49 The Arade 1 shipwreck. A small ship at the mouth of the Arade river, Portugal

Filipe Castro

Introduction
The mouth of the Arade River has been inhabited since at least the Iron Age. Some scholars believe that Portus Hanibalis, an important harbour built by the Carthaginian general Amilcar in the 6th century BC, was located nearby (Carrapiço et al. 1974: 40). Later, after a predominantly rural Roman occupation of this area, North African Muslims colonized the territory from AD 715 to 1250, developing the village of Silves, a few miles upstream, and increasing the traffic on the Arade River. In AD 966 a fleet of 28 Viking ships attacked the region and was engaged and beaten on the Arade River by an Arab naval force sent from Seville (Coelho 1989, 2: 133; Marques 1993: 129).

In the 13th century the Portuguese conquest of this area brought new settlements and new settlers to the area around the mouth of the Arade River. The modern city of Portimão was a small settlement in the mid-13th century and had around 40 households in 1463, when it was named São Lourenço da Barrozo. These 40 families are thought to have been dedicated predominantly to the fishing of tuna, an ancient activity in the region. Exposed to frequent pirate incursions, the village was fortified during the second half of the 15th century (Loureiro 1909, 4:189). Due to its growing economic importance during the following centuries, two fortresses were built in the first decades of the 17th century in order to protect the river from pirate incursions. By 1615 there were 1802 inhabitants in Portimão (Carrapiço et al. 1974: 28).

The population increased steadily in this area during the following three centuries and in 1926, as the development of the preserves industry in Portimão called for larger fishing vessels, dredging operations were carried out in the mouth of the Arade River. Then, in the 1940s, two jetties were built to protect the river mouth, and in 1970 major dredging works were carried out. After this the port authorities implemented maintenance dredging works approximately every decade.

The Arade River Shipwrecks
During the summer of 1970 the captain of the dredge Mark, working at the mouth of the Arade River, reported having struck five shipwrecks, which were said to have been either totally or partially destroyed.

Two of these shipwrecks – named Arade 1 and Arade 2 – were inspected by two rival groups of sport divers. Rumours of further destruction of shipwrecks hit the local press in the early 1980s, when a new dredging campaign was launched by the harbour authority. At least one other shipwreck was destroyed. In the 1990s further dredging works and the construction of a marina brought more news of possible shipwreck trebes and destructions.

In 2001, following a public outcry against the potential destruction of yet more ship remains during a newly planned campaign of dredging operations, Centro Nacional de Arqueologia Náutica e Subaquática (CNANS) – the Portuguese National Agency for Nautical Archaeology created in 1997 – sponsored a survey at the mouth of the Arade River, with the help of Grupo de Estudos Oceânicos (GEO) a very active local group of amateur divers.

CNANS's team identified four sites of potential archaeological interest, to which were added another ten sites by the GEO divers. One of the CNANS sites, known as A1, proved to be the Arade 1 shipwreck of 1970. The surrounding area was surveyed, and a preliminary plan of the shipwreck was produced. In the summer of 2002 the excavation of this shipwreck was entrusted to a team from Texas A&M University/Institute of Nautical Archaeology under my direction.

Part of my job was to identify and organize all shipwreck sites reported intact or destroyed during the last three decades (Fig. 49.1). After consulting archives and talking to witnesses it became clear that the shipwrecks visited by sport divers in 1970 were not two, but three. The first shipwreck, Arade 1, had been surveyed and photographed by both groups of sport divers. Two good sketches and a short report were produced. The second shipwreck identification was less clear: according to the
first group it was located near one of the jetties, close to the place where a bronze gun had been found in the late 1950s. Moreover, it had more bronze guns in it, and was completely covered by silt before anybody could see it. For the other group the second shipwreck was located near the Arade 1 site, was totally exposed, and was clinker built. I have called these two vessels Arade 2 and Arade 6 respectively.

To this list of six shipwrecks another eight sites were added. Two with iron guns, located next to each other near the entrance of the jetties, were designated Arade 7 and 8. The site of the ship that had been destroyed in 1980 was located and called Arade 9, and three recent derelicts, either removed or covered during the construction of Portimão’s marina, were marked as Arade 10, 11 and 12. The last two sites added to this list were identified in 2001 by the local group GEO. The first, Arade 13, was a large copper-fastened ship lying in the middle of river. The second, optimistically named Arade 14, was a plank showing pegged mortise-and-tenon joints, the first found so far on the Portuguese coast.

Arade 1 Shipwreck

Following the promising results of the 2001 survey, CNANS sponsored a large field season at the mouth of the Arade River in the summer of 2002. The team of this field season comprised GEO divers, a group of archaeologists from the University of S. Paulo (Brazil), and another from the Nautical Archaeology Program at Texas A&M University (USA).

