



THONIS-HERACLEION, EMPORION OF EGYPT, RECENT DISCOVERIES AND RESEARCH PERSPECTIVES: THE SHIPWRECKS

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ABSTRACT

The European Institute of Underwater Archaeology's work on the city of Thonis-Heracleion, which is located in the submerged Canopic region in the west of the Egyptian Nile Delta, has revealed this ancient port-city in all of its detail. From the 8th century BCE, this town was the custom and border post and the emporion that controlled access to the Canopic channel, traded with the Greek regions, and supervised foreign ships. This paper will highlight the discovery of over 60 shipwrecks, dating from the 6th to the 2nd centuries BCE, which demonstrate the intense maritime and fluvial activity in this coastal region. Each shipwreck was radiocarbon dated and a paleobotanical examination of its structural timbers was carried out in order to assess the wood species used in the construction of the vessels. These data constitute an exceptional source of primary evidence to pursue investigations of the development of shipbuilding in the eastern Mediterranean, and of maritime trade and regional connectivity and finally on the interaction between human society/topography of the town and the natural environment.

B egun in 1996 in the Bay of Aboukir (about 30 km at the North-East of Alexandria), geophysical and geological analyses have made it possible to determine the contours of the Canopic region now underwater, the circumstances and chronology of the phenomena of its submersion, the course of the ancient western branch of the Nile, the position of the principal archaeological deposits mentioned in the ancient texts, as well as the site's morphology and the configuration of the human establishment. Using topographical surveys and archaeological excavations, and taking into account literary, epigraphical, and iconographical sources and a thorough historiographical knowledge of the writings of the first explorers, the work now in progress by the European Institute of Underwater Archaeology (*Institut Européen d'Archéologie Sous-Marine* – IEASM), in cooperation with the Supreme Council for Antiquities of Egypt (SCA), has permitted in particular the identification of Thonis-Heracleion, city harbor in the 8th–2nd century BCE, and a formulation of an idea of its layout.¹

The site of Thonis-Heracleion (Figure 1) was organized around the temenos of the main god of the city: Amun-Gereb, the worship of whom would secure the new pharaoh's power. At the north of the temple, the architectural remains seem to belong to a shrine of Khons, the son of Amun. The interplay of *interpretatio graeca* and *interpretatio aegyptiaca* conflated the god

Amun with Zeus and Khons with Herakles. This principle of transference allowed the Greeks to view “Khons the Child” as an image of the legendary hero who had paused in this part of the Delta;² “Khons in the 1st millennium BCE becomes popular as a savior in distress, a warrior, and as a god who provided oracles. These qualities caused his worship to surpass that of Amun, so that foreigners could identify the Amun sanctuary as one of Herakles,”³ an Heracleion,⁴ the Greek name of the Egyptian city Thonis.⁵

Temples and their annexes were on a central promontory and overlook the surrounding city. To the north and east stretched the harbors of a vast port. The quays, as well as a foreport, accessed the Nile by a narrow channel. The whole is protected by a string of dunes. The location was ideal, sheltered both from prevailing northwest winds and from northeasterly storms. The topography of Thonis-Heracleion fits over that established by Jean Yoyotte through study of the texts: the name of the city of Thonis (T-Hôné) reflects a particular historical geography; the city was built over one of the “lower basins (hôné) of the arms of the Nile from where the offshoots at the end of the lower branch of the Delta emptied into the coastal lagoons, while the single upper arm emptied into the open sea.”⁶ From the topographical maps derived from the geophysical and geological surveys (Figure 2),⁷ combined with results from targeted

archaeological excavations, it can be seen that the harbor installations were highly complex. There were several major port basins⁸ interconnected by secondary waterways, all centered upon the temple area. This was bordered by two channels crossing the city from east to west that connected the port basins on the east

to a lake in the west. The port basins were connected to the Canopic branch of the Nile via two main passages: a wide passage between coastal sand dunes that linked the north port to the branch and a narrow passage to the southwest that connected the southern basins to the Nile.

