Shipwreck 5 from Thonis–Heracleion, Egypt

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Abstract: The site of Thonis–Heracleion located in the Nile's Delta contains more than a hundred ancient shipwrecks, most of which date to the Egyptian Late (664–332 BC) and Ptolemaic (332–31 BC) periods. Shipwreck 5 was excavated by the Institut Européen d'Archéologie Sous–Marine (IEASM) in 2019 and dates from the first half to the middle of the 4th century BC. The ship caught fire and sank during a putative naval battle. The preserved portion of the hull measures seven by three meters while the original length of the ship may be estimated at 14 to 15 m. The hull's remains were in a good state of preservation and contained a considerable amount of thick ropes.

Keywords: maritime archaeology, Egyptian Late Period, Thonis–Heracleion, ancient shipwrecks, Greco–Roman type of construction

1. Introduction

The Institut Européen d'Archéologie Sous–Marine (IEASM) has identified 125 ancient ships in the waters of the Egyptian port–city of Thonis–Heracleion on the Mediterranean coast of Egypt (among the latest publications on the subject see Robinson *et al.* 2017; Goddio *et al.* 2020; Robinson, Goddio 2021). Some of these shipwrecks form accumulations with their hulls held in place by wooden stakes and may correspond to boat bridges, some could also have been used for the purpose of land reclamation (Fig. 1).

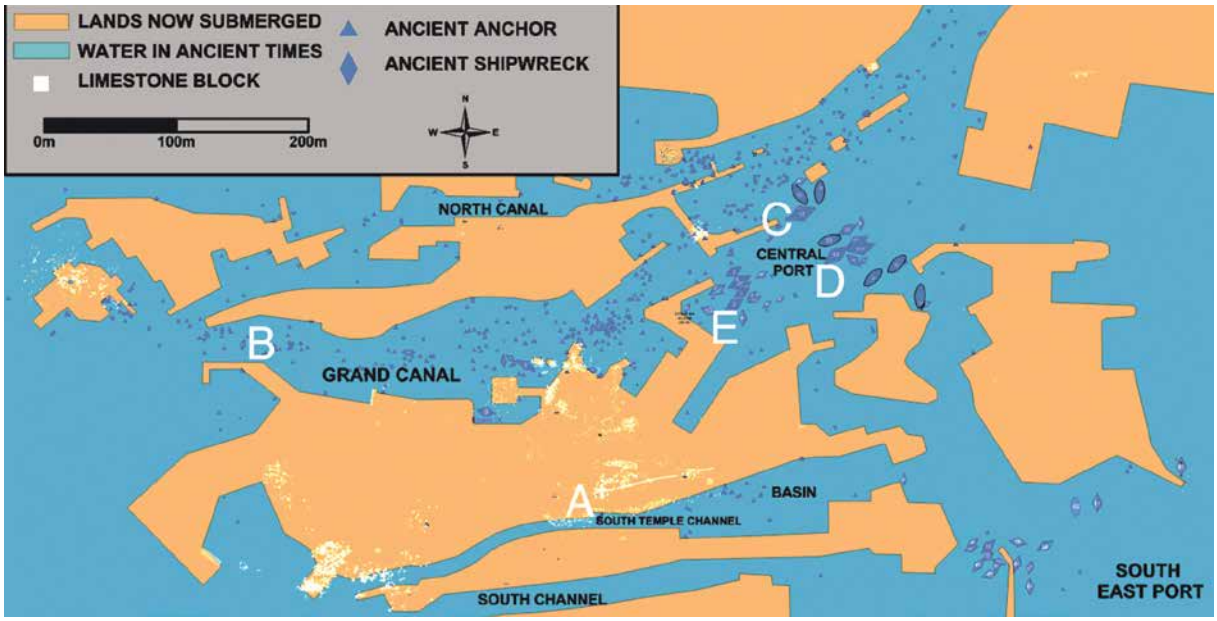

Fig. 1 Map showing the accumulations of ships in Thonis–Heracleion, after Robinson 2018, 326, Fig. 1 (map: F. Goddio, © F. Goddio/IEASM)

Two ships (Ships 17 and 43), belonging to the Eastern accumulation in the Central Port of the city (marked 'C' and 'D' on Fig. 1), have been fully or partially excavated and published (Belov 2014; 2019; Robinson 2015). These ships were identified as *barides* – local river–faring multipurpose freighters that were described by Herodotus in the middle of the 5th century BC (Belov 2015). Quite numerous on the site of Heracleion, they were built with local wood and demonstrate a very specific type of construction. However, the excavations in the spring of 2019 brought to light the remains of a small ship built in a classical shipbuilding tradition, relying on a dense network of mortise–and–tenon joinery for its planking.

