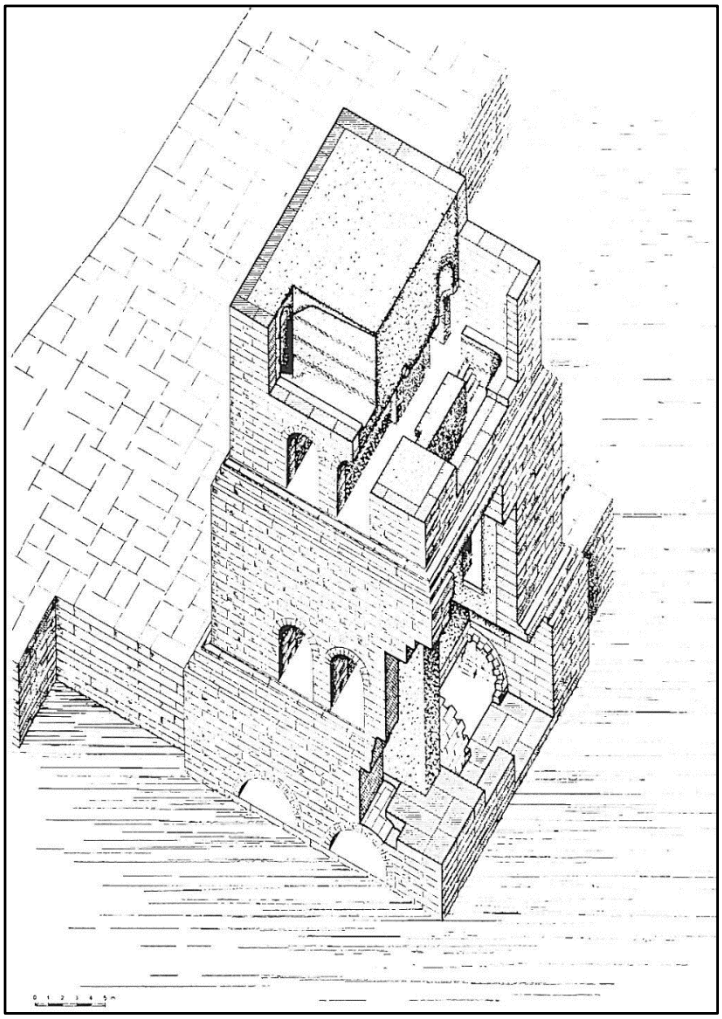

Fig. 4-10. Axonometric drawing of the Leptis Magna lighthouse
showing the eastern and northern walls.
Reprinted from Bartoccini 1958, Plate XXIX.

The archaeological remains of the lighthouse include the remnants of a stairway that was contained in a light well, the southern vault and part of the northern vault on the first story, and a cornice that was part of the third story. Only 6 meters in height survive of the first-story southern staircase. The two first-story corridors leading to the windows survive. The platform is similar to that of the lighthouse at Patara, although the Patara

lighthouse platform is stepped, which is thought to have been the result of Hellenistic influences. The Dover and Patara lighthouses are also good examples of the internal construction of lighthouses. The tower of the Patara lighthouse included an inner and outer cylinder and a spiral staircase, and the interior of the Dover lighthouse was square. The Pharos of Alexandria likely had an internal spiral staircase.[526] A signal tower was located across from the lighthouse on the eastern pier (Fig. 4-3), providing a valuable example of pairing a lighthouse with a tower or statue and demonstrating that in some places, lighthouses and signal towers served different purposes.

Placement

The lighthouse was built on a small island at the western edge of the port, which Nero had connected to the land by creating a pier made of concrete, 150 meters long and 10 meters deep (Fig. 4-3).[527] The lighthouse was built to face northeast to protect it from northwest winds and storms.[528] Parts of the Tripolitanian coast were known as the major and minor Syrtes (also known as the Gulf of Sirte and Gulf of Gabès, respectively), after the port of Sidra,[529] and were highly perilous, with a lack of anchorages, unpredictable shallows, and coastal tribes called the *Nasamones* who were known as pirates and wreckers.[530] In *Geography*, Strabo described the dangers of the shallows and the habit of