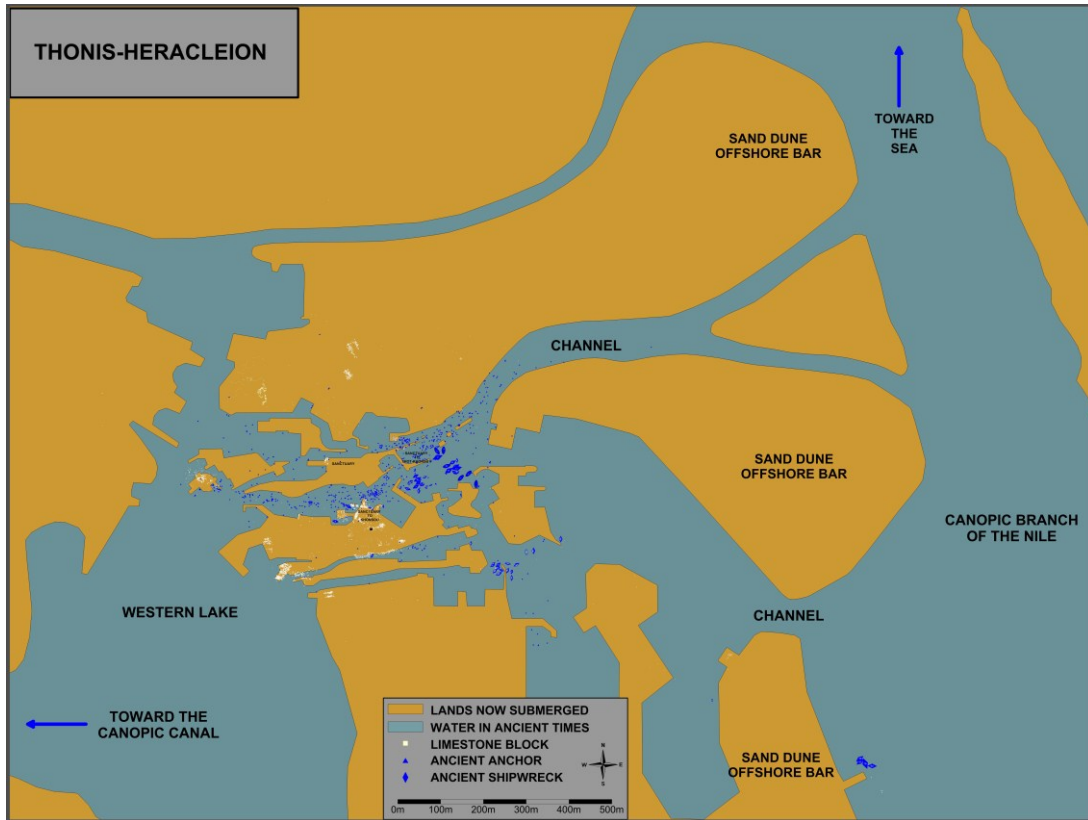


Figure 1: Map of Thonis-Heracleion, showing distribution of ancient wrecks. © Franck Goddio/Hilti Foundation.

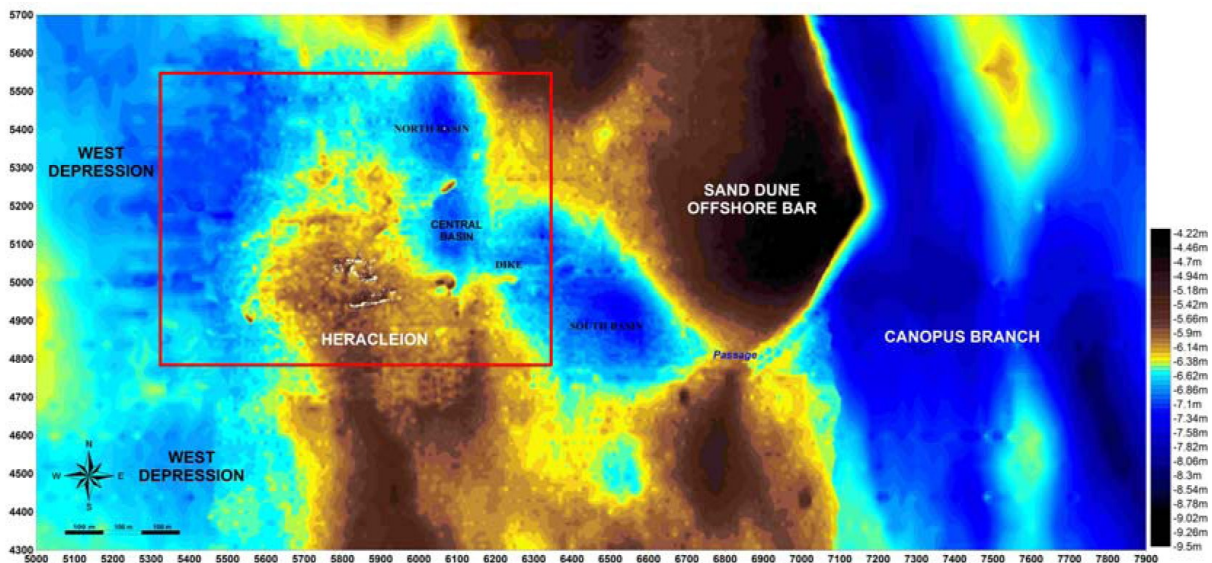


Figure 2: Bathymetric map showing the area of strong magnetic disturbance and location of Thonis-Heracleion in the submerged Canopic Region, situated between port basins to the east and a lake to the west. Sand dunes separated it from the mouth of the Nile’s Canopic channel. © Franck Goddio/Hilti Foundation.

