

The Depositional Contexts of the Ships from Thonis-Heracleion, Egypt

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Over 70 ancient vessels have been discovered by the *Institut Européen d'Archéologie Sous-Marine* in the port-city of Thonis-Heracleion, Egypt. These were deposited both individually and in groups from the 8th to the 2nd century BC. This paper investigates the contexts of these vessels to suggest that a variety of explanations—shipwrecking, ritual deposition, abandonment, and structural reuse—account for their deposition. It also seeks to place these events within the changing landscape of Thonis-Heracleion to understand the agency behind many of the decisions about what to do with old ships and boats at the end of their use-life.

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More than 70 ancient ships have been discovered in the waters around the port-city of Thonis-Heracleion by the European Institute for Underwater Archaeology. This is the largest assemblage of vessels ever to be discovered in one location in the ancient world and is an incomparable resource for understanding aspects of the nautical archaeology of Egypt's Late and Ptolemaic Periods from which the ships largely date (Fabre, 2011; Fabre and Belov, 2012; Goddio and Fabre, 2013).

As the survey, excavations, and research into these vessels and the contexts in which they were found have progressed, it has become apparent that the assemblage is not simply a random collection of ships and boats that sank by chance across the history of the port. Instead, the assemblage is the result of some very specific formation processes in which catastrophes and ship wrecking certainly played a part, but these must also be set alongside a range of decisions, most likely taken by the inhabitants of Thonis-Heracleion themselves, about what to do with their old ships and boats as they came to the end of their active working lives. Understanding what these decisions were and how they resulted in different formation processes is at the heart of this paper and will be illustrated mainly through reference to those vessels discovered in the northern area of the port-city in the Central Port and Grand Canal. The distribution of these submerged vessels clearly demonstrates that they are not evenly scattered throughout the port but appear to be concentrated in several distinct areas (Fig. 1). Notably, there appears to be an eastern (Fig. 1A) and

a western group (Fig. 1B) in the Central Port, a group close to the shoreline to the north and west of the sanctuary of Khonsu on the Central Island (Fig. 1C), and a cluster in the South East Port (Fig. 1D). This southern group of vessels is not included in this present discussion as only survey work has been undertaken here. In contrast, several of the ships and boats to the north have been stratigraphically excavated and their wider contexts examined in detail, allowing us to understand something of the agency of the ancient Egyptians who created the parts of the assemblage currently under investigation.

The discovery of the ships

The majority of the ships were found during survey work to characterize the topography of the port basins. This involved the systematic probing of the upper mobile layers of sand with thin metal rods by teams of divers (cf. Bowens, 2009: 135–136). Where evident obstructions were encountered the sand was cleared, which often revealed stone blocks, anchors and occasionally traces of wooden structures. The survey took place in discrete areas, each with their own baseline that was geospatially located. Each find was recorded in the site database, along with their spatial location relative to the local baseline, which allowed their plotting using the mapping software Surfer[®]. The survey areas were chosen to assist in the reconstruction of the topography of the port, with anchors obviously becoming fouled and lost in the waterways, whereas limestone blocks were used on the surrounding land