[526] Supra n. 37.
[527] Bartoccini 1958, 66; Giardina 2010, 53.
[528] Supra n. 507.
[529] Mattingly 1994, 2. The Lesser Syrtes is located to the west of Leptis Magna and the Greater Syrtes is located east.
[530] Supra n. 529; Strab. *Geog*. 7.3 (Jones 1924).

sailors to take risks, even to attempt to navigate along the shores, and said that this was one of the main reasons for the wrecks along the coast. Such dangers may have led people to use the ports at Carthage and Rome more often than they used Leptis Magna, although Leptis Magna still would have been used for export purposes.[531]

The southern side of the lighthouse faced the entrance of the harbor, and excavations indicate this side was better protected than the northern side, which was exposed to the elements. Bouchard suggests the square shape of the lighthouse protected it from the elements because it left only one side exposed. Even though the majority of the lighthouse was protected from the harshest blows, the other three sides were still subject to some exposure.[532]

The Doric Temple, located near the signal tower, was also built on a stepped podium, which was a common element in Greek and Roman temples and the Mausoleum of Halicarnassus, discussed in Chapter II, and the lighthouse at Patara. The podium may have also been a feature common for harbor buildings that were exposed to the elements and required more stability. Both the Patara and Leptis Magna lighthouses were built directly on the coast, and although their upper structures were shaped differently, both were constructed with square platforms for bases that likely contributed to their stability.

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[531] Supra n. 529. There is significant archaeological evidence for open-ocean crossing in North Africa. A concentration of shipwrecks have been found at Skerki Banks, which is a channel between Sicily and Tunisia. McCann, A., 2001, "An Early Imperial Shipwreck in the Deep Sea off Skerki Bank," *RCRFActa* 37.
[532] Menen 1972, 103.

According to Thiersch's reconstruction, the Pharos of Alexandria was built on a base that likely would have been a necessity for stability reasons.[533] Comparatively, the Dover lighthouse was not built with a base, possibly because having been built on a cliff, it would not have been directly exposed to the waves and tides, although it would have still been subjected to wear from the sun, wind, and precipitation. Dover also has a rocky coast, as opposed to the sandy coast along North Africa, which may have required less stability.

Construction and Materials

The lighthouse was square in shape with three stories, each slightly smaller than the one beneath, and its tower was composed of courses of ashlar masonry. The core of the first story was constructed of *opus quadratum,* a Roman building technique involving square blocks in parallel courses often constructed without mortar, and the other two stories likely would have been as well.[534] The concrete core measured nine meters above sea level, and the top of the core formed the base of the second story of the lighthouse. In Roman concrete, the "core" is mortared rubble, and faced with a type of ashlar masonry.[535] The core of the Leptis Magna lighthouse was faced with the brown

[533] Supra n. 39.
[534] Supra n. 523; Hauschild 1976, 248. This technique is discussed by the Roman engineer, Vitruvius (80-15 BCE; Vitr, *de arch.* Morgan, M., ed. and transl., 1914, Vitruvius, *Vitruvius: The Ten Books on Architecture* [Cambridge: Harvard University Press. London: Humphrey Milford]).
[535] Lancaster, L., 2005, *Concrete Vaulted Construction in Imperial Rome: Innovations in Context* (Cambridge University Press: Cambridge); Wilson-Jones, M., 2003, *Principles of Roman Architecture* (New Haven: Yale University Press).

limestone that was quarried nearby at Ras-el-Hammam.[536] The limestone facing of the lighthouse was placed between the brick courses, and, according to Ward-Perkins, the facing was crudely dressed and "so rough it was barely distinguishable from the core."[537] Ward-Perkins also notes that the limestone quarried from Ras-el-Hammam is brittle, easily damaged and commonly repaired, although any repairs to the lighthouse were not noted in secondary scholarship.[538] However, on the western side of the lighthouse, there is an inscription commemorating the victory of the proconsul Dolabella against rebels in 21 CE, nearly 200 years before Septimius Severus came into power, which suggests that salvaged material may have been reused in the construction of the lighthouse, or that there was an earlier version of the lighthouse.[539]

The internal walls were constructed of *opus incertum* (irregular work) and faced with rough, finished blocks, while the corridor walls were faced with terracotta tiles and a minimal amount of red clay tiles.[540] The windows of the lighthouse had similar patterns to those in the Dover lighthouse, with brick arches bound with mortar. As the stronger, more penetrating, and more flexible of the materials, brick was used in doorways, in niches, and to bond courses together.[541] Brick was used in the architecture of Leptis Magna but is not common across Tripolitania. Fired brick was known for its heat and

