CHAPTER 23

THE WOODEN ANCHORS OF KARABURUN: DOCUMENTATION AND PRELIMINARY ASSESSMENTS

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Abstract

The subjects of this article are two wooden anchors that were found by fishermen in 2011 off the Black Sea coast in Karaburun Village, Istanbul. The waterlogged wooden anchors were delivered to Istanbul University’s Conservation Laboratory for scientific analysis. Documentation studies carried out in the laboratory revealed the four pieces of the remains to belong to two different wooden anchors. The anchors are dated between 580-460 BC according to the C14 analyses. The waterlogged wooden anchors were stored wet, the desalination procedure was completed, and surface cleaning was carried out. After cleaning, photo-mosaics were completed of both sides of the anchors by combining approximately 25 photo-frames. Documentation was carried out using the 3D digitizer FaroArm; the technical details of the anchors, the data related to the manufacturing methods, and the elements such as nails, dowels, mortise and tenon joints are written on the drawing. Wood samples were taken from the anchors, and genus-species identifications as well as dendrochronological results are in the works.

Keywords: Anchor, Black Sea, Karaburun anchors, waterlogged wood, wooden anchor
1. Karaburun anchors: Discovery

In the winter of 2011, wooden pieces caught in fishermen’s nets off the Black Sea coast in Karaburun village, Istanbul-Turkiye were delivered to Istanbul University’s Department of Conservation of Marine Archaeological Objects for scientific analysis and conservation (Fig. 1). Preventive conservation was applied to the wooden anchors taken to laboratory, and the necessary conservation studies were initiated. The 1:1 scale drawings of the details, C14 analyses, and wood species identification have been done for these unique wooden anchors. The Karaburun anchors consist of four main parts. During the documentation studies carried out in the laboratory, the remains were understood to belong to two separate wooden anchors. Scientific investigations on the construction technique used for the anchors will be carried out by experts in our laboratory using the 3D digitizer FaroArm.

![Figure 1. People who contributed to the rescue of the anchor, (from right to left) Haslet Soyöz and Selçuk Birinci.](image)

2. Karaburun

The village settlement of ancient Delkos (Terkos) is located on the Black Sea coast approximately 40 km west of the northern entrance of the Bosphorus and 2 km northwest of the Durusu estuary (Fig. 2). Some researchers have stated that the ancient Philea settlement should be localized in this region. Historians think that Philea was not a city but a marketplace (emporion) of the Delkos settlement on the shore of Terkos Lake. All researchers agree that a lighthouse had existed in Karaburun in ancient times, similar to where one is today. Five votive inscriptions were found here, and the museum purchased these pieces in 1913 (Sayar, 2005, pp. 4–5; Gyuzelev, 2008, pp. 291–292). The inscriptions revealed the existence of a
local cult called Heros Stomianos. The adoration of Heros Stomianos in Karaburun shows that this cult was related to the safety of sailors traveling in the Black Sea. Although the location of the sanctuary of this cult in Karaburun and the traces of the Philea settlement have not yet been identified with archaeological finds, this place is probably located around the hill overlooking the Black Sea, where today’s Karaburun Lighthouse is located, and under the present settlement.

Figure 2. The Delkos settlement and Karaburun.

3. Wooden Anchors

Anchors are equipment that keep floating vehicles in a particular position by counteracting the effects of wind, current, and waves.\(^1\) Anchors that are lowered into the water with a rope, chain, or a combination of the two either cling to the bottom to ensure stability or create a large area to minimize drag under the boat, as used in open seas (Kocabaş, 2005, p.11). Anchors are one of the most critical pieces of equipment of a boat or ship today and undoubtedly had much more vital importance for ancient sailors who sailed only with the wind and oars.\(^2\) While the first examples attempted to ensure the anchor was attached to

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1 For general information about the history of anchors, see Curryer (1999).
2 The Greek poet Theognis, probably a seaman, in an article from 548-537, literally dwelled on the functions of anchors: “A young girl is not good for old man, for she does not follow the rudder as a ship does. She is not
the sea floor, this understanding developed in the direction of lightening anchors by having them attach to the bottom with sharp nails. This was achieved by constructing anchors using different materials (Fig. 3).

In the initial stages of their historical development, anchors were made of heavy stones. Homer used the word εὐναῖ to express anchor stones in his Odyssey (Homeros, ix. 137); he also mentioned perforated stones to have been used as anchors in the Iliad (Homeros, i. 436; xiv. 77). The Greeks referred the anchors ἄγκυρα (ankyra), meaning hook. Sidonis (600 AD) wrote, “Ancora comes from the Greek...like a hand it grips sand and stone.” In the 5th century BC, Pindar described anchors as “bronze toothed” in his Pythian Odes (iv. 24), referring to a bronze nail attached to the end of the arms of a wooden anchor to prevent wear. Virgil stated that this type of anchor was still used by the Romans in the 1st century BC, using the expression “stubborn tooth” (Virgil, Aeneid, vi.4). Anchor teeth found in the Ma’agan Mikhael and Porticello shipwrecks, dating back to 400 BC, were made of copper and bronze (Rosloff, 1991, p. 223; Eise-eman & Ridgway, 1987, pp. 19–21).