The topographical plans and the excavations confirmed indeed allusions by classical authors concerning the locality of Thonis-Heracleion. Located east of Canopus and on the Mediterranean shore, the city was in a zone now underwater, at the mouth of the Nile's western branch, known by the names "Canopic Mouth" and "Herakleopolitan Mouth."⁹ In the Egyptian Late Period, this site controlled access to Egypt, traded with the Greek regions, and supervised foreign ships in transit for

Naukratis.¹⁰ Thonis-Heracleion was an emporion, a port and a site of commercial exchanges, which preceded the founding of Alexandria (331 BCE).¹¹

The port of Thonis-Heracleion clearly saw an intense amount of activity, as can be seen from the intact stele of granodiorite, a duplicate of the Stele of Naukratis, recovered in this sanctuary (Figure 3). The hieroglyphic text sanctions a decision made by the founder of the 30th Dynasty, Nectanebo I, in 378 BCE, in favor of the temple of Neith, patron deity of Sais. The pharaoh adopted, among other measures, the transfer to the goddess's treasury of part of the royal levies concerning, on the one hand, the goods and products of the Greeks of Naukratis, and, on the other hand, the imports that reached them by sea via the Canopic channel.¹² Intensely active trade between Egypt and the lands of the eastern Mediterranean is revealed or confirmed by the discovery of ceramics. Imported ceramics confirm extensive contacts toward the middle of the first millennium (from the 6th to the 4th century BCE). Available documentation reflects great commercial movements. According to ceramological literature, these movements are the following: a Corinthian current, noticeable especially at the beginning of the period; an Ionian current; a Cycladic current; then an Attic current, which particularly emerges starting with the Persian Period. To this list can be added a Phoenician current, the major point of which seems to have been the island of Cyprus.¹³

Another type of documentation testifies to the importance of Thonis-Heracleion as a port: over 700 anchors and over 60 shipwrecks have been identified, the majority of which date from the 6th to the 2nd century BCE (Figures 4–7). By systematically locating shipwrecks in the Central Basin, it has been possible to create a map showing the distribution of ancient boats and to determine special concentrations of ships (Figures 4, 5). It should be stressed at this point that the shipwrecks have been examined only through survey, with limited and small isolated soundings being made to evaluate each wreck.¹⁴ Wood fragments from the boats have been carbon dated, which has revealed that the majority of the shipwrecks date from the Late Period and are thus pre-Ptolemaic.¹⁵ These boats serve as exceptional documentation for the study of naval architecture, development, and operation of the port, and organization of maritime/fluvial or regional/interregional trade.¹⁶

Analyses of the woods show that the material used in the construction of the ships discovered in Thonis-Heracleion was for the most part (70%) acacia (*Acacia* sp.) (Figure 7), which was native to Egypt. The other local wood observed in the remains of boats in Thonis-Heracleion is sycamore (*Ficus sycomorus*), used for the construction of fluvial boats.¹⁷ Four shipwrecks have planking, in part, of oak – *Quercus* sp. (sclerophyllous oak type or deciduous oak type), a wood most often imported. Nevertheless, the texts of Theophrastus and Pliny the Elder indicate that oak was present in Thebaid.¹⁸ Even before studying the architecture of the ships, such initial facts suggest the local naval context. Only two shipwrecks demonstrate wood from non-native trees: *Pinus* sp.¹⁹ This is remarkable, as it would suggest a marked lack



Figure 3. Stele of Thonis-Heracleion. Granodiorite. 30th Dynasty, year 1 of the reign of Nectanebo I, 378 BCE. H. 195 cm, W. 88 cm, D. 34 cm (SCA 277). "His Majesty says: (...) Let there be given: 1/10 of the gold, silver, rough wood, finely worked wood, of everything that comes from Wady-wer of the Hau-nebut (= the Greeks), of all goods, that is, everything that is brought into the King's House in the city called Henet (= Thonis); and 1/10 of the gold, silver, everything that arrives in Per-meryt, called Naukratis, on the banks of the Anou, which are written on the account of the King's house, in the form of a divine offering for my mother Neith." Photograph by Christoph Gerigk. © Franck Goddio/Hilti Foundation.

of foreign ships as well as a virtual absence of imported shipbuilding timber, despite clear references in the texts to an import trade in this material.