[536] Supra n. 507.
[537] Ward-Perkins 1993, 92.
[538] Ward-Perkins 1993, 90.
[539] Bartoccini 1958, 64.
[540] Supra n. 525; Bartoccini 1958, 60-1.
[541] Supra n. 538.

damp-resisting properties,[542] making it useful in the construction of a lighthouse in a harbor exposed to the elements. Fired brick was also used in baths and fountain buildings outside of the Severan harbor complex.[543] It is unusual that fired brick was used so frequently throughout Leptis Magna because it is not found elsewhere in Tripolitania, and there have been no brick kilns found in the region.[544] Crude, sun-dried brick was used, however, in domestic architecture in both Leptis Magna and Sabratha.[545]

Illumination

Because the top story of the lighthouse no longer remains, its shape and the method of illumination are speculative. There is no flame shown in depictions of the lighthouse, leading some scholars like Francesca Ghedini, who cites Michel Redde's 1979 typology, which listed Leptis Magna among "towers without lights,"[546] to debate whether this structure was in fact a lighthouse. However, given the location of the lighthouse and its depiction on the Severan arch in Leptis Magna (Figs. 4-8 and 4-9), Ghedini's conclusion is unlikely.

Giardina presumes that the top of the lighthouse where the lantern was housed was cylindrically shaped, and its illumination materials were likely wood or oil. Pliny and

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[542] Supra n. 538.
[543] Supra n. 538.
[544] Supra n. 538.
[545] Supra n. 538.
[546] Ghedini, F., 1984, *Giulia Domna tra oriente e occidente: le fonti archeologiche* Vol. 2 (Rome: L'Erma di Bretschneider), 69; Redde 1979.

Strabo both note forests full of wild beasts, and this is taken to refer to the Gebel, which was once thickly forested.[547] In contrast, Sallust describes the Roman province of Africa Vetus, or Old Africa in which Leptis Magna was located, as having few trees,[548] that were already being exploited before the Roman conquest[549] and as a result, little remained of woodlands in Tripolitania. Ward-Perkins claims that wood was likely imported, and this was probably the case for the lighthouse fuel as well. Olive oil was a common lighting fuel,[550] and if, as Mattingly predicted, there was a surplus in olive oil, it could have also been a fuel used to sustain a burning fire.

Harbor Symbolism

The construction of the Severan Arch at Leptis Magna and the scenes it depicts are an example of a common pattern among rulers like Caesar, Claudius, Caligula, and Septimius Severus, who were honored in triumphal processions in celebration of their victories when returning from their various conquests. The lighthouse at Leptis Magna was therefore a triumphal monument in honor of the Severan military campaign in the East,[551] similar to the construction of the lighthouse at Dover, which Tuck argues is part of the Claudian lighthouse system including Dover (England), Boulogne (France), Brundisium (Italy), Ravenna (Italy), and Portus, honoring Claudius's successful

[547] Mattingly 1994; Plin. *NH*. 5.26 (Bostock 1855); Strab. *Geog*. 17.3.18 (Jones 1924).
[548] Supra n. 529; Sall. *Iug.* 17.5-6 (Watson 1899).
[549] Sjöström 1993, 29.
[550] Mattingly 1994, 140.
[551] Supra n. 550.

campaign in Britannia in 43 CE.[552] The harbor renovations and construction of the lighthouse were largely symbolic, perhaps more so than other lighthouses of that time. Cassius Dio criticized the program for being wasteful and argued that Severus was merely placing his name on buildings he had only restored.[553] Some modern scholars argue the building program was an empty gesture of favoritism by the emperor toward his birth city, but others argue that there was a real need for it and that it served in part to legitimize Severus's role as the new emperor.[554] The building program was also both symbolic and propagandistic. According to Tuck, when Severus became the new emperor and renovated the harbor, he took on a dual role of triumph and religious sanction which granted his authority and established him as Trajan's successor (98-117 CE), while simultaneously heralding a coming era of peace and stability. This dual role is mirrored in the buildings at Leptis Magna.