Plinius in his Naturalis Historia (vii. 57) mentioned that single-armed wooden anchors were used after stone anchors and that this discovery was attributed to Eupalamus. Strabo in his Geographika (vii. 303; 64 BC-25 AD) credited the invention of the double-armed anchor to the Scythian Anakharsis (600-590 BC). According to legend, King Midas of Phrygia founded the city of Ankyra (Ankara), where he discovered a ship anchor. Pausanias, in his Descriptio Graeciae (i. 4–5) stated that this anchor was still preserved in the temple of Zeus during his time (2nd century AD).

Stone anchors have been around since stones were used as anchors by the first sailors. Lead stock anchors were also developed based on a two-armed wooden anchor with a stone stock. The medieval and modern iron stock anchors were achieved based on the iron anchors used in tandem with wooden anchors. The unique dating and classification of ancient stone, wood, and especially iron anchors have been discussed in the article by German underwater archaeologist Gerhard Kapitan (1984) in the International Journal of Nautical Archaeology (IJNA). Kapitan’s article has been frequently repeated and used as a reference by researchers interested in this subject. However, since then, new research and discoveries in underwater archaeology have shown that Kapitan’s work should be updated with changes and additions (Haldane, 1986; Kocabaş, 2003; Votruba, 2014).

held by anchors. She tears the ropes” (Curryer, 1999, p. 25).
Wooden anchors as they are known today were first used at the end of the 7th century BC. Stone or lead stocks, bronze or iron nails, and lead support pieces were used on wooden anchors at the junction of the arm and the shank. When an anchor is lost underwater, the wood deteriorates, leaving metal, stone, and other anchor elements. Evaluations are also made according to these remains and the information from ancient sources, rarely from the wooden anchor itself. The classifications made so far have primarily been based on the stock material and the way it is attached to the wooden anchor (Kapitan, 1984; Haldane, 1984). Archaeological and written documents indicate that, stone or lead-filled wooden stocks appear to first have appeared in the 7th century BC. The first examples of stone stocks being in Cyprus, Punta della Ristola, and Metaponto. One example dating to
the second half of the 6th century BC was also found in the Dattier Shipwreck. In addition, wooden-anchor depictions first appeared on coins dating from 600-400 BC. Almost all of these depictions on coins strikingly show quite thick arms and a buoy ring on the stock and crown, which allows the anchor to be pulled up in case it gets stuck on the bottom or breaks. Depictions were first found on the coins of Apollonia Pontika3 (Fig. 4; Kapitan, 1990, p. 243; Paunov, 2017). However, when examining the descriptions of anchors on the coins recovered from Apollonia Pontica, the anchor body is understood to have contained two shanks and the arms to have been composed of pieces adjacent to this body shank. These shanks were probably cut from a large tree with one or two branches. Until the discovery of the Karaburun Anchors, how these two pieces that make up the wooden anchor were put together had remained unknown.

Figure 4. Depictions of wooden anchors with stock on Apollonia Pontica coins (Paunov, 2017, p. 84).

4. Preventive conservation

How much time elapsed from when the fishermen had retrieved the wooden pieces underwater to when they were delivered to us is not known precisely. The first examinations determined that deep cracks had occurred on the artifact, which had been found in a waterlogged state due to the drying that had occurred while exposed to the air. This occurring in winter

3 Apollonia was founded as a Miletus colony in Thrace on the Black Sea coast in the 6th century BC. Today, the settlement within the borders of Bulgaria was named Sozopol.
prevented the formation of irreversible damage to the works to some extent. The waterlogged wooden artifacts were stored wet in the laboratory. By the dimensions of the objects, a wooden chest was made for storing them in water. Thus, the wooden anchors could be stored wet during the entire study. The procedure for desalinating the objects was also carried out in the same crates. Due to the low salinity of the Black Sea (1.8%), the objects were placed directly into freshwater and measured using a conductometer tester periodically; the salinity was reduced to around 350 ppm in approximately four months through the water changes. Work in the laboratory started with the mechanical cleaning of the anchors. The cleaning removes inorganic dirt and organic formations such as mud, clay, sand, and grit residues on the pieces in order to reveal the details. The surfaces of the objects were thoroughly cleaned using soft brushes, water, and dental tools.