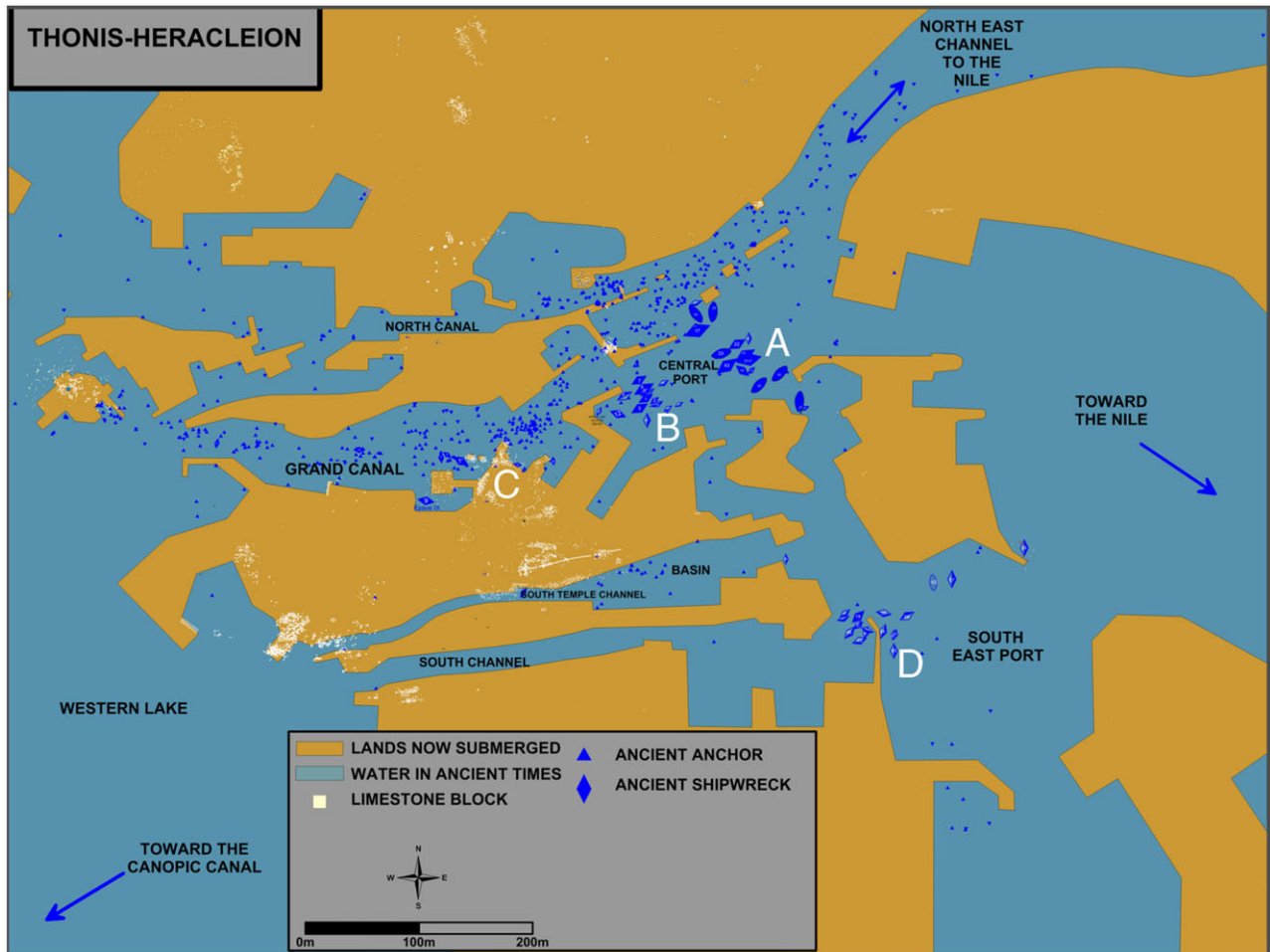


Figure 1. Thonis-Heracleion and its submerged vessels. A Central Port Eastern Group; B Central Port Western Group; C Temple of Khonsou Group; D South East Port Group (Map Franck Goddio © Franck Goddio/IEASM).

to construct temples and other monumental structures. Together these two contrasting types of artefact roughly enabled the differentiation of areas of land from their surrounding waterways and the targeting of more detailed excavations to precisely locate the shorelines. The numbers of anchors discovered in the northern areas of the site is a testimony to the intensity of the survey in this part of the city, as well as their functions as anchorages during particular periods of the port's history. It should be noted when looking at Figures 1 and 2 that not all of the port was surveyed in the same detail. Ships were also discovered through this process, which were often covered by a mound of limestone ballast (Fabre, 2011: 26–28, fig. 1.19) and, as resolutely riverine and nautical objects, they too were subsequently systematically searched for due to the information that they could provide for the topography of the port, as well as about the vessels themselves.

In the survey of the Central Port and Grand Canal the positions of suspected vessels, either represented by mounds of ballast or from timbers, were plotted. Following the initial discovery of the first ships during

the 2001 mission, it quickly became apparent that it was neither practical nor desirable to conduct full stratigraphic excavations on every vessel and a policy of preservation *in situ* was adopted for the great majority of them. From 2003–2008 specific surveys were carried out to make an inventory of the ships in the South East and Central ports in order to characterize the nature of the nautical assemblage, to assess its preservation, and to develop a long-term strategy for the investigation of the different types of vessels preserved in Thonis-Heracleion. This involved the removal of the upper mobile layers of sand over suspected ships and where possible following the surviving edges of the hull planking where it emerged from the underlying clay of the harbour floors. It should be noted that excavation into the archaeological stratigraphy of the clay layers was kept to an absolute minimum and that the removal of the planking as belonging to a vessel—as opposed to some other wooden structure—and provided some ideas about its shape and dimensions. During this stage of the investigation a plan of the outline of the ship was

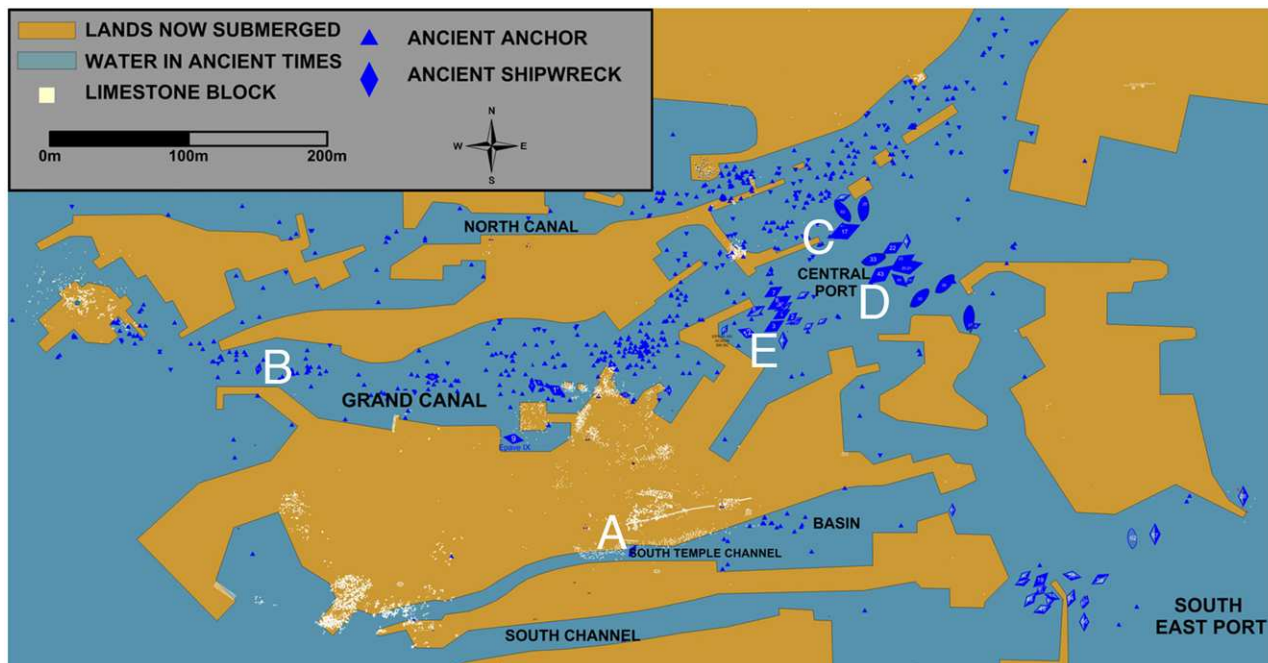


Figure 2. Close up of the Central Port and Grand Canal showing anchors, limestone blocks and ships. A ship 61; B ship 11; C ship 17; D ship 43; E western ship graveyard (Map Franck Goddio © Franck Goddio/IEASM).