Conclusion

The lighthouse at Leptis Magna was a symbol of triumph, wealth, and power. Although the harbor renovations would end up being part of what led to the decline and destruction of the city, they transformed the image of the harbor into one fitting the leader of successful military campaigns and the founder of a dynasty. The image of triumph is evident in the splendor of the city that rivaled Carthage and Alexandria, the

[552] Tuck 2008, 325.
[553] Cass. Dio 76.16.1-4 (Cary et. al. 1914); Birley 1999, 199.
[554] Cordovana 2012, 59; Laronde 1994.

extent of the harbor renovations, and the size of the lighthouse. The lighthouse was a massive structure and its placement on the end of a promontory would have helped sailors identify the safe harbor along a flat coastline before the coast was in sight. An earlier version of the lighthouse may have been standing during the Phoenician period, and, if so, the remains of the lighthouse represent repairs or restorations that took place during Severus's harbor expansion. Similar to the Dover lighthouse, most of the building materials were locally sourced; however, in contrast, its shape does not appear to be locally influenced, as square lighthouses were found across the Mediterranean. More likely, its shape is a result of its location within the harbor, designed to stand strong against the elements. The lighthouse at Leptis Magna is a valuable example of a lighthouse constructed as part of a significant imperial building program. The lighthouse and its depiction on the Severan arch at Leptis Magna together show the value of iconographic representation when it is present and how it can be applied to theorize about a lighthouse's architectural elements.

CHAPTER V

CONCLUSIONS

A study of ancient lighthouses requires a thorough examination of the available iconographic, textual, and archaeological evidence. Lighthouses are represented in a wide variety of ancient iconographic media, such as coins and sculptural reliefs on triumphal columns and monuments. Each depiction portrays a different degree of detail and provides information that texts may not, which is especially important for lighthouses that have no archaeological remains. For example, there are no textual references to the lighthouses at Laodicea ad Mare in modern-day Syria or the lighthouse of Heraclea Pontica in modern-day Turkey, and nothing survives of either structure. These lighthouses are portrayed on coins however, and details like an external staircase leading to the Laodicea lighthouse, and a multi-tiered construction for the lighthouse at Heraclea Pontica are clearly depicted, providing information we would otherwise not have.[555] Statues of Isis and Triton are depicted on coins alongside the Pharos of Alexandria and as such, are believed to have stood near or on the structure. Contemporary sources, on the other hand, often document the placement of the lighthouse, sometimes provide a general idea of a lighthouse's form and construction materials, and indicate the magnificence of the structure. Pliny indicates that Caligula's obelisk barge had been towed to Ostia, sunk, and used in Claudius' harbor works;

[555] Supra n. 27.

Suetonius and Cassius Dio write that the lighthouse was built on an island in the harbor, and its foundation may have been the sunken obelisk barge.[556] Caesar and Josephus write of the Pharos' great height,[557] and according to Strabo, the Pharos was made of white marble and had many stories.[558] Not all ancient lighthouses were mentioned by ancient authors, however, which reinforces the necessity for an integrated approach to the study of lighthouses and the evidence for them.

There is evidence for seafaring at night in antiquity that predates the earliest, sixth-century BCE lighthouses, which implies the usefulness of and need for lighthouses.[559] Ancient seafarers had minimal tools to help them navigate at night, such as the sounding lead and the use of their own senses, however, a lighthouse would have helped them avoid hazards and reach a safe harbor, or mark a flat shore before it was in sight.[560] Lighthouses may have had multiple functions besides indicating a safe harbor, such as acting as a watchtower from which guards could watch for enemies, to act as a node in a signaling system, or as part of a triangulation system with other lighthouses, which may have been valuable to sailors approaching the coast if they knew of the alignment, although it would be confusing if they did not. There is evidence that signals from towers were used to confuse enemy ships during battles, and for the lighting of false

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[556] Cass. Dio. 60.11.4-5 (Cary et. al. 1914); Plin. *NH*. 14.40, 201 (Bostock 1855); Suet. *Claud*. 20.2 (Reed and Thomson 1899).
[557] Caes. *BCiv*. 3.112 (McDevitte and Bohn 1865); Joseph. *BJ*. 4.10.5 (Whiston et. al. 1895).
[558] Strab. *Geog*. 17. 1 (Jones 1924).
[559] Objections of Odysseus's crew: Hom. *Od*. 12.286-90 (Murray 1919); Death of Hegestratos who jumped overboard at night: Dem. 32.5f. Aratus, *Phaen*. 300ff (Mair 1921), Thuc. 3.80.2, 81.1. (Dent 1910).
[560] Supra n. 56.

beacons, causing ships to wreck on the coast,[561] and while there is no concrete evidence that lighthouses also used this tactic, considering the triangular alignments, it is possible that lighthouses were used similarly. If triangulation of multiple lighthouses was purposeful, it would seem that lighthouses were evolving into a more complex network in the Roman Imperial period.