Under my direction, the Texas A&M team was entrusted with the excavation of the Arade 1 shipwreck. During that field season the remains of the Arade 1 ship were fully recorded, and the ceiling planking subsequently recovered. Four trenches were dug around the shipwreck, and a second portion of this hull, previously hidden in the sediments, was discovered and exposed (Fig. 49.2).

During the summer of 2003 a team from CNANS under the direction of Dr. Eric Rieth disassembled the upper portion of the shipwreck and transported the timbers to the CNANS warehouse, in Lisbon, for further study.

The upper section of the ship seems to correspond to the bow, and was preserved over an area of 7 x 3 m. It was composed of a keel, stem, apron, 18 partial frames, four strakes of ceiling planking, and six strakes of the
Keel – one section, as far as it could be observed @ C10/C11 level.

Sided – 15.5 cm (top); 11 cm (bottom).
Moulded – 13.5 cm.
Preserved length – 6.05 m.
Scarfs – Not observed.
Sided – 14.5 cm (top); 9.5 cm (bottom).
Moulded – 13.5 cm.
Preserved length – 1.49 m.
Scarfs – Not observed.
Sided – 14.5 cm (top).
Moulded – 16 to 17 cm.
Sided – Average 18 cm.
Moulded – 16 to 17 cm.
Around 42 cm between C1 and C8.
Around 29 cm between C9 and C18.

Ceiling planking (fixed) – Carefully shaped and laid. Linked through flat horizontal scarves.

Width – 23 to 27 cm.
Max length preserved – 3.28 m (TN3A).
Scarfs – Flat horizontal, 50 to 60 cm long.
Thickness – 5 cm.
Width – Variable. Min. 7 cm; Max. 29 cm.

Ceiling planking (loose) – Carefully shaped and laid.

Filler pieces – Carefully shaped and laid.

Hull planking – Carefully shaped and hung.

Fastenings – Both treenails and iron nails; remains of two bolts.

outer planking (Fig. 49.3). A scantling list is presented above, in Table 49.1.

The keel was preserved to a length of 6.05 m on the upper portion of the shipwreck, and at least 1 m on its lower portion. Its section was observed both at the fracture between the two portions and between floor timbers C10 and C11. Much eroded, it seemed to have a T-shaped section with a trapezoidal body. Later, after the 2003 field season, it was found to have a trapezoidal section with the rabbet opened below its upper surface, leaving about 3 cm of rising wood on the keel above the back rabbet line.

The stem also presented a trapezoidal section with rectangular rabbets, but without rising wood. It was connected to the keel with a flat, vertical scarf. The remains of what seemed to be an apron were attached to the upper face of the keel at its forward end. It was much eroded and no details could be recorded.

There was no keelson towards the bow, where a group of loose ceiling planks covered the area above the keel. The remains of a large mast step were recorded in 1970, preserved over a length of 5.13 m, tapered in the direction of the stern, and showing shallow notches on some of the floor timbers. The 1970 sketch shows the mast step with a square section 20 cm sided and 20 cm moulded at the level of mortise. This mortise was 40 cm long, 8 cm wide and 5 cm deep.

The remains of 18 frames were partially preserved, with floor timbers, first and second futtocks. The position of a 19th frame was clearly indicated on the planking towards the bow.

The floor timbers could be divided into two main groups. The first, lighter and better shaped, comprised timbers C9 to C18 on the upper section of the hull, and C20 to C22 on its lower section. These central floor timbers were placed with 20 cm of clear space between them and presented almost square sections 15 cm sided and 16 cm moulded. Their lower surfaces appeared smoother and showed better adherence to the hull planking. The second group of floor timbers comprised the frames localized before floor C9. These floor timbers were placed over the keel at less regular intervals, although the average distance between them, 20 cm, did not vary much from the average distance between central frames.

Table 49.1. Scantling List.
However, since these bow frames presented heavier scantlings, the average value of the room and space varied greatly between the first and second group, with 35 cm for the central frames, and 42.1 cm for the bow frames.

All floor timbers were fastened to the keel with one, two or three treenails, with the exception of floor C1, which sat on the stem and was fastened to it with a single iron nail. All floor timbers showed trapezoidal timber holes 5 cm high, 6 to 8 cm on their bases, and 4 to 5 cm on their tops. Many floor timbers were cut from oak trees with diameters smaller than 20 cm, leaving sapwood and bark on the edges. Three of the bow floor timbers – numbers C3, C4, and C5 – presented a fore and aft groove of unknown function in their upper surfaces, approximately over the keel.