made (for example Fabre, 2015: 179, figs 9.5–9.6) and samples were taken from the timbers for radiocarbon dating and wood species analysis. The implications of these analyses for the northern vessels will be returned to at the end of this paper.

In 2009 the first stratigraphic excavation began on ship 17, which was followed by ship 11 in 2010. These excavations are now complete and two more—ships 43 and 61—are currently under investigation. From this small sample it is clear that only one of these vessels can be termed a shipwreck. Of the remainder, one is interpreted as having been ritually deposited at an important liminal location in the city's religious landscape and two others appear to have been reused following a working life on the river as different pieces of maritime infrastructure in the port. Furthermore, from a consideration of the composition of one of the concentrations of submerged vessels—a ship graveyard—we can suggest that unwanted ships and boats were also abandoned (Richards, 2011: 856–857). Thus, in the northern sector of Thonis-Heracleion we are confronted with an assemblage of wrecked, ritually deposited, reused, and abandoned vessels.

Shipwrecks

Within the waters of the ancient Mediterranean, shipwrecks are by far the most commonly discovered type of submerged vessel (Parker, 1992; Strauss, 2013). They can be defined as having suffered catastrophic loss and 'being broken up by the violence of the sea, or by ... striking or stranding upon a rock or shoal' (Richards,

2008: 6–7; 2011: 857). The archaeological signatures of such losses are the presence of many items that would have been in use at the time of the catastrophe, commonly cargo and the domestic assemblage of the ship and its crew (see Beltrame, 2015; Robinson, 2017). At present it is possible to speculate, on the basis of items of cargo that seem to be associated with them, that several ships have been identified in outlying areas of the port of Thonis-Heracleion that could have become stranded and wrecked in the shifting waterways (see Cooper, 2014), although this needs to be clarified through further detailed investigation.

There is much more secure evidence for a wreck in the South Temple Channel, where ship 61 is currently under excavation. From the structure of the ship that is emerging from the clay, it appears that the hull has planking fastened with mortise-and-tenon joints and reinforced by heavy timber frames fastened to the hull with copper nails (Fig. 2A; Fig. 3). This style of construction is reminiscent of other cargo ships sailing in the eastern Mediterranean at the time (see Steffy, 1994; McGrail, 2004; Pomey *et al.*, 2012). It was discovered lying in a channel, adjacent to a quayside on the southern side of the Central Island, south of the sanctuary of Amun-Gereb (Goddio, 2015: 23–27, fig. 1.18). Little in the way of cargo has as yet been discovered in the hull of the ship, although there are some pottery objects that could be crew-related. Consequently, **ship 61 appears to have been a trading vessel that had either been recently unloaded at a quayside or was awaiting lading when it was wrecked during a land-slide associated with**



Figure 3. Ship 61 under excavation with a limestone block from the destruction of the temple overlying it (Photograph Christoph Gerigk © Franck Goddio/Hilti Foundation).

sedimentary liquefaction (Stanley, 2007; Goddio, 2015: 44). This natural disaster at the end of the 2nd century BC (Robinson and Goddio, 2015: 3–4; Goddio and Robinson, 2016: 30; based on the data provided by Thiers, 2009 (stele of Ptolemy VIII Euergetes II); Meadows, 2015 (coins); Grataloup, 2015 (ceramics)) resulted in the destruction of the temple of Amun-Gereb and the nearby sanctuary of Khonsu, the debris from which flowed down and engulfed ship 61 as it was tied up at the quayside. This can be seen by the presence of large limestone blocks discovered in contact with the hull of ship 61. A number of other ships—1, 9, 14, and 15—have also been discovered along the northern shores of the Central Island and date from this period; it is probable that they too were wrecked in this catastrophe.

Ritual deposition

A small boat—ship 11—was deliberately scuttled lengthwise across the western entrance to the Grand Canal (Fig. 2B; Fig. 4). This waterway passes on the northern side of the Central Island on which the temple of Amun-Gereb stood. The island was the focus of life in the port-city from the foundation of the temple between 450–380 BC (Goddio, 2015: 45–46) until its destruction in the natural disaster at the end of the 2nd century BC that also sank ship 61. The deposition of ship 11 dates to around 400–325 BC, shortly after the foundation of the temple.

Ship 11 was a small vessel around 10m long by 2m wide. It is unusual in the assemblage from Thonis-Heracleion as it is the only one constructed from *Ficus sycomorus*, the sycamore fig, although this wood is used

for shipbuilding timber elsewhere in Egypt (Gale *et al.*, 2000: 367–368; Ward, 2000; Creasman, 2013). The boat has a keel made up of five sections that were scarf-jointed together, to which strakes were attached and fastened using pegged mortise-and-tenon joints. The hull was strengthened through a combination of ten floor-timbers with half-frames and futtocks and at least 12 through-beams that were fastened to the upper edge of the eighth strake and protrude outside of the hull. The boat was caulked internally with a fibrous material and had an external coating of resin.