The concept of the lighthouse may have been inspired by Bronze Age temples and Classical Greek signal towers. Fires atop Bronze Age temples may have been visible from sea, as indicated in the Ugaritic text, *The Legend of King Keret*, which references the offering of a sacrifice by Keret "on the summit of the tower."[562] The text supports the concept that a fire burning atop a tall structure was visible at sea. However, there is little parallel in function between Bronze Age temples and lighthouses, and the Classical Greek tower is a more likely precursor. The Classical Greek tower was one of the most common sights in antiquity and remains of these towers can be found all over the Greek islands, like Siphnos in the Aegean Sea and Lefkada in the Ionian Sea.[563] Some of the earliest lighthouses were found on the islands of Thasos (northern Aegean) and Lefkada and resemble classical signal towers in form and function. There is an observable parallel between Greek towers and ancient lighthouses, particularly in their round and square shapes, their internal arrangements, and local sourcing of material for

[561] Eur. *Hel.* 766; Thuc. 3.22.7 (Dent 1910); Morton 1998, 182-83, 323.
[562] Gordon 1952, 212–13; Yon 2006, 111.
[563] Ashton and Pantazoglou 1991; Morris 2001.

construction.[564] Sardinian *nuraghes* are also similar to ancient lighthouses in shape and internal arrangement, in that they have internal staircases and inner and outer layers.

Ancient lighthouses were symbols of power, prestige, success, and wealth. The presence of a lighthouse may have made a coast more attractive and suggested that the harbor and/or city to which the lighthouse was attached had enough funds to construct a lighthouse to protect their assets.[565] Illumination materials such as oil and wood were not specialty items and could be locally sourced as long as the region had the necessary resources. A specific construction was required for a lighthouse to function properly, such as the space to maintain the fire, and internal or external construction (a ramp, pulley system, or internal staircases) to transport illumination materials to the top story.

The three lighthouses examined in this thesis, at Dover, England; Patara, Turkey; and Leptis Magna, North Africa are valuable archaeological examples of the construction of navigational beacons during the Roman Imperial period. Each one has a unique background and provides useful information in regards to construction, materials, context, placement, and shape.

The harbor at Dover, England had a long history before the Roman Empire. Occupation at Dover likely dates back to the Neolithic Period (4,000-2,500 BCE) and cross-channel

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[564] Ashton and Pantazoglou 1991, 26; Morris and Papadopoulos 2005, 155.
[565] Supra n. 70.

trade was vibrant before the Roman invasion in 54 BCE. Pre-Roman cross-channel trade indicates the importance of the channel and this is further supported by the establishment of a base at Dover for the Roman fleet in Britain, the *Classis Britannica*. Dover was a base for the fleet and a trading hub in the first century CE which led to the construction of the Dover lighthouse. The dates for the construction of the lighthouse are provided through the examination of unstamped Roman roof tiles and bricks, indicating that the lighthouse was constructed between 43 CE and 85 CE. Such a narrow date is provided by the known date of Claudius's invasion of Britain in 43 CE, and the fact that the stamping technique was not used until Trajan's reign in the second century CE. A second lighthouse was constructed possibly in the fourth century CE but very little survives. The lighthouses were constructed on the Dover cliffs which was an ideal placement for the lighthouses to effectively indicate the location of the harbor. There may have been a trend of placing lighthouses at river mouths, of which Dover may be considered part.[566] The two Dover lighthouses were also possibly part of a triangular alignment with the Boulogne lighthouse, which was built by Caligula (37-41 CE) in the early first century CE and located across the English Channel in northern France. Regional influence is noted in the octagonal shape of the Dover lighthouse, which may have been a feature of lighthouses in formerly Celtic regions. The materials used in the construction of the lighthouse were locally sourced. Local tufa was the primary material and was an effective building stone which made it unnecessary to import other, more

[566] Supra n. 105.

well-known types of stone.[567] Typical Roman building techniques were used in the lighthouse, such as *opus vittatum* in the arches of the windows[568] and the tower. No contemporary texts or epigraphy reference either of the Dover lighthouses, although historical texts have proved relevant and support the local sourcing of materials and building patterns that were used in the construction of the lighthouses.