A total of 23 first futtocks were preserved on the upper portion of the hull, and another five were exposed on the lower portion of the hull. Futtocks were 15 to 22.5 cm sided, and about 16 cm moulded. They were generally roughly shaped, some – such as B5E, for instance – with bark still attached. No futtock was accurately recorded in this first phase of the excavation.

Several first futtocks were fastened to the floor timbers. However, since no futtocks were disassembled during the 2002 field season, the fastening pattern is not yet known. One feature raised interesting questions: it seems that, at least in four places, fore and aft treenails fastened three timbers at the same time.

Only four, badly eroded, second futtocks – probably top timbers – were preserved on the starboard side of the Arade 1 shipwreck. These were between 14 and 17 cm sided. It is impossible to know their moulded dimensions, since none was preserved over a length more than 25 cm or to its original thickness. The best-preserved – Ap6 – was preserved to a maximum of 9 cm high, surely less than its full original maximum moulded dimension.

Four stroakes of ceiling planking were preserved on the port side. In the centre, between the four ceiling stroakes and the keel axis, there were four, small loose ceiling planks, labelled by means of wedges, also not fastened, between the ceiling and the floor timbers. All ceiling planks were 6 cm thick and had a maximum width of 28 to 29 cm. Their average lengths cannot be estimated, because none was preserved in its entirety. The longest – TN4 – was preserved for 3.60 m. Strakes 1, 2 and 3 were composed of two planks each, scarfed together with flat, horizontal scars on around 40 cm long.

There was no apparent fastening pattern. Some planks were fastened to the frames with small nails whose heads had long eroded away. This may suggest either some kind of provisional fastening, or the nailing of some kind of matting over the ceiling planking. This matting was photographed in 1970 and was still preserved in an iron concretion of one of the nail heads.

The ceiling planking was sealed above the upper strake by a number of small independent filler pieces wedged between the first futtocks. A small and well carved piece of wood was nailed to the inner face of these futtocks, lending continuity to this line of fillers (Fig. 49.4). In some of the 1970 pictures it looked like there was a continuous strake notched over the futtocks instead of these small timbers.

The hull planking was 4.5 cm thick and extended over a width of over two meters to the north (starboard side), forming seven continuous strakes with one stealer between strakes 5 and 6. To port, only two strakes were preserved. It is not possible to reconstruct the hull planking from the data collected in the 2002 summer season alone. Too many doubts remain. It looks, however, like there were seven fair runs of planking, all showing a maximum width of 37 or 38 cm, tapering gently towards the presumed bow. On each strake the planks were connected through flat scarves.

At this phase of the work there is very little information on the nature of the fastenings and fastening patterns. Both small iron nails, with square shanks about 4 x 4 mm in section, and treenails about 2.5 to 3 cm in diameter were found, as well as iron bolts around 2.8 cm in diameter. The keel scarves may have been fastened with iron nails, since remains of iron concretions were spotted on the lateral surfaces of the keel, in the supposed connection of the keel to the stem post. As mentioned above, floor timbers were fastened to the keel with one, two, or three treenails. The keel was fastened to the keelson or mast step with iron bolts in at least two places, between floor timbers C10 and C11, and floor timbers C14 and C15. The planking was fastened to the frames with one or two treenails per plank and per frame. The ceiling was also fastened to the frames with treenails, although it is not possible at this stage to say how many treenails were inserted from the outside, through the outer planking and frames, and how many – if any – were inserted from the inside. As mentioned before, it seems that some fore-and-aft treenails went through more than two timbers.

No traces of caulking were found in 2002. Some
timbers showed a white coating on the inside. Its nature is so far unknown.

**Hull shape**

Although there are enough data to attempt a reconstruction of the hull shape from the profiles taken during the 2002 field season, the effort seems premature at this stage of the project, in view of the amount of data that can still be retrieved after the recovery of the timbers in the 2003 field season.

As it is, the existing data shows that the shipwreck has suffered some deformation probably due to the impact of the dredge that broke its hull in two in 1970. The planking at the bow has fallen out slightly – frame C2 was tilted towards starboard – and the keel must have been severely hit in 1970. In fact, the first striking feature looking at this vessel is that the frames are not perpendicular to the keel.

The sketch made in 1970 could correspond to a section very close to amidships since it shows a fairly flat floor. The data retrieved during the summer of 2002 show a hull shape that is compatible with the sketch but ending – at floor timber C10 – well before the midships frame.