At the time of its scuttling the small boat had clearly seen a lifetime of service, as can be seen from the scratches on the underside of the hull where the vessel had been repeatedly beached or hauled out of the water. The deposition of the boat was carefully done and involved the positioning of the vessel and then letting the water in through a pre-prepared hole where a plank of the keel had been removed through carefully sawing through its tenons. The hull was filled with pieces of local limestone in order to counteract its buoyancy and enable it to easily sink. The attentiveness with which this was done and the location provides the first indications that the scuttling of ship 11 was not a simple case of the disposal of an old and no-longer-wanted vessel. Indeed, the ship graveyard in Thonis-Heracleion discussed below has very different depositional characteristics. Instead, the placement of the boat at the interface between the Grand Canal and the Western Lake, a place of significance in the ritually charged landscape of the port-city (Goddio, 2015), appears to have been a deliberate act in keeping with its location. The partial silting up of the North Eastern Channel from the Nile and the Mediterranean



Figure 4. Photomosaic of ship 11 (Photomosaic Christoph Gerigk © Franck Goddio/Hilti Foundation).

beyond to Thonis-Heracleion in the late 5th century BC (Goddio, 2015: 45) resulted in the reduction of the significance Central Port to maritime trade, with ships then reaching the city from the Nile and anchoring in the South East Port where the ships date mainly to the Ptolemaic period (Fabre and Belov, 2012: 108–109). At this time, it is likely that the religious aspect of the Grand Canal (see Goddio, 2007: 111; Goddio, 2015) was amplified with ship 11 marking its western end.

Ship 11 was also discovered surrounded by some very specific types of artefacts that are not part of the everyday refuse that was dumped into the waters of the port and were likely to have been deposited as ritual acts. Foremost among these are a group of *simpula*, long-handled ladles that were most probably linked to the Osirian celebrations during the month of *Khoiak*, which were repetitively deposited along the banks of the waterway with their long axis in an east-west direction (Goddio, 2015: 29–34). Elsewhere in the Grand Canal these were occasionally accompanied by incense burners and receptacles, particularly those made of lead but also in copper alloy, which contained the remains of fauna or flora and were often squashed closed by hand to seal in the contents before being placed into the waters (Goddio and Fabre, 2015: 100–102).

The bow and stern of ship 11 were also carefully aligned with places that have been interpreted as small chapels on the banks of the waterway and it is possible that other groups of artefacts that were excavated from around the boat were also placed into the water from these offertories. These are characterized by stone offering dishes, which were often found together with a small crushed piece of lead and animal bones suggesting that they were all placed onto the dishes together before being slipped into the waters close to the boat (von Bomhard, 2016: 189).

Ship 11 was not accidentally lost, the deliberate removal of a plank of the keel is testimony of that and, given that it was found amidst other deposits that have been interpreted as being ritual in character, it is unlikely that it was simply discarded in this location when the ship graveyard of the port was only a few hundred metres away to the east. Instead, ship 11 was deliberately abandoned in a place that was carefully

articulated within the sacred geography of the city and its ritual spaces. This may suggest that the vessel itself could have had a religious role prior to its deposition. Similar boats have been found deposited in burials and were also used for a variety of sacred voyages, both mythological and actual, from the early Dynastic period onwards (Ward, 2000; Assman, 2005: 222–223, 304; Smith, 2009: 256–257; 2017: 63–64). The wood that it was constructed from, *Ficus sycomorus*, comes from the Egyptian ‘Tree of Life’ that was sacred to the god Osiris (Goddio and Fabre, 2015: 112) and would have been a particularly apt choice for the construction of a temple barque made to participate in the rituals associated with this god. Such a barque, for example, may have been used in the navigation of Osiris on the 29th of *Khoiak*, when the god travelled to the west in his sacred boat from his temple in Thonis-Heracleion to that in Canopus (Wallis Budge, 2014: 30; Goddio and Fabre, 2015: 107, 112–116; von Bomhard, 2016: 188–189). In such a context, the scuttling of ship 11, an old and potentially worn-out Osirian barque, at the western end of a sacred waterway would also have been an apt location for the abandonment of such a vessel beyond any profane recycling or reuse in its watery ‘afterlife’.

Vessel reuse

At the end of the working life of a vessel its owner has a series of decisions to make regarding what to do with it (Richards, 2008: 61): do they dismantle it in a breaker’s yard so that any value left in the ship in the form of its timbers or fittings can be realized through recycling; do they reuse the vessel somehow, perhaps as a piece of port infrastructure; or do they abandon it like a piece of maritime refuse? Within the nautical assemblage from the Central Port of Thonis-Heracleion we have good evidence for the latter two of these decisions in the form of distinct groups of submerged vessels. The eastern group (Fig. 1A) appears to be formed of nearly identical *baris*-type ships that were probably reused as a pontoon bridge and as a wharf, whereas the western group (Fig. 1B) is made up of a variety of different types and of sizes of vessel and is more likely representative of an abandonment graveyard.