2. Context and date of the ship

Ship 5 belongs to the accumulation of ships in the eastern part of the Central Port (marked 'E' on Fig.1). The depth at the excavation site was about seven meters. The upper planking of the ship was discovered under approximately 70 cm of sand. The interior of the hull below the sand was filled with dense fluvial clay. Ship 5 was surrounded by other shipwrecks, namely Ships 4, 6 and 41 (Fig. 2). Moreover, Ship 5 was deposited inside the hull of Ship 6 whose dimensions were considerably larger. All of the surrounding ships belonged to the *baris* type. A layer of sediment between Ships 5 and 6 confirms that some time had elapsed between the separate events of their deposition on the seafloor.

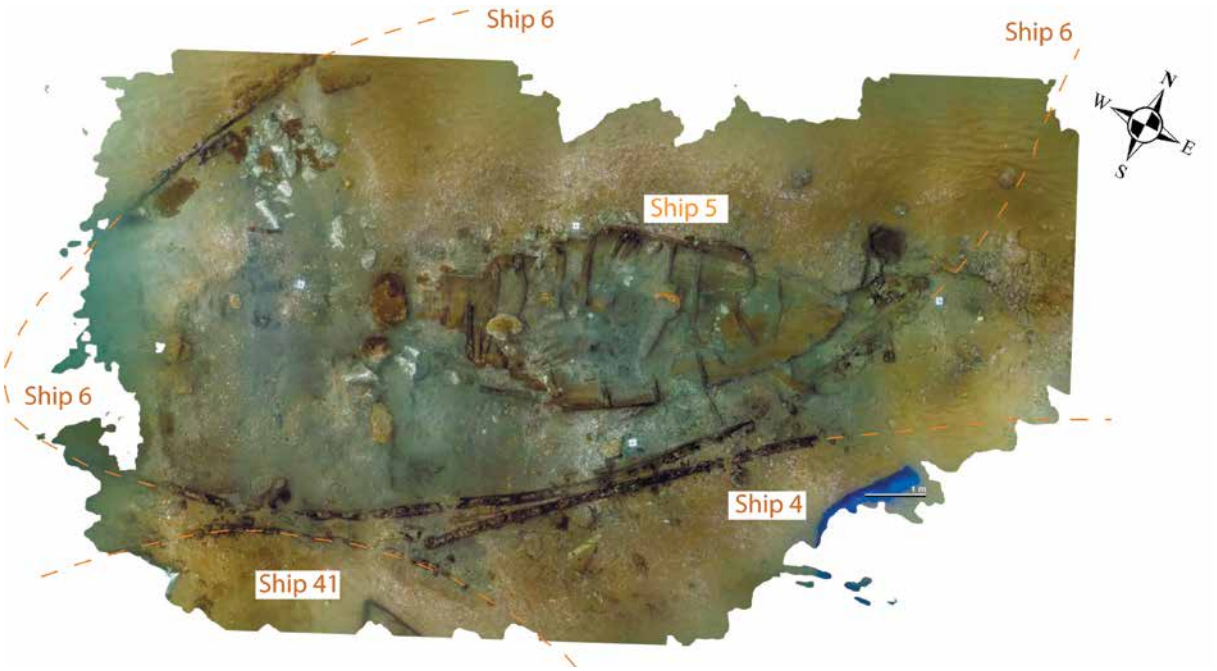

Fig. 2 Orthographic photograph showing the position of Ship 5 in relation to the surrounding Ships 4, 6 and 41 (photo: Ch. Gerigk, © F. Goddio/IEASM)

After the end of the excavation of Ship 5, it was recovered with the sediment and left *in situ*, as Egypt currently does not have facilities for the treatment and conservation of water-logged wood. The calibrated radiocarbon date for the sample of the planking is available from the Archéolabs laboratory in France (report ARC2118, 2001). It was dated 745 cal BC–380 cal BC at 95.4% and 595 cal BC–400 cal BC at 59.6% (calibration curve: IntCal98, Stuiver *et al.* 1998). The calibrated radiocarbon date for Ship 5 is very close to that of Ship 6 (Archéolabs, report ARC2119, 730–370 cal BC at 95.4% and 595–405 cal BC at 56.0%, calibration curve: IntCal98, Stuiver *et al.* 1998). Our experience shows that radiocarbon dating generally provides estimates that are less precise than those derived from the artefacts discovered on the site of Thonis–Heracleion and that pottery often affords a much narrower date range for associated objects. Several amphorae and pieces of tableware found directly resting on the interior of the hull of Ship 5 indicate that its sinking occurred sometime between the first half and the middle of the 4th century BC. It is possible that the recovered artifacts belonged to the cargo, although more research is needed to confirm this hypothesis.