Patara, Turkey was the headquarters of the Lycian League, a main city of Lycia, and an important port for trade and shipping of grain.[569] Patara was likely occupied as early as the Bronze Age, indicated by a Bronze Age stone axe and Protogeometric ceramics.[570] Beginning with the Persians in the sixth century BCE, the region of Lycia experienced a long line of diverse leaders and occupation by different cultures which left a unique mark on the architecture of Lycia and Patara, seen in the rock cut tombs in Lycia, and Patara's lighthouse.[571] The Patara lighthouse is the oldest standing ancient lighthouse and its remains are valuable for examining construction patterns in comparison to other surviving lighthouses like those at Dover and Leptis Magna. The construction of the lighthouse was likely part of a harbor restoration project carried out in the mid-first century CE by the governor of Lycia, Gaius Lucinius Mucianus, on the orders of the emperor Nero (54-68 CE). The preparation work for the new lighthouse may have been

[567] Supra n. 232.
[568] Supra n. 252.
[569] Supra n. 319.
[570] Supra n. 326.
[571] Supra n. 288.

begun under Claudius (41-54 CE)[572] but the actual construction was likely ordered by Nero (54-68 CE) and carried out by the governor Sextus Marcius Priscus who followed Mucianus. The construction of the lighthouse during Nero's reign is supported by an inscription that was found during excavations at Patara, which names both Nero and Priscus and suggests that the construction was either government or privately funded.[573] The letters of the inscription were gilded bronze which supports the lighthouse's imperial identity. The lighthouse had a square base which likely provided stability, and its cylindrical body may have diffused waves more effectively than a square shape. The construction consists of ashlar masonry and a unique braided system of convex and concave stones in the inner and outer cylinders. The base, part of the tower, and parts of an internal staircase survive in good condition. The base of the lighthouse is stepped, which is reminiscent of Archaic and Classical Greek temples and the fourth-century BCE Mausoleum of Halicarnassus. The primary material is sandstone, although it is unknown if it was imported or locally sourced. The preservation of sandstone depends on its composition, water content, and proximity to water, and because the lighthouse is located so close to the sea, it has likely suffered more than ancient sandstone structures located farther inland. Like the Dover lighthouse, there are no iconographic depictions or descriptions in contemporary texts. Patara was visited in the 19th century by British and French scholars although none recorded the lighthouse, which suggests that the lighthouse was buried in sand at the time.

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[572] Supra n. 336.
[573] Supra n. 363.

Leptis Magna was settled by Phoenicians in the seventh century BCE and came to be one of the most important harbors in Roman North Africa. There was no suitable natural harbor at Leptis Magna and the coast was dangerous due to the irregularity of the local Wadi Lebda, prevailing winds, and a lack of protection, but the proximity to fertile farmland made Leptis Magna a valuable city for the Roman Empire. There is evidence for Roman occupation of Leptis Magna after the defeat of Carthage in the second century BCE.[574] There may have been an earlier lighthouse at Leptis Magna during the Phoenician period and if so, what remains today is part of a restoration carried out by the emperor Septimius Severus (193-211 CE). There is an inscription on the western side of the lighthouse which commemorates the victory of the proconsul Dolabella against rebels in 21 CE, nearly 200 years before Septimius Severus came into power, which suggests that salvaged material may have been reused in the construction of the lighthouse, or that the lighthouse was standing before the commencement of Severus's building program.[575] Dio claims that Severus placed his name on buildings that had already been constructed, which may further support the idea that there was an earlier lighthouse. Severus significantly expanded the harbor which may have included the construction of the lighthouse, or at least a substantial restoration, as well as an enlargement of the harbor which ironically led to the decline and destruction of the city in the third and fourth centuries CE.[576] The lighthouse at Leptis Magna was not