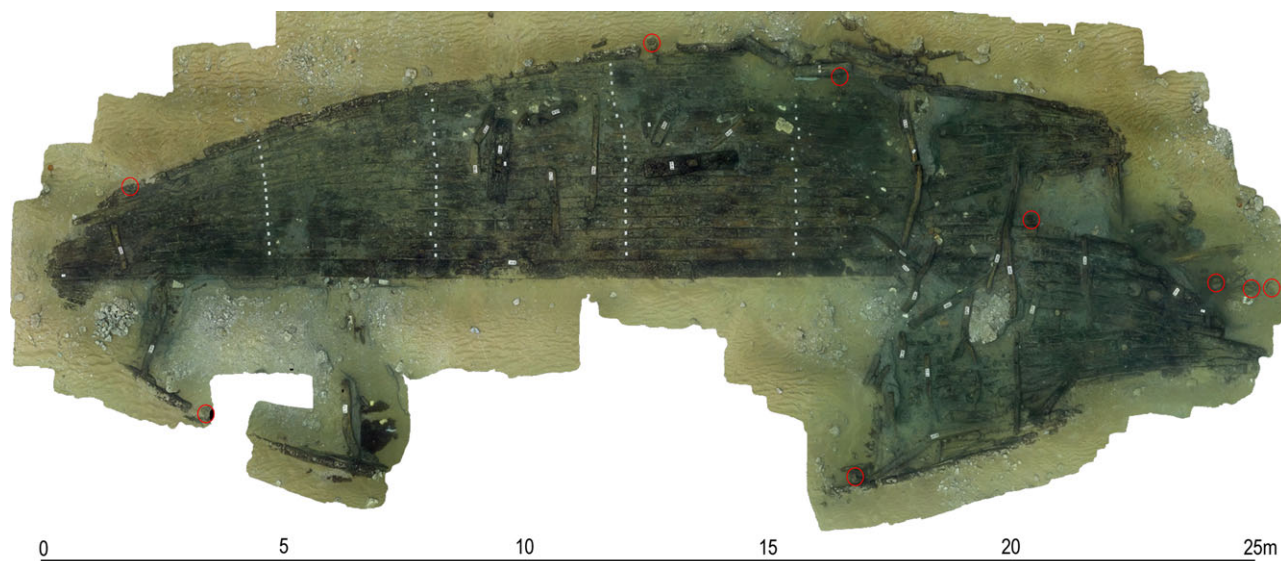


Figure 5. Vertical wooden posts surrounding ship 17 (Photomosaic Christoph Gerigk © Franck Goddio/Hilti Foundation).

Infrastructure: wharf

The first example of the structural reuse of a vessel is ship 17 (Fig. 2C), which was a Nilotic freighter known as a *baris* during its active river-faring life (Herodotus, *Historiae* 2.9; Belov, 2015a: 206; Belov, forthcoming). It dates from the beginning of the 5th to the middle of the 4th century BC and has a reconstructed length of 27–28m, a beam of 8m and a draught of 1.6m. In use, it would have had a cargo capacity of around 4000 talents or 112 metric tonnes (Belov, 2015a: 206–207). The hull was made of sturdy, short lengths of acacia wood laid in a characteristic ‘courses of bricks’ pattern. Multiple runs of planks were fastened together using very long tenon-ribs; for example, on the starboard side of the vessel a transversal section revealed that a single 1.99m long tenon passed through 11 strakes (Belov, 2014a; 2015a: 197, fig. 10a). The first line of tenon-ribs passes through the keel to which the strakes on either side were attached (Belov, 2015b). The ends of the tenon-ribs were fastened with pegs. This effectively produced lines of ‘internal ribs’ within the hull itself, although they probably provided little transversal strength (Belov, forthcoming). This was provided by through-beams, of which three were preserved, being irregular in shape and coarsely worked. Ten half-frames, or bracing timbers, were also found, which may have only been added to particular areas of the hull to provide further strengthening during the use of the vessel on the river. Ship 17 was steered using an axial rudder with two circular openings for the steering oar (Belov, 2014b) and has a step for a mast towards the centre of the vessel.

Ship 17 most likely came to the end of its working life and then would have been prepared for reuse through primary salvage (cf. Richards, 2008: 155–156) and floated into position adjacent to a small island with a jetty on the northern side of the Central Basin. It was

then staked into position using 14 long wooden piles, which were driven up to 3m into the clays of the harbour bottom (Belov, 2014a: fig. 2, Fig. 5). The purpose of this was clearly to extend the line of the jetty into deeper waters to allow ships of greater draught to berth or a larger number of ships to tie up. It is likely that an upper structure was constructed over the hull—although there are no traces of this in the surviving archaeology—to provide decking for the wharf. Nevertheless, what is clear is that the structural integrity of the hull was retained and that the ship continued to float (Belov, forthcoming). This would have allowed the jetty to rise and fall with the Nile flood and so continue to allow vessels to tie up at it throughout the year.

Infrastructure: pontoon bridge

Located at the western edge of the eastern group of ships in the Central Port, ship 43 (Fig. 2D), another *baris*, was specifically chosen for excavation to help further characterize this class of vessel, as well as to investigate the nature of the ship graveyard of which it forms a part. In terms of the nautical architecture of ship 43, it rapidly became apparent that although it was another *baris* constructed in the same way as ship 17, it was better preserved and could provide further information about the stem area and also more details about the through-beams and strengthening beams within the hull (Fig. 6). Ship 43 also has different construction details than ship 17, notably a single hole for its steering oar and, as such, the comparison of the two vessels can provide an indication of the amount of variation in two ships of roughly the same dimensions, design, construction style and intended use.

In a similar way to ship 17, ship 43 would have been prepared for its new role through the removal of the mast, rigging and any upper works so that only



Figure 6. Photomosaic of the stern of ship 43 taken during 2014 mission (Photomosaic Christoph Gerigk © Franck Goddio/Hilti Foundation).

the hull was left. This remained watertight, although it may have been laid up after this for a period of time as seen by a thin layer of Nile silt and papyrus leaves that appears to have been washed into the vessel, perhaps while the other ships in the eastern graveyard were similarly prepared for reuse. When sufficient hulls had been made ready, ship 43 was ballasted with pieces of local limestone, which overlie the Nile silt and clay layer. The ship was then floated out into position on the water where it was tethered to long piles sunk deeply into the clays of the harbour bottom to hold the vessel into position floating alongside others (Robinson, 2015: 213–216).