Evidence further suggests that the ship was lost under tragic circumstances. The preserved section of the outer hull, many internal constructional members, and pieces of rigging bear witness to a strong fire (Fig. 3). Consequently, a considerable amount of charcoal was deposited inside the hull. The excavation brought to light several lead sling bullets and a Greek helmet of Chalcidian type (5th–4th c. BC). These artefacts allow for the suggestion that Ship 5 was lost during a military conflict, a hypothesis that will be elaborated on in the Conclusions.

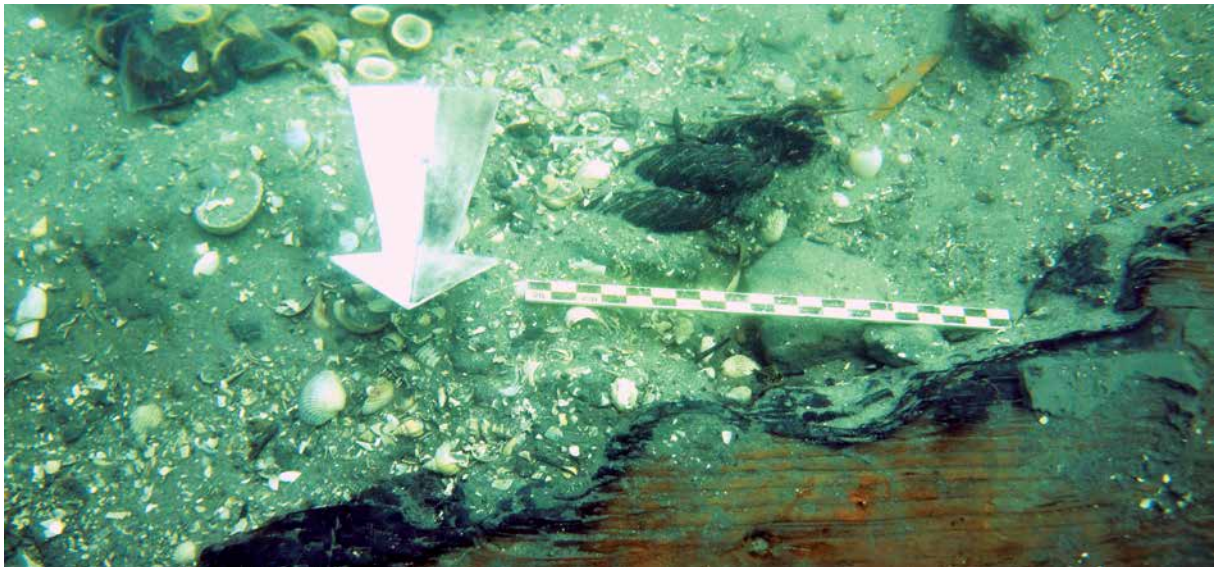

Fig. 3 The charred preserved section of the outer planking of the southern board of Ship 5 and the charred end of a rope (photo: D. Honoré © F. Goddio/IEASM)

3. Wood species and Construction

The wood species used in the construction of Ship 5 were determined by A. Belov in November 2021 using thin section microscopy (see Hather 2000: 12–20 and Akkemik 2015: 15–29 for descriptions of the standard methodology used). The use of species such as fir, pine, maple, and walnut in the construction of Ship 5 favours a foreign origin.

The wreck remains measure 7 by 3 m which corresponds to approximately one half of the initial length of the hull (Fig. 4). The remains of the ship do not allow for establishing which end was the bow and which was the stern. However, the mortise in the keel, probably destined to accommodate a mast, favours the position of the bow at the south–west. The southern board was found in a much better state of preservation than the northern one due to the considerable lurch of the ship to the south, reaching an angle of 36° at the eastern preserved extremity. The hull was also deposited with a considerable pitch towards the north–east.

3.1. Keel

The preserved length of the keel was about 7 m. The keel was formed from two pieces of wood cut from species of pine (*Pinus sylvestris / mugo / nigra*). It had no rabbet, and the inner garboard edges were simply set flush with its sides. It was essentially rectangular in section and was 11 cm high and 12 cm wide on mean average.