After ignoring stations C1 and C2, which were tilted outwards as a result of damage, the lines drawing of this portion of the hull showed it to be quite fair and compatible with a flat floor amidships of about 1.60 to 2.00 m, as suggested in the 1970 sketch. This suggests that Arade 1’s overall dimensions could be around 4 m to 5 m in beam, around 12 to 15 m long, and 2 to 2.5 m of depth in hold. The scantlings seem heavy for a vessel at the lower end of this limit, but fairly normal for a vessel at the other extreme.

**Dating the Arade 1 Shipwreck**

A sample from the Arade 1 shipwreck was analyzed in the Centro de Investigação em Paleoeconomia Humana of the Instituto Português de Arqueologia, and found to be oak (*Quercus faginea* Lam.), known in Portuguese as *carvalho cerqueiro*, common in the centre and south of Portugal and Spain, Balearic Islands, Algeria and Morocco.

Three samples were dated with the radiocarbon method at Beta Analytic Inc. and yielded calendar dates of 1530 ±50, 1630 ±40, and 1600 ±40, placing the shipwreck in the second half of the 16th or the first half of the 17th century. These dates are consistent with the presumed dates of the few artefacts found on and around the shipwreck.

**Artefacts**

The artefact collection found within the 10 x 10 m area defined around the Arade 1 ship is small and quite poor. A cast iron gun, a pewter plate and a copper cauldron were found during the 2001 field season. An olive jar and three dead-eyes were found during the 2002 field season. A total of 114 artefacts were raised and catalogued, mostly ceramic shards.

One of the most interesting artefacts recovered in 2002 is a concretion containing what is thought to be the bottom of the ship’s pump. This concretion is asymmetrical and its lower sides show the imprint of wood grain. Given the fact that the pump sump was uncovered in 2002, carved on the lower portion of the hull, between floor timbers C21 and C22 (Fig. 49.3), it seems that the pump shaft was displaced and its lead bottom involved in an iron concretion. This concretion was formed on the bottom of the hull after the collapse of some of some of its inner structure, such as a bulkhead or the walls of the pump well.

Three heart blocks and a few pieces of rope were found on the port side of the shipwreck, in Trench 4. This particular type of block – in Portuguese *sapatas trincadas* – is documented in the second half of the 16th century, used for tensioning either the forecastle or the shrouds (Nelson 2001: 107).

The gun was not recovered and it is therefore difficult to date. For the time being we can only state that it does not contradict the time frame established through carbon dating (Caruana 1994).

The same thing can be said about the pewter plate. There was a mark although it seemed completely eroded away. Only after conservation will it be possible to say whether or not it can help date this shipwreck more precisely.

The Spanish olive jar is a typical type B, Middle Period (1570–1800), after the classification by Gogin (Gogin 1964, James, Jr. 1988, Marken 1994). It bears a painted inscription on the rim, perhaps “MM,” and a mark scratched on the shoulder in the shape of a crescent moon.

A number of round concretions were found around the shipwreck and tentatively identified as barrel hoops that were either part of the ship’s cargo, or the crew’s victuals (Fig. 49.2). One of the concretions was raised, but it is impossible to know for certain what it is until it is analyzed and X-rayed.

The study of the artefact collection will undoubtedly yield information that can help to identify and date the shipwreck. For now only basic conservation is being undertaken.

**Conclusion**

It is too early to draw conclusions about the vessel type, where was it coming from, or where it was going. At this stage there is no doubt that shipwreck A1 found in 2001 by the CNANS team is the Arade 1 shipwreck exposed by a dredge in 1970. The species of timber used in its construction – Iberian oak – suggests an Iberian origin for the ship, a suspicion that is reinforced by the individual filler pieces inserted between the futtocks, as well as the presence of a complete Spanish olive jar and many shards of this type of vase.
The few artefacts found in clear association with this shipwreck confirm the period established by radiocarbon dating for the loss of the Arade 1 ship; sometime during the second half of the 16th century and the first half of the 17th century.

The extent of the hull remains and the measure of the flat amidships, around 1.6 m, suggest a maximum beam of around 4 m, an overall length between 12 and 15 m, and a depth in hold around 2.5–3 m.

Should these dimensions, date and origin be confirmed, the Arade 1 vessel would be a rare example of a small 16th- or 17th-century Iberian ship, member of a family of watercraft types virtually unknown to us. In his 1580 Livro da Fabrica das Naus, Fernando Oliveira wrote that during his lifetime small ships had changed so much that some types unknown forty years before were common by 1580, and others, common forty years before, were gone and forgotten (Oliveira 1580: 76).

In spite of its probably humble origins and the lack of rare artefacts I have no doubts that its further excavation is well justified in terms of its scientific importance.

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