Underwater observations have permitted us to form an idea of the manner in which certain boats discovered at Thonis-Heracleion were constructed. Based on this it has been possible within the study of naval architecture (as preliminary as this may now be) to show that the majority of boats were assembled by means of mortise-and-tenon joinery. This construction technique was well known in the Mediterranean in ancient times.

At the same time, elements collected during explorations allow one to posit that certain ships were built using a construction procedure that was completely original (Figure 8). These ships have hulls with flush-laid planking.²⁰ The planks are made to fit together edge-to-edge and are approximately 12-17 cm large and 10-15 cm thick; it appears that the planks at the prow are characterized by a distinctive knife-shaped form. Individual planks are joined to their neighbor by means of tenons (or strips) of considerable size pegged into the mortises. These mortises are usually carved in the edge of each plank, and the tenons are solidly pegged in place, thus forming an extremely thick network (with gaps of 20 to 35 cm) that lends great strength to the planking.

The majority of the planks used in the construction of the vessels wrecked at Thonis-Heracleion are thick and relatively short in size. Herodotus noted the use of acacia wood in Egyptian cargo boats and wrote that “of this tree they cut logs of two cubits length and lay them like courses of bricks, and build the boat by

making these two cubit logs fast to long and close-set stakes.”²¹ This kind of brick-like construction technique is also illustrated in a tomb painting (c. 2000 BCE) at Beni Hassan,²² which shows a hull under construction made of planks of small dimensions. This painting has been corroborated by the discovery in 1893 at Dahshur of several ships built using this procedure.²³ The dimensions of the acacia planks from the shipwrecks of Thonis-Heracleion roughly correspond to those given by Herodotus. The planks are between 100 and 105 cm in length, with one cubit being equivalent to 52 cm. The use of “long and close-set stakes” to fasten together the planks also perfectly describes the pegged mortise-and-tenon fastening method of the shipwrecks at Thonis-Heracleion.

The method of planking of the shipwrecks at Thonis-Heracleion differs fundamentally from the mortise-and-tenon joinery found not only earlier in Egypt but also elsewhere in the ancient Mediterranean. At Thonis-Heracleion, planks are held in place by means of long, wide tenons arranged in staggered rows, passing through and thus connecting several planks at once. This is unlike the fastening of the 4th century BCE Kyrenia ship, in which “[w]here strakes were extremely narrow, as in the ends of the ship or near scarf tips, mortises and tenons extended into the third plank.”²⁴ Instead, it is as if a frame inside the planking was intended, with the tenons almost playing the role of regularly alternating floor timbers and half timbers. It is tempting to see this unique planking technique as a specifically Egyptian style of naval construction.

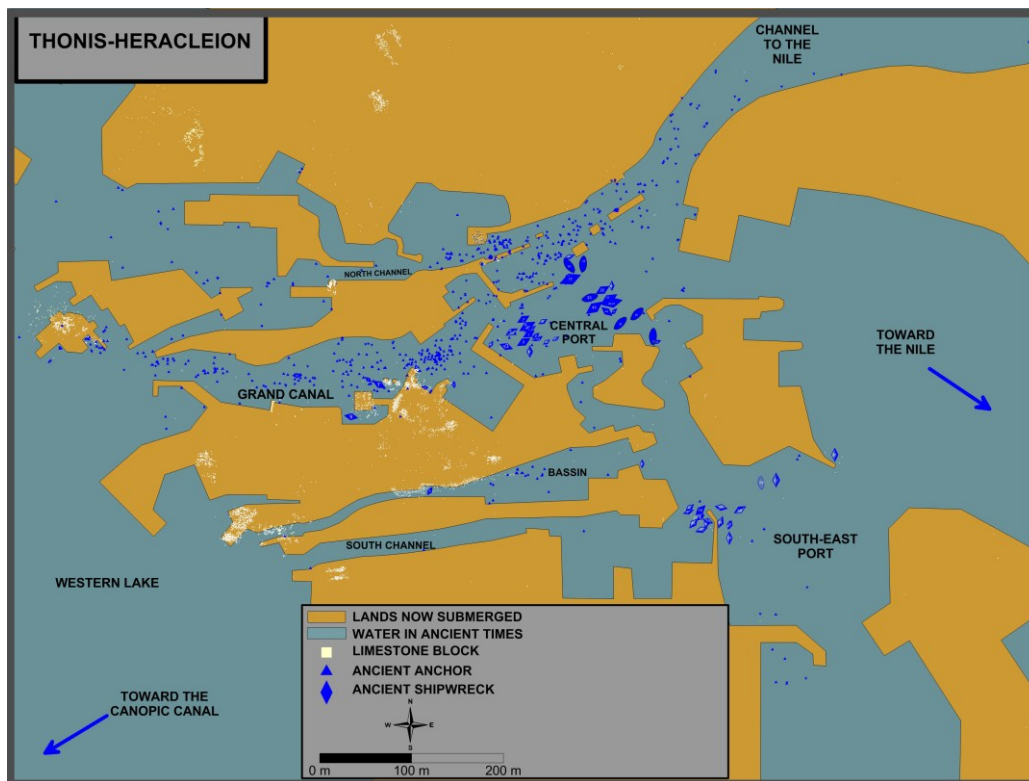


Figure 4: Map showing the distribution of ancient boats in the center of the site: Central Harbor, south of the Eastern Passage, ‘Grand Canal’). © Franck Goddio/Hilti Foundation.