3.2. Fore or aft transition timber

Towards its north–eastern preserved extremity, the keel was continued with a transitional piece that had a pronounced angle of elevation. This piece represents either a gripe or forefoot timber at the bow transitioning to the stem or a similar timber at the aft end of the keel transitioning to the sternpost. The Jupiter scarf between the keel and the transitional timber had no key, probably owing to the modest size of the ship. The outboard preserved extremity of the transitional timber was broken and charred. However, a transversal rectangular opening was preserved that was probably part of a joint with a stem or a sternpost.

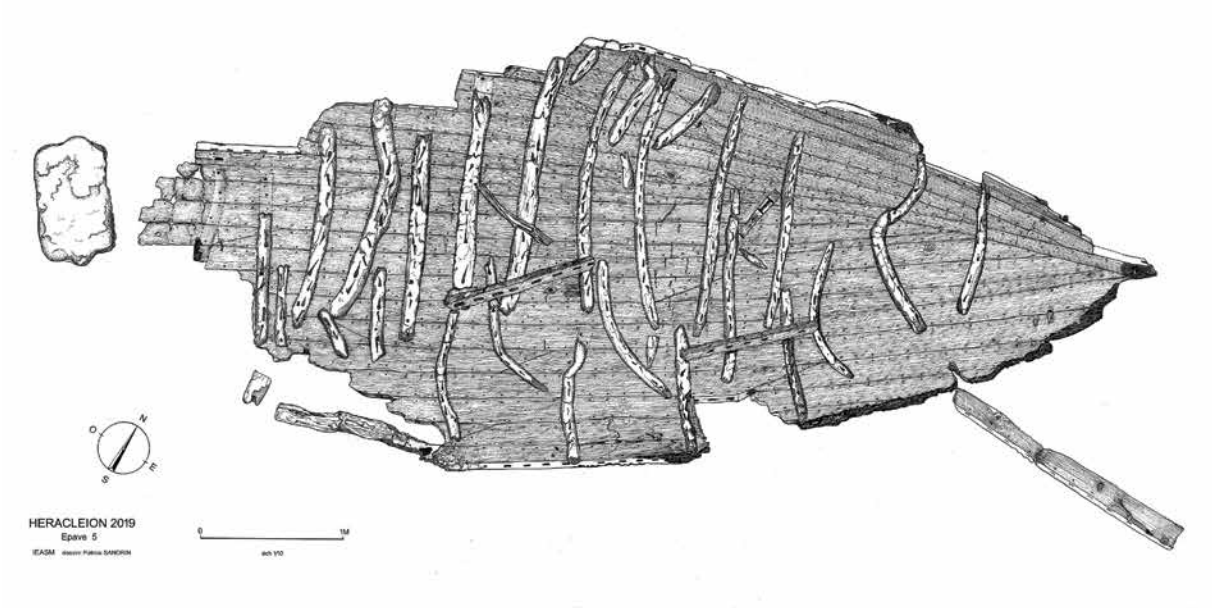

Fig. 4 Plan of the wreck (drawing: A. Roy, P. Sandrin, © F. Goddio/IEASM)

Fig. 5 Mortise–and–tenon joinery between strakes S13 (top) and S12 (bottom) with the mortises opened to reveal the interior of the joints (photo: D. Honoré, © F. Goddio/IEASM)

3.3. Planking

The planking of the ship was made of pine and silver fir (*Abies alba*). It was well preserved but rather worn, suggesting that Ship 5 was not new when it sank. The planks were plainly sawn, with their longitudinal edges cut square with no bevelling. Ten lines of strakes were preserved on the northern side and thirteen on the southern side. The plan of the planking was asymmetrical. The planks were tapering towards the extremities of the vessel and included several stealer strakes. The length of the six completely preserved planks varied from 2.7 to 5.5 m, with a mean average of 3.9 m. However, several incomplete strakes were longer, exceeding 6 m in length. Plank widths varied between 9 and 19 cm. The average thickness of the planks as observed in the preserved part of the hull was 2.5 cm. The upper wale was probably located at starboard strake S13, by far the thickest in the preserved part of the hull (3.8 cm). This strake had mortise–and–tenon joints in its upper edge, probably to secure a bulwark. This latter detail is now missing, but a plank found near the north–eastern extremity of the hull may be identified as a fragment of a bulwark. The diagonal scarf was exclusively used to join the planks of the same strake. The carvel planking of Ship 5 was assembled with pegged mortise-and-tenon joints cut in the middle of the edges of the planks. Traces of ligatures, sometimes reported from shipwrecks of this age, were nowhere to be seen on Ship 5. There were no traces of caulking or tar