The position of the ships in the eastern graveyard would suggest that they were staked into place after the partial silting up of the North Eastern Channel to the Nile in the late 5th century BC. The radiocarbon dates for the securing piles, and the pine fluke of an elongated composite stone anchor found on ship 43, may all date to after the closure (Robinson, 2015: 216; cf. Abd el-

Maguid, 2015). This is significant as it is unlikely that the ships would have been reused across the Central Port if it were still a major commercial anchorage for ships sailing into the port from the Mediterranean, as they would have presented a barrier to navigation (see Richards, 2008: 84–85). The ships themselves appear to be tethered roughly in pairs (Fig. 7), which may indicate the form of organization behind their placement. In his *Bibliotheca Historica* (11.71.3–6), Diodorus Siculus describes a walled city at the end of the Nile ‘which is divided into two parts by the river and provided on each side of the mouth with pontoon bridges and guard houses at suitable points’. While only a general comment, the creation of pontoon bridges to link up the various islands and islets within Thonis-Heracleion would appear to be eminently sensible, particularly as—like the wharf created by ship 17—they could rise and fall with the river during the period of the inundation. The vessels in the eastern group could well be the remains of such a bridge and the tethering of pairs of

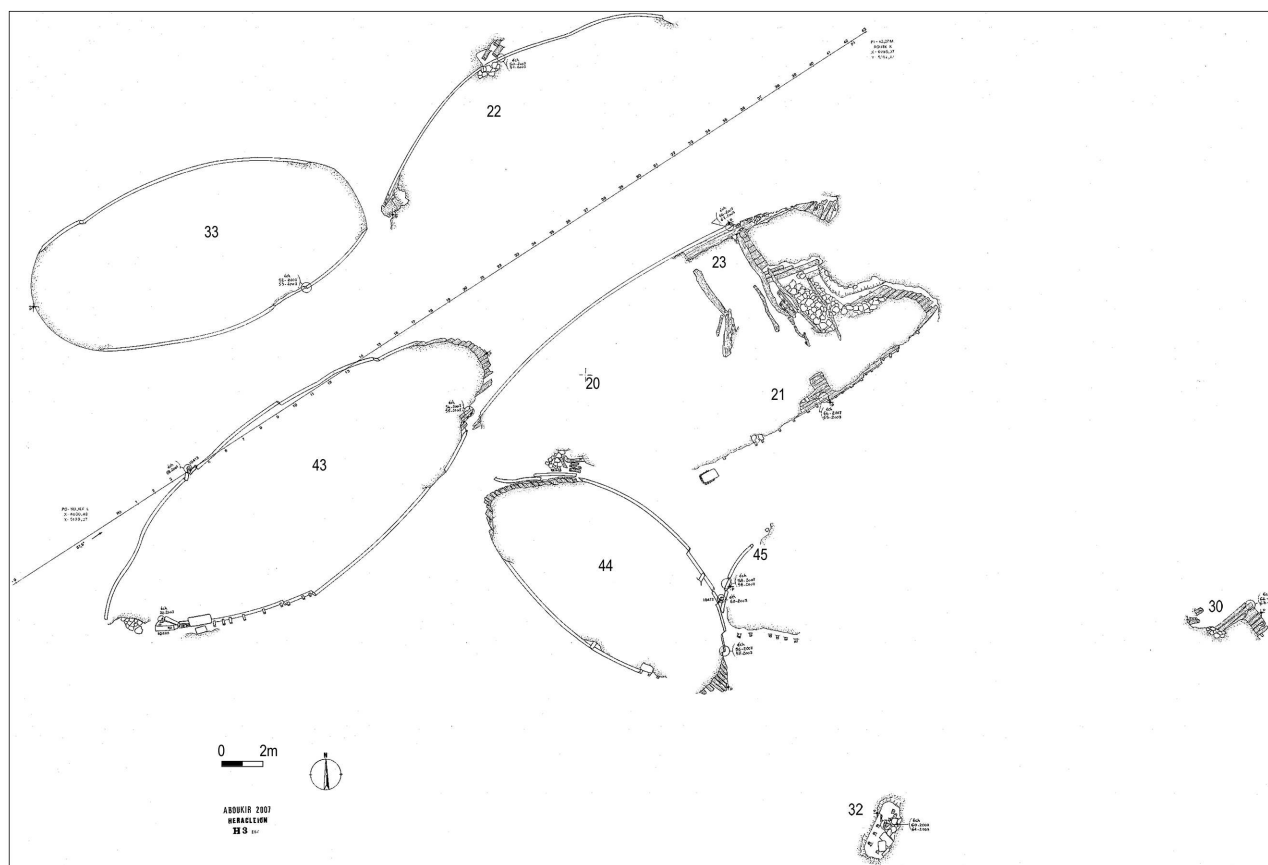


Figure 7. The remains of the **pontoon bridge** at the eastern end of the Central Port in Thonis-Heracleion (Drawing Patrice Sandrin © Franck Goddio/IEASM).

ships is particularly reminiscent of the pontoon bridge across the Hellespont built by Xerxes (Herodotus, *The Persian Wars* 7.36). Furthermore, pontoon bridges were also used elsewhere on the Nile, for example on the site of modern-day Cairo where since at least the Roman period one was used to link the eastern shore of Babylon/Fustat to the eastern shore of the island of Roda and then from its western shore to Giza on the western bank of the Nile (Cooper, 2014: 187–191, figs. 12.2–12.3; Sheehan, 2015: 49–50).