Figure 5: Anchor. Limestone and wood (*Pinus* sp.). L. 75 cm, W. 50 cm, Th. 18 cm. Port H3 (shipwreck 43) (H3_10411). 405 cal BCE–208 cal. Photograph by Christoph Gerigk. © Franck Goddio/Hilti Foundation.

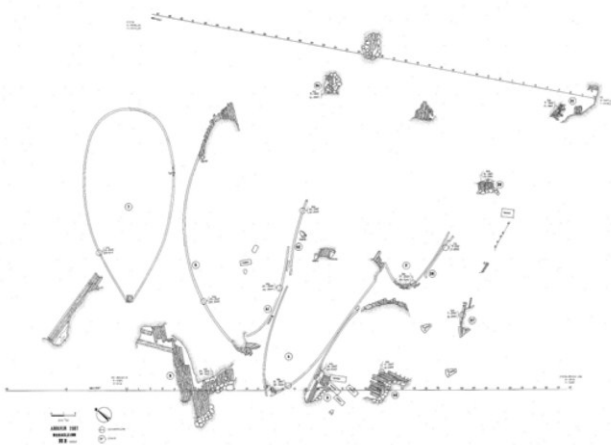


Figure 6: Plan showing a special concentration of shipwrecks (west of the Central Harbor, south of the Eastern Passage). Drawing by Patrice Sandrin. © Franck Goddio/Hilti Foundation.

This style of fastening is particularly used on shipwreck 17, excavated in 2009–2011.²⁵ Shipwreck 17 is surrounded by 14 vertical wooden poles, many of which fix the hull to the bottom. This last use of the boat could correspond to a quay or an embankment. In fact, Diodorus of Sicily wrote: “At each mouth (of the Nile) is built a city that is divided by the river and whose two parts are separated by bridges of boats and well-sited defences.”²⁶ According to the analyses of A. Belov, this shipwreck has provided further details of this distinctly Egyptian form of naval architecture. The keel of the ship, having greater sided dimensions than moulded dimensions (i.e., being wider than thick), consists of seven complete pieces and two partially preserved pieces of which the sections are assembled by a horizontal joggled joint.²⁷ An absence of the stern and stem posts in their common aspect is quite characteristic for ancient Egyptian hull construction, where the role of these structural elements was played by the curved keel itself. The planking is connected to the rabbet-less keel by long and wide tenons. Each tenon passes through a mortise in the keel and mortises in the planks, fastening together up to 5 strakes. In addition, the remains of the inner structure of shipwreck 17 are quite diverse. They include four large frames made of reused planking, some smaller auxiliary frames, and deck beams. It seems that the beams were positioned evenly along the hull, although the remains of only three were discovered. Beam ends are protruding from the hull according to ancient Egyptian boatbuilding tradition. One deck stanchion, found in its vertical position *in situ*, and a hatchway attest to the existence of the deck that was normally removable. The mast is believed to have been situated amidships, where a rectangular mortise is preserved in the keel.



Figure 7: Shipwreck 21. *Acacia* sp. Conventional ¹⁴C dating: 540 +/- 50 BCE. Calibrated ¹⁴C dating: 787 cal BCE - 482 cal BCE. Port H3 (H3_10028). Photograph by Christoph Gerigk. © Franck Goddio, Hilti Foundation.

At present, the majority of the ships of Thonis-Heracleion feature a solid, expansive lower hull, from which it is possible to arrive at an estimate of the size of the vessel. The architectural tendency that emerges from the “geometry of the proportions” of the Thonis-Heracleion ships corresponds to what we know about antique coasters in general: they had a length/width ratio of 1/3. Roughly the average length of the shipwrecks is around 20–26 m

and the width around 7–10 m. Certain boats from Thonis-Heracleion also demonstrate a relatively flat lower hull, which is characteristic of the naval architecture of interior waterways, although they were also fitted with a keel and thus would be adapted to the sea. The absence of shipworm traces on the outer side of the planking and the use of local wood and constructional features plead in favor of a river rather than a seagoing ship. In fact, this suggests an optimised form of naval architecture perfectly suited to its operational environment.