either. Mortises were cut into both edges of each plank (Fig. 5). The majority were rectangular, but a few were hexagonal in shape. The mortises were, on average, 4.7 cm wide in the middle and 1.3 cm high (thick). The depth (height) of the pair of mortises was about 16 cm on average. However, the mortises composing a pair were not of equal depth (see Fig. 5). In several cases, the mortises were overlapping. The tenons were made of walnut (*Juglans cf regia)*. Their corners were angled to fit the mortise bottoms. The tenons were secured inside the mortises by tapering pegs, which had an average diameter of 0.9 cm. The pegs went through the thickness of the planking and had been inserted from the outside of the hull. The distribution of mortise-and-tenon joints across the planking was regular and rather dense. The average centre-to-centre horizontal distance between the joints was 12 cm. Several planks bear witness to a repair.

3.4. Frames

27 elements belonging to the transversal structure were preserved in the construction of Ship 5, including 13 floor timbers cut from walnut and maple (*Acer sp.*). Their distribution was not very regular, nor were they positioned exactly at a right angle to the keel. The form and size of the frames varied considerably, and the distances between them was equally uneven. The floor timbers were fixed to the planking with double–clenched bronze nails driven through wooden pegs from the outside of the hull. Each of them had a single limber hole of triangular shape positioned over the keel. The futtocks were installed rather chaotically, and they were never connected to the floor timbers. The primary strength of the hull was provided by the pegged mortise-and-tenon joinery of the planking, and these frames were of secondary importance.

Although the reconstruction of the hull is still in progress, it is possible to suggest a ship with a round bilge having a reconstructed length of about 14–15 m. No vestiges of a deck were preserved, so at the current stage of research, it is difficult to say whether the ship was decked or not.

4. Ropes and rigging

A dozen rope segments were discovered inside the hull of Ship 5 (Fig. 6). They were in a good state of preservation and undoubtedly belonged to the ship, as they were found lying directly at the bottom of its hull. The samples of rope were collected for the subsequent determination of plant species.

The longest of the preserved segments measured 3.3 m; the others were slightly shorter. As per the orientation of the twist, all ropes were Z–twisted[1] cordage and had a diameter measured in situ approaching 5 cm. However, the ropes were considerably flattened due to post–depositional processes, and their initial diameter may be estimated at 3–3.5 cm. The ropes were composed of two strands, each probably consisting of three yarns of S–twist orientation.

Several hypotheses may be suggested for the accumulation of ropes inside the hull of Ship 5. All segments of rope were of the same diameter and of the same type. They were found lying on the internal hull in parallel lines along the longitudinal axis of the ship. The position of the ropes means that they were not part of the rigging of Ship 5. The diameter of the ropes rather indicates the mooring lines that possibly belonged to Ship 5. The other possibility is that she was transporting them. It remains unclear whether the cable, or cables, were part of Ship 5's cargo when it caught fire or whether she was preparing for the mooring in the harbour. No fragments of deck were found under the ropes. If being transported, the ropes would more likely have been coiled, rather than stowed in the manner in which they were found. The 'mooring' hypothesis remains plausible if the ship was not decked and had her cables stretched out in lines in preparation for the mooring. Inside the hull of Ship 5, a toggle, a dead–eye, and several sailors' tools were found.

[1] To determine the twist, an imaginary letter 'S' or 'Z' is superimposed on a length of cordage. The central stroke of the letter defines the orientation of the twist. A rope of Z-twist can be alternatively described as twisted to the left. Issues of terminology are considered in Sanders 2010.