Ship abandonment

The geomorphological changes that resulted in the reconfiguration of the North Eastern Channel and the Central Port would have heralded the end of the use of this area as the main commercial anchorage for ships sailing into the port from the Mediterranean and would have perhaps rendered the western area of it as something of a backwater. This quietness would appear to provide the context for the deposition of the ships in the western ship graveyard (Fig. 2E). Unlike the eastern graveyard, which is characterized by ships of the same shape, size and date (Robinson, 2015: 218), there appears to be more variation in the vessels deposited

in the west. There is also no evidence for piles and the tethering of ships. Furthermore, they were also found superimposed over each other (compare Fabre, 2011: 15–16, figs. 1.5–1.6). Altogether the evidence would suggest that this group of ships and boats is a good candidate for an abandonment graveyard (cf. Richards and Seeb, 2013). It is as if this area of the Central Port was locally recognized as the place to which unwanted ships were taken to be dumped: a quiet area away from the main flows of traffic (Richards, 2008: 84–85). Here the vessels appear to have been scuttled without any effort made to recycle them for their timber, perhaps indicating that it was not always in short supply in the port.

The radiocarbon dates from the ships in the western group are much more varied than those in the eastern group and range from the Third Intermediate Period through to the Ptolemaic Period (Fabre and Below, 2012: 116, fig. 1). This would indicate that this assemblage was created over a long period of time and that it is unlikely that they were deposited all at once. From their dates, it would appear that the western end of the Central Port was perhaps always a quiet spot where vessels began to be abandoned relatively early on in the life of the port. Nevertheless,

it was the creation of the pontoon bridge alongside the geomorphological changes to the North Eastern Channel that appears to have accelerated the scale of the dumping of unwanted ships in this location. This quiet backwater must have become the locally recognized place in Thonis-Heracleion where old and no-longer-wanted ships and boats could be taken to be abandoned.

Discussion

Dating

Although the vessels discovered in Thonis-Heracleion are a very large assemblage, we can say with certainty that they represent only a very small proportion of the total number of ships and boats that would have used the waterways of the port in antiquity. **As a very rough indicator, the dating of the more than 70 ships spans 700 years from the 8th to the 2nd century BC,** suggesting that on average 0.1 ships per year found its way into the archaeological record: one for every decade of the port's life. Yet, from the discussion of the contexts of the ships above it is clear that groups of them were deposited at the same time—like the reuse of ten *baris* in the construction of the pontoon bridge, or the destruction of vessels such as ship 61 tied up alongside the Central Island when the temples on it were catastrophically destroyed—which indicates that there is not an even spread of vessels across the life history of the port. Certain periods of time are more strongly represented than others, most likely those in which there were large programmes of infrastructural development that called for the reuse of old ships (Fabre and Belov, 2012: 116, fig. 1; Robinson, 2015: 216; also see Ford, 2013: 212). Obviously set against this are individual events, such as shipwrecks, or the periodic dumping of unwanted vessels in the western ship graveyard in the Central Port.

Range of ships

It is also clear that we do not have a 'snap-shot' or even a representative sample of all of the different types of ships and boats that would have used the port. Although a Roman view of a Nilotic landscape, the mosaic from the sanctuary of Fortuna Primigenia at Praeneste in Italy provides a useful view of many of the different types of vessels that would have been in use in this landscape. Nine ships and boats are illustrated in this mosaic: four small papyrus boats; a small coracle-type craft; two large commercial vessels; a pleasure ship; and a naval galley (Pomey, 2015). Compared to the assemblage from Thonis-Heracleion, the mosaic has a different range of vessels: there are none of the small papyrus boats or coracles or indeed any smaller planked vessels that would surely have been a very frequent sight on the river. The exception here is obviously ship 11, the possible temple barque, which is itself a type of vessel not represented on the mosaic, although it has been suggested that such a vessel would have been illustrated in a now-missing section adjacent to the depiction

of an Osirian ritual procession (Meyboom, 1995: 64). Furthermore, there is **no indication of naval vessels or galleys** in the assemblage from Thonis-Heracleion despite the literary references for the presence of both Egyptian and Greek-style warships operating in the Delta (Thucydides, *History of the Peloponnesian War* 1.104, 1.109–110.4; Diodorus Siculus, *Bibliotheca Historica* 11.71.3–6, 2.74.5–75.4, 77.1–5). Equally, no evidence has so far been discovered during the survey and excavation for the Greek-style shipsheds that would have been required for their upkeep (Blackman and Rankov *et al.*, 2013).

Instead we have a highly structured sample that is heavily biased towards larger vessels—those over 10–15m in length—the commercial and pleasure types seen in the mosaic. While it is difficult to tell the difference between them from the submerged evidence, it is likely that both are represented in Thonis-Heracleion. Although, given the nature of the assemblage as discussed above, the smaller pleasure craft (and perhaps also smaller fishing and other commercial vessels) are more likely to be components of the western ship abandonment graveyard than that in the east, which is composed almost entirely of the same type of cargo vessel, the *baris*.

Wood species analysis

As part of the initial discovery and survey of the ships, samples were taken for wood species analysis (Fabre and Belov, 2012), from which it is clear that we are mainly dealing with Egyptian vessels from Thonis-Heracleion and that foreign ships appear to be largely absent. Only two ships contain wood from non-native trees, pine (*Pinus* sp.), which makes up just 3% of the sampled timbers. The remainder of the vessels were constructed from woods that were either common in the Delta region, notably acacia, which accounts for around 78% of the sampled timbers and sycamore fig at 2% (although this is entirely accounted for by ship 11). Although it could have been imported, oak, which accounts for 7% of the wood, could also have been of Egyptian origin as according to Theophrastus and Pliny the Elder it was grown in the south of the country (Theophrastus, *Historia Plantarum* 2.4.2–8; Pliny the Elder, *Naturalis Historia* 13.63.19).