The naval architecture of Thonis-Heracleion must be understood in conjunction with the local nautical region and/or nearby inland waterways to be navigated. Thonis-Heracleion was built over one of the lower basins of the arms of the Nile that emptied into the open sea. Along the northern sea coast there are currents and headwinds, high sea floors, and sand bars that would have made coastal voyaging difficult. The narrow coastline is not very advantageous for visiting ships to dock at, as it lends itself well to wreckers and to surveillance by naval ships. The coastline of the Nile Delta was broken by so-called “false mouths.” These led sailors into dead-end lakes, mazes of floating islets and unknown channels, sedges and reeds that blocked the view, and muddy sea floors where boats could get stuck. Ships were not able to penetrate into the Delta except by the principle mouths of the Nile, that of Pelusium or that of Canopus.²⁸ It was thus an uncertain landscape: a large band of fluctuating borders depending on the Nile’s flow, submerged for long periods of time and always wet. The shallow drainage canals and lake-like gulfs were not very deep and permitted only boats with flat bottoms and/or low draughts to enter. In short, the shipwrecks of Thonis-Heracleion appear to have been well-adapted to the lagoon conditions in their dimensions and shape, as well as most probably in the manner in which they were rigged, in accordance with local conditions. The limited depth of the coastal waters dotted with high sea floors translated, in morphological terms, into the floors of the hulls being extremely flat, thus reducing the

ships’ draughts and, to facilitate grounding, a straight hull. With hardly any keel, these ships could sail just as well on the Nile as at coastal sea and could pass from the latter to the river in order to dock in the interior, in the Delta.

Thonis-Heracleion therefore “bathed” in a special nautical space. This is a physical and cultural environment, animated by networks of communication and inter-regional exchange and by the commercial channels of the eastern Mediterranean. There is no doubt that some of the boats discovered participated in the organization of trade as inshore/seagoing boats, transshipment boats, barges, etc., or even in the organization of the harbor infrastructure as quay, embankment, or bridge.

NOTES

- ¹ About the history of Thonis-Heracleion, role and function, steps of its discovery, archaeological findings, etc., see Jean Yoyotte, “Le second affichage du décret de l’an 2 de Nekhtnebef et la découverte de Thônis-Héracleion,” *Égypte, Afrique & Orient* 24 (2001): 24–34; Jean Yoyotte, “Les trouvailles épigraphiques de l’Institut européen d’archéologie sous-marine dans la baie d’Abû Qîr,” *Bulletin de la Société française d’Égyptologie* 159 (2004): 29–35; Franck Goddio, *Topography and Excavation of Heracleion-Thonis and East Canopus (1996–2006). Underwater Archaeology in the Canopic Region in Egypt* (Oxford: Oxford Centre for Maritime Archaeology, 2007), 1–28, 69–130; Franck Goddio, “Rediscovered Sites,” in Franck Goddio and David Fabre (eds.), *Egypt’s Sunken Treasures. Exhibition catalogue* (Munich: Prestel, 2008), 26–48; David Fabre, “Heracleion-Thonis: Customs Station and Emporion,” in Goddio and Fabre 2008, 219–234.
- ² About the Khons-Herakles, see Yoyotte 2004; David Fabre, “Myths and Legends,” in Goddio and Fabre 2008, 72–73; Ursula Höckmann, “Heracleion, Herakles and Naukratis,” in Andrew Wilson and Damian Robinson (eds.), *Alexandria and the North-Western Nile Delta—Joint Conference Proceedings of Alexandria: City and Harbour (Oxford 2004) and Trade, Topography and Material Culture of Egypt’s North-Western Delta (Berlin 2006)* (Oxford: Oxford Centre for Maritime Archaeology, 2010), 25–34.
- ³ Jean Yoyotte, “Naos of the temple of Amun-Gereb,” in Goddio and Fabre 2008, 309 no. 115.
- ⁴ Hdt. 2, 179.
- ⁵ The discovery of the naos (monolithic chapel containing the image of the principal god venerated in this shrine) dedicated to “Amun-Gereb,” along with information from the famous stele with the Decree of Canopus, made it possible to determine the name of the city in which it stood: Heracleion. Jean Yoyotte, “Naos of the temple of Amun-Gereb,” in Goddio and Fabre 2008, 309 no. 115. In addition a stele, the “Stele of Thonis-Heracleion,” was found in situ in the sanctuary which nearly duplicates the stele of Naukratis, and which confirmed the toponym of Thonis for that city as its text gave us the site’s Egyptian full name for the first time: “Thonis of Sais.”