[574] Supra n. 440.
[575] Cass. Dio 76. 16. 1-4 (Cary et. al. 1914).
[576] Supra n. 497.

referenced in any contemporary texts which reinforces the limitations of relying solely on texts when studying ancient architecture. The lighthouse is, however, represented on the Severan Arch at Leptis Magna, and when examined in conjunction with the remains, this may reveal aspects of the internal arrangement.[577] The interior of the lighthouse was made up of a complicated series of corridors, staircases, ramps, and vaults, which Giardina believes was purposeful, to allow access only to certain people.[578] The lighthouse was constructed on an island that had been linked to the coast by a manmade pier commissioned by Nero.[579] The podium and tower of the lighthouse were square in shape, which may have provided stability against the elements. The lighthouse was constructed using standard Roman masonry techniques such as *opus quadratum*, which was the use of square blocks in parallel courses, and window arches of brick bound with mortar. Like the lighthouse at Dover, the material was locally sourced. The configuration of the top story is speculative since nothing survives. The lighthouse at Leptis Magna was a thoroughly Roman structure that doubled as a triumphal monument, possibly similar to the Dover lighthouse which Tuck argues was part of a Claudian lighthouse system that also included Boulogne (France), Brundisium (Italy), Ravenna (Italy), and Portus. Whether it was built or merely restored by Severus, it was a symbol of power and wealth, and like the other architecture constructed as part of his building program, it functioned to honor his return to his birth city.

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[577] Supra n. 516.
[578] Supra n. 525.
[579] Supra n. 527.

Lighthouses in antiquity held both functional and symbolic roles. They were used to guide ships into harbors and to indicate dangers along the coast but also were symbols of propaganda, patronage, triumph, and power, particularly during the Roman empire. This study of three ancient lighthouses focused on each structure's unique context, construction, and historical background. Despite a wide range of evidence available for the study of ancient lighthouses, problems remain. Not all lighthouses are represented in iconography or mentioned in contemporary sources. Contemporary sources that discuss the Pharos of Alexandria like Strabo, Caesar, and Josephus do not mention any sort of illumination and it is not until Lucan's first-century CE text that the Pharos's illumination is mentioned.[580] There are also discrepancies between iconography and contemporary sources, and within the artistic media. For example, Suetonius and Cassius Dio claim that the lighthouse at Ostia stood on an island, while Pliny writes that it stood on a mole near the harbor.[581] Iconographic depictions are not always reliable due to a lack of space in which to render sufficient detail.

For this reason, the archaeological evidence is paramount, but few lighthouses remain in their entirety, and early lighthouses constructed before the Pharos in 280 BCE can be hard to identify because of their similarities to Greek towers. Additionally, the lighthouses that do survive do not survive in their entirety, and several were

[580] Luc. *BC*. 9.11.1004-5 (Ridley 1905).
[581] Suet. *Claud*. 20.2 (Reed and Thomson 1899), Cass. Dio. 60.11.4-5. (Cary et. al. 1914), Plin. *NH*. 14 (Bostock 1855).

reconstructed over the centuries since their destructions or abandonments. The Dover lighthouse went through changes during the Middle Ages and 18th and 19th centuries, and the Torre de Hercules or Ã Coruna lighthouse underwent significant reconstructions in the 18th century and as a result, Roman masonry survives only on the interior. Neither the Patara nor Leptis Magna lighthouse survive above the bases, so the construction and appearance of their top stories are speculative based on iconographic depictions and reconstructions of other lighthouses.

Although gaps in the data cannot always be filled by other artistic media, each type of evidence can often fill in what is missing in the others. Literary evidence provides information about placement, context, and description by ancient authors who had seen the structures while they were functioning. The archaeological remains provide information regarding lighthouse construction, materials and sourcing, and internal layout, which we cannot learn from iconographic or textual evidence. Iconographic depictions are valuable because they indicate what ancient lighthouses may have looked like while standing and provide clues regarding illumination and external construction. It is necessary to examine the information together to get a clearer picture of the topic of ancient lighthouses, and by doing, so, a fairly comprehensive understanding can be gained and applied to further study.