Using only the evidence from the wood of the ships, we would be forced to conclude that the port mainly catered for local traffic. Against this, however, is the evidence from more than 700 ancient anchors that have been discovered in Thonis-Heracleion, some of which through typological parallels would suggest visitors from the Eastern Mediterranean and Greek worlds (Fig. 8; Robinson, 2016: 59), which alongside other abundant imported material (for example Grataloup, 2015; van der Wilt, 2015) and textual evidence (von Bomhard, 2015), confirm its function as a major international trading port. The reason for the absence of foreign vessels is again to be found in the formation processes of the nautical assemblage. Although



Figure 8. Kapitän Type 2 wooden anchor stock with lead inserts (Kapitän, 1984: 37, fig. 4) (Photograph Christoph Gerigk © Franck Goddio/Hilti Foundation).

Greek or Phoenician ships might have wrecked on the treacherous shifting sand bars of the Canopic mouth—and there is evidence to suggest that they did—the majority would have successfully made the return journey back to their homeports. It is here, back in Greece or Phoenicia (cf. Yardeni, 1994; Briant and Descat, 1998), that these ships would have reached the end of their working lives and been broken up or reused.

Shipbreaking

In an Egyptian port such as Thonis-Heracleion it would have mainly been the local ships and boats that would have reached the end of their working lives there. A large majority of them would have probably ended up in the ship breaker's yard where they would have been dismantled so that their owners could have recycled them and potentially had one last 'payday' from their timbers. So far, however, the locations of the shipyard, which was probably visited by Herodotus (*Historiae* 2.9), or the breaker's yard have proved frustratingly elusive, although of course, their archaeological signatures today may be minimal and difficult to distinguish in the small 'keyhole' excavations undertaken under water in Thonis-Heracleion. Nevertheless, five pieces of ship planking were reused in the construction of supports in ship 17 (Belov, forthcoming), indicating that these forms of activity would most likely have occurred somewhere in the port.

Conclusions

The assemblage of submerged vessels from Thonis-Heracleion contains both shipwrecks as well as the results of varied acts of ship abandonment and reuse. It is a significant nautical collection, particularly when placed alongside more than 700 ancient anchors and

abundant evidence for wharfs and other examples of dockside infrastructure that have been discovered during the survey and excavations of the European Institute for Underwater Archaeology. As this article has demonstrated, this assemblage is unlikely to be a chance collection of ships and boats that would enable us to examine vessel use in the port-city across its history, but is instead highly structured with regards to the types that became incorporated into the archaeological site that is currently under investigation. We consequently need to ask appropriate questions of the assemblage: why are ships clustered in particular areas and how do they inform and are informed by our interpretations of the evolving landscape (cf. Robinson *et al.*, 2017)?

This is not to suggest that ships and boats were not wrecked on sandbars or in the waterways around Thonis-Heracleion due to accidents. The natural catastrophe that resulted in the destruction of the main temples on the Central Island also appears to have accounted for several unfortunate vessels tied up on its shores at the time. When comparing these types of wrecks, however, it also needs to be acknowledged that their archaeological signatures will vary considerably depending on whether a vessel was lost while fully loaded with cargo, as opposed to sinking in port awaiting lading. On balance though, many more of the ships and boats discovered in the port-city seem to have found their way into the archaeological record through decisions about what to do with old vessels. This can be seen in the reuse of ship 17 to extend a wharf out into deeper water, or the deliberate scuttling of ship 11, the possible temple barque, at a ritually significant location within the sacred landscape of the city.

It is clear, however, that human agency regarding the abandonment and reuse of ships and boats needs to be set against the backdrop of the changing

geomorphological conditions in the port. This dynamic environment, which has both natural and anthropogenic causes, stimulates change and provides the contexts within which the groups of ships need to be situated. Foremost among these geomorphological changes are the **partial silting up of the northern entrance to the port from the Nile and the Mediterranean beyond, coupled with the gradual rise in sea level in the north of the city that resulted in the shift of the main body of the settlement to the south** (Goddio, 2015: 45–47). It was the closure of the North Eastern Channel to large ships and the movement of the main temples on to the Central Island that created the conditions for the reuse of ship 43 alongside other *baris* in the building of a pontoon bridge that helped to link up the old and new centres of settlement to year-round foot traffic. In turn this construction created an ideal quiet backwater at the western end of the Central Port where unwanted ships could be abandoned without a resulting navigational hazard. Furthermore, the use of the Grand Canal as a sacred waterway for the temples on the Central Island, and the waterborne rituals that were enacted upon

it, provided the context for the deliberate scuttling of ship 11.

The processes of wrecking and purposeful abandonment, in their many guises, contribute to the formation of this exceptional assemblage. What is presented here are the results of our initial interpretations of only four detailed excavations, which are used to infer how and why other vessels came to be deposited where they did: with more work on the various groups of ships, as well as on the landscape and material culture around them, it may be possible to refine these still further. Nevertheless, both individually and collectively the ships and boats provide unique examples of how Egyptian shipwrights built their vessels; how temple priests and locals used them as objects of veneration within the ritual landscape of the city; how local authorities could either requisition or redeploy sometimes large numbers of ships for remaking the maritime landscape of the port; and finally they tell us about attitudes towards the abandonment and discard of ships that had no further use on the waters of Thonis-Heracleion, the Delta and the Nile.

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