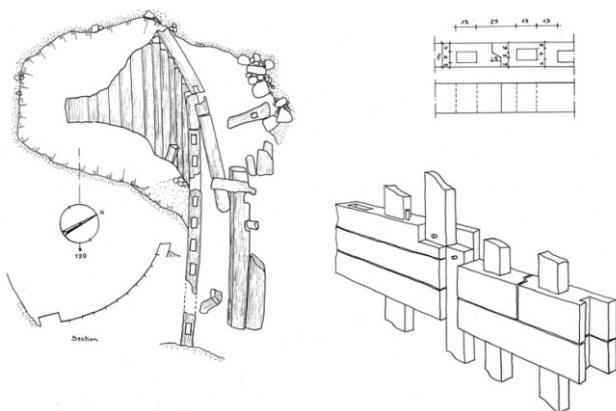


Figure 8: Assembly of planking (detail). Shipwreck 21. Photograph by Christoph Grigk. © Franck Goddio/Hilti Foundation.

Anne-Sophie von Bomhard, *The Decree of Sais* (Oxford: Oxford Centre for Maritime Archaeology, 2012). Such hypothesis had been made by J. Yoyotte, based on philological considerations. Yoyotte 2001; Jean Yoyotte, "Stele of Thonis-Heracleion," in Goddio and Fabre 2008, 238 no. 116. Another find confirmed the location's identity: a gold plaque inscribed in Greek indicating that King Ptolemy III had founded (or renovated) a shrine to Herakles in this place. Jean Yoyotte, "Ptolemy III Foundation Plaque," in Goddio and Fabre 2008, 142 no. 158.

⁶ Yoyotte 2001, 25.

⁷ Methods and results of the geophysical and electronic researches completed by geological analyses have been presented in Goddio 2007; Jean-Daniel Stanley, *Geoarchaeology. Underwater Archaeology in the Canopic Region in Egypt* (Oxford: Oxford Centre for Maritime Archaeology, 2007); Franck Goddio, "Geophysical Survey in the Submerged Canopic Region," in Wilson and Robinson 2010, 3–13.

⁸ The "Central Port" covered an area of about 3 ha. The southern basins seem to extend for a considerable area and are still under survey.

⁹ A collection of Greek and Latin literary sources, as well as papyri and inscriptions for the region around Canopus, is given by André Bernand, *Le Delta égyptien d'après les textes grecs. Les confins libyques, Mémoires publiés par les membres de l'Institut Français d'Archéologie Orientale* 91 (Cairo: Institut Français d'Archéologie Orientale, 1970), 153–258.

¹⁰ Jean Yoyotte, "Notes de toponymie égyptienne," in *Festschrift zum 80. Geburtstag von Professor Dr. Hermann Junker, Mitteilungen des Deutschen Archäologischen Instituts, Abteilung Kairo* 16 (Cairo: Deutschen Archäologischen Instituts, 1958), 427; Yoyotte 2001, 27; Fabre 2008, 219–234.

¹¹ Concerning the scientific approach of the IEASM to the study of the Oriental Port of Alexandria and excavations results, see David Fabre and Franck Goddio, "The Development and Operation of the Portus Magnus in Alexandria: an Overview," in Wilson and Robinson 2010, 53–74. A full study of the excavations carried out by the IEASM is currently in production: Franck Goddio and David Fabre (eds.), *Alexandria. The topography of the Portus Magnus. Underwater archaeology in the Eastern Port of Alexandria in Egypt* (Oxford: Oxford Centre for Maritime Archaeology, forthcoming).

¹² Bomhard 2012.

¹³ Here we are not able to present, even incompletely, the role of Thonis-Heracleion as an emporion and customs post. We refer to our review, which shows how during the Late Period this location commanded access to the Canopic branch of the Nile, had trade relations with regions of Greece, and was used to inspect all foreign ships passing through Naukratis: Fabre 2008, 219–234. See also Catherine Grataloup, "Ceramics are Remnants of Daily Life in the Canopic Region," in Goddio and Fabre 2008, 246–252; Catherine Grataloup, "Occupation and Trade at Heracleion-Thonis. The evidence from the Pottery," in Wilson and Robinson 2010, 151–154; Jean-Yves Carrez-

Maratray, "Réflexions sur l'accès des Grecs au littoral égyptien aux époques saïte et perse," *Topoi* 12–13 (2005): 193–205. Concerning the link between Thonis-Heracleion and Cyprus, see David Fabre and Franck Goddio, "Une statuette chypriote découverte à Thônis-Héracléion," in *Studies Dedicated to Professor Zsolt Kiss, Études et Travaux* 25 (Warsaw: Polish Academy of Sciences, Research Center for Mediterranean Archaeology, 2012): 81–101.