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Software Attribution

APPENDIX A

ABBREVIATIONS FROM THE AMERICAN JOURNAL OF ARCHAEOLOGY STYLE GUIDE AND OXFORD CLASSICAL DICTIONARY

Primary authors and texts

Aesch.: Aeschylus

Ag.: *Agamemnon*

Pers.: *Persae*

Ant. Itin.: *Antonine Itinerary*

App.: Appian

B.Civ.: Bellum Civile

Syr.: Syriaca

Arat. *Phaen.*: Aratus, *Phaenomena*

Ar.: Aristophanes

Pl.: *Plutus*

Ath.: Athenaeus

Caes.: Julius Caesar

BAfr.: Bellum Africum

BGall.: Bellum Gallicum

BCiv.: Bellum Civile

Cass. Dio.: Cassius Dio

Cic.: Cicero

Flac.: Pro Flacco

Dem.: Demosthenes

Diod. Sic.: Diodorus Siculus

Diog. Laert.: Diogenes Laertius

Hdt.: Herodotus

Hom.: Homer

Il.: Iliad

Od.: Odyssey

Joseph.: Josephus

BJ: Bellum Judaicum

Livy *Ab Urbe Cond.*: *Ab Urbe Condita*

Luc.: Lucan

Oros.: Orosius

Paus.: Pausanias

Plin.: Pliny

NH: Natural History

Polyb.: Polybius

Ptol.: Ptolemy

Ravenn. Cos.: *Ravenna Cosmography*

Rut. Namat.: Rutilius Namatianus, *De reditu*

Sall.: Salllust

Iug.: Bellum Iugurthinum

Stadiasmus: *Periplus Stadiasmus Maris Magni* (in GGM 1. 427)

Strab.: Strabo

Geog.: *Geographica*

Suet.: Suetonius

Claud.: Claudius

Calig.: Caligula

Tab. Peut.: *Tabula Peutingeriana*

Tac.: Tacitus

Thuc.: Thucydides

Standard Reference Works

BMC: British Museum Coins

CAH: Cambridge Ancient History

CIL: Corpus Inscriptionum Latinarum

GGM: Geographici Graeci Minores

IG: Inscriptiones Graecae

IRT: Inscriptions of Roman Tripolitania

PECS: Princeton Encyclopedia of Classical Sites

RIB: Roman Inscriptions of Britain

RRC: Roman Republic Coins

SEG: Supplementum Epigraphicum Graecum

TAM: Tituli Asiae Minoris

Journals

AA: Archäologischer Anzeiger

AJA: American Journal of Archaeology

AnatSt: Anatolian Studies

ArchDelt: Archaiologikon Deltion

ArcJ: Archaeological Journal

Britannia: Britannia: A Journal of Romano-British and Kindred Studies

BCH: Bulletin de correspondance hellénique

BICS: Bulletin of the Institute of Classical Studies of the University of London

CP: Classical Philology

FA: Fasti archaeologici

FolOr: Folia orientalia

GaR: Greece and Rome

Hephaistos: Hephaistos: Kritische Zeitschrift zur Theorie und Praxis der Archäologie und angrenzendes Wissenschaften

Hermes: Hermes: Zeitschrift für klassische Philologie

Hesperia: Hesperia: The Journal of the American School of Classical Studies at Athens

Historia: Historia: Zeitschrift für alte Geschichte

HSCP: Harvard Studies in Classical Philology

IJNA: International Journal of Nautical Archaeology

JAEA: Journal of Ancient Egyptian Architecture

JEA: The Journal of Egyptian Archaeology

JHS: Journal of Hellenic Studies

JNES: Journal of Near Eastern Studies

JRA: Journal of Roman Archaeology

JRS: Journal of Roman Studies

Klio: Klio: Beiträge zur alten Geschichte

LibSt: Libyan Studies

MAAR: Memoirs of the American Academy in Rome

MEFRA: Mélanges de l'École française de Rome, Antiquité

MM: Madrider Mitteilungen

NNM American Numismatic Society: Numismatic Notes and Monographs

PBSR: Papers of the British School at Rome

RM: Romische Mitteilungen

REA: Revue des études anciennes

RCRFActa: Rei Cretariae Romanae Fautorum Acta

Syria: Syria: Revue d'art oriental et d'archéologie

TAPS: Transactions of the American Philosophical Society

ZPE: Zeitschrift für Papyrologie und Epigraphik