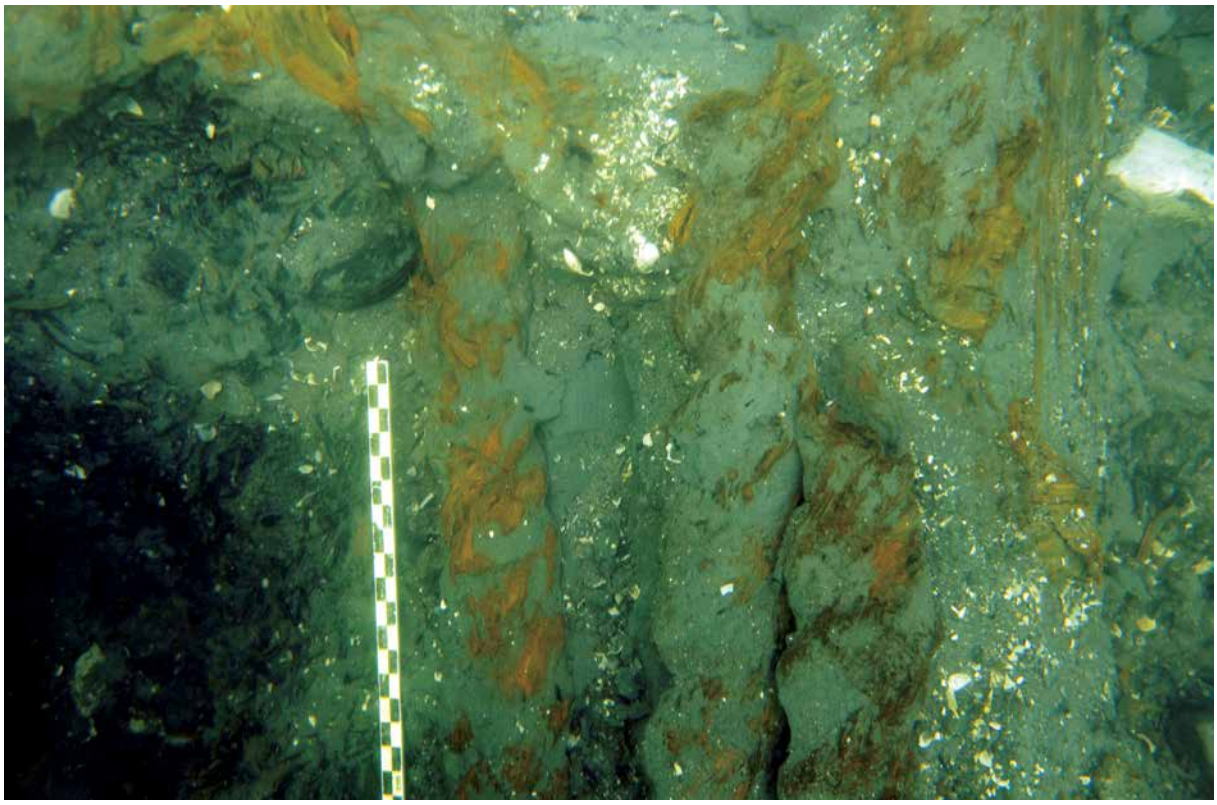

Fig. 2 Orthographic photograph showing the position of Ship 5 in relation to the surrounding Ships 4, 6 and 41 (photo: Ch. Gerigk, © F. Goddio/IEASM)

5. Conclusions

The transition in archaic Greek shipbuilding from the laced type of construction to one mainly relying on pegged mortise–and–tenon joinery took place from the late 6th century BC to the 4th century BC (Pomey 1997; Polzer 2012). Several archaic Greek shipwrecks demonstrate the concomitant use of both methods and testify to a gradual shift towards Greco–Roman shipbuilding traditions (e.g. Jules–Vernes 7 and 9, 6th c. BC). The final stage of this long development is best illustrated by the Kyrenia shipwreck from Cyprus (295–285 BC; see Steffy 1994: 42–59). Although older than the Kyrenia ship, Ship 5 contains no traces of laced joinery in its construction.

Thonis–Heracleion was situated at the entrance of the Canopic branch of the Nile, a point of strategic importance that gave the easiest access route to the Delta and to the Nile valley beyond. The city could not avoid the numerous waves of violence that shook the Delta through the 5th and 4th centuries BC. It seems that the revolt of Inaros and the Athenian intervention in 466 BC preceded the sinking of Ship 5. However, the time of the reconquest of Egypt by the Persians (343–342 BC) and the subsequent reign of Khabbabash (343 and 336–335 BC) was quite turbulent and included many martial episodes, one of which could have witnessed the sinking of Ship 5 (Fabre, Belov 2012: 115).

To conclude, there are not many known Mediterranean wrecks that date to the 4th c. BC and demonstrate a well–preserved hull. In this respect, the data collected from Ship 5 is of prime importance for the study of the naval architecture of the period. Moreover, the ship belongs to a different type of construction than the majority of the ships from Thonis–Heracleion and was in all likelihood built abroad. The ship further confirms that Thonis–Heracleion played an important role in Egyptian history in peacetime and wartime alike. The monograph devoted to the construction and function of Ship 5 is currently in preparation.

Acknowledgements

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