¹⁴ The archaeological approach concerning these wrecks, as well as the stone anchors and anchor stocks, follows the same pattern as that adopted for determining the contours of the sunken lands and port infrastructures. During the survey, excavation of these wrecks was kept to a minimum, with only the first layer of coarse modern sediment being removed from around the ship remains protruding from the clay. This allows the outline of the wreck to be drawn and wood samples taken for ¹⁴C dating and the identification of the wood species. Just two shipwrecks (11 and 17) have been excavated between 2009 and 2010; excavation of shipwreck 43 is in progress (see below).

¹⁵ A considerable number (about 40%) of ships can be assigned to the Ptolemaic period, but we confine ourselves here to pre-Ptolemaic shipwrecks. We draw attention to the fact that the range of dates suggested by radiocarbon is quite large, even after adjustments have been made for environmental factors (plus or minus 50 years, or even more). The date derived from ¹⁴C methods relates only to the period during which the wood was living matter, that is, when it was still sapwood. The data, with ¹⁴C analyses and references, will be published in a monograph devoted to each shipwreck of Thonis-Heracleion.

¹⁶ We summarize here two preliminary studies already published concerning the shipwrecks of Thonis-Heracleion, with bibliography: David Fabre, "The shipwrecks of Heracleion-Thonis (Egypt). Preliminary Study and Research Perspectives," in Damian Robinson and Andrew Wilson (eds.), *Maritime Archaeology and Ancient Trade in the Mediterranean, The Proceedings of the third OCMA Symposium held in Madrid in 2008* (Oxford: Oxford Centre for Maritime Archaeology, 2011), 13–32; David Fabre and Alexander Belov, "The shipwrecks of Heracleion-Thonis (Egypt). An Overview," in Galina A. Belova, *Achievements and Problems of Modern Egyptology, Proceedings of the International Conference held in Moscow on September 29–October 2, 2009* (Moscow: Russian Academy of Sciences, Center for Egyptological Studies, 2012).

¹⁷ This is the case of the shipwreck 11 (4th century BCE), discovered in the "Grand Canal" at the North of the temenos, excavated in 2010 and 2011. Study is in progress by S. Brousse and D. Fabre.

¹⁸ Theophr. c. plant. 2, 4, 2, 8; Plin. nat. 13, 63, 19.

¹⁹ One also wonders whether this fact doesn't reflect different levels of access to wood resources in Egypt insofar as the region of Thonis-Heracleion would have been particularly well supplied with acacia.

²⁰ This naval construction method used throughout the Mediterranean region is distinct from the clinker method (where the boards are made to overlap), which was

employed later.

²¹ Hdt. 2, 96.

²² P. E. Newberry, *Beni Hassan I* (London: Kegan Paul, Trench, Tubner & Co, 1893), pl. XXIX.

²³ See, most recently, P. P. Creasman, "A Further Investigation of the Cairo Dahshur Boats," *Journal of Egyptian Archaeology* 96 (2010): 101–123, pl. II.

²⁴ J. Richard Steffy, 1985, "The Kyrenia Ship: An Interim Report," *AJA* 89.1 [1985]: 81.

²⁵ A project of a three-dimensional reconstruction of its hull is being planned by IEASM as a part of a PhD thesis of Alexander Belov entitled: *The Egyptian Shipbuilding of the Late Period. New Archaeological Evidence and 3D Reconstruction of the Hull of Shipwreck 17 of Heracleion* (In French: *Études de l'architecture navale égyptienne de la Basse Époque. Nouvelle évidence archéologique et un essai de restitution 3D de l'épave 17 d'Héracleion*). This research is being carried out in the laboratory of three-dimensional reconstructions of the Institute Ausonius of the University

Michel de Montaigne Bordeaux-3, under supervision of Dr. R. Vergnieux. At the moment, the two seasons of excavation (2011, 2012) undertaken on Shipwreck 43 by the IEASM and the Oxford Centre for Maritime Archaeology show that the naval architecture is approximately the same that observed on shipwreck 17 (Damian Robinson, "News," *Nautical Archaeology Society Newsletter*, Winter 2012); Damian Robinson and David Fabre, "Ship 43 and the formation of the ship graveyard in the central basin at Thonis-Heracleion, Egypt", in *School of Archaeology and Ancient History, 46th Annual Conference on Historical and Underwater Archaeology, University of Leicester, Leicester, United Kingdom January 9-12 2013*, forthcoming.

²⁶ Diod. 1, 33, 7–8.

²⁷ Personal communication.

²⁸ Pierre Chuvin and Jean Yoyotte, "Le delta du Nil au temps des pharaons," *L'Histoire* 54 (1983): 54.