5. Documentation

After cleaning, photo shoots were made for a photo-mosaic. First, the photo-mosaic works on both sides of the anchor were completed by combining approximately 25 photo frames. The images were combined in the program Adobe Photoshop to obtain a single high-resolution image. Next, three-dimensional drawings of the objects were made by expert Ayşegül Çetiner-Dinçer using the 3D digitizer FaroArm. This was used to determine the elements of the anchor, such as nails, dowels, and mortise and tenon joints. The documentation work was completed by storing the documentation reports in the laboratory once the detail photos had been taken (Figs. 5a, 5b). The investigations on the wooden anchor were completed by Ayşegül Çetiner-Dinçer at Istanbul University Yenikapı Shipwrecks Application and Research Laboratory.

![Figure 5. (a) Photo and (b) 3D drawing of wooden anchors.](image)
5.1. Karaburun Anchor 1 (KA1)

A general description of the find reveals a double-armed anchor that is considered whole with its shank and arms; it is composed of two equal parts formed by dividing it into two along the axis of symmetry. In short, each part has one arm and half of the shank axis. These parts are named KA1-1 and KA1-2. KA1-1 was found intact with the shank, arm, and head parts; the length of the piece measures 460.5 cm. KA1-2, on the other hand, was broken at a point very close to the beginning of the stock-aperture, and most of its head was missing. The current length of the piece up to the fracture is 315.7 cm. Apart from these, no other element that could belong to this anchor was found.

The wood from both parts is rugged and robust. However, the most extensive damage to the pieces occurred in the form of deep cracks from the outside to the core due to being exposed to rapid moisture loss, especially on the faces of the anchor pieces taken from the sea. Apart from this, surface losses are found in the form of scorching due to occasional wear and excessive drying on the surfaces.

These two anchor pieces are joined by four mortise and tenon joints on the body parts, and the tenons are fixed in place with the peg that act as a lock on both sides. In addition, three more mortises on the head part of the anchor are seen to pass through the piece in the horizontal direction.

![Figure 6. Karaburun Anchor 1 photo-mosaic.](image)

5.2. Karaburun Anchor 2 (KA2)

If identifying the find is necessary, one can start with Karaburn Anchor 1, which has a similar structure and from which more data can be obtained. The anchor can be described as
double-armed anchor, which is considered as a whole with its body and arms, and is composed of two equal parts formed by dividing it in half along the axis of symmetry. In short, each part has one arm and half of the trunk axis. As seen from the drawing, these parts are named KA2-1 and KA2-2. Of these, only part of the body of KA2-1 is present. The head, arms, and crown have not survived. The current length of the piece is 247 cm. We also have the head of KA2-2, which unlike KA2-1 was found broken in three pieces. Its current length is 483 cm. Apart from these, no other element was found that might belong to this anchor.

The wood of both parts is rugged and robust. Apart from the losses, they have a few cracks and occasional wear on the surface. When evaluating the existing parts of these two anchor pieces, six mortises are seen to open from the body parts and to be joined with a tenon, and the pegs to be fixed in place act as a lock on both sides. However, not much care is understood to have been taken while opening the mortise. The mortise holes were not centered while drilling but were drilled closer to the second surface. One of the holes is seen to open too close to the edge (second surface) and to extend beyond the edge line, thus ceasing its function as a mortise socket. The makers were seen to have resolved this problem caused by careless calculations during the construction by shaving the mortise edges and the surface and using it in that form. It was probably hammered into the joint and visible from the outside, but it has not survived.

Figure 7. Karaburun Anchor 2’s estimated reconstruction based on KA 1. (Drawing by Ayşegül Çetiner).

6. Conclusion

The focus of underwater archaeology studies in the Black Sea in recent years have identified many well-preserved shipwrecks as a result of various deep-sea research (Ward & Ballard, 2004; Batchvarov, 2021). These shipwrecks have been dated to different centuries and are accepted as an indicator of intense trade in the Black Sea.
The unique Karaburun Wooden anchors can be considered proof of this wealth of underwater archaeology in the Black Sea and have been examined in detail regarding their construction techniques. In particular, the high level of preservation for KA1 and the fact that the two essential parts constituting the anchor were recovered with very little incompleteness increased the accuracy of the work carried out on them.

The preserved length of the Karaburun Anchor 1 (KA1) is 460.5 cm, and the arm width of the anchor is 184.5 cm from end to end. The Karaburun Anchor 2 (KA2) has features similar to that of the KA1 anchor but has fewer preserved parts. The mortise and tenon joint was used to connect both anchors.

Looking at the finds, no clear statement can be easily made about the material of the stock that had been lost. Therefore, the anchor may conceivably had a stone, lead, or lead-wood composite stock. However, the stock-aperture measurements of the Karaburun anchors help us infer the type of stock used in the anchor’s construction. Accordingly, it can be suggested that stone stocks were used for Karaburun anchors.

Based on the C14 analysis results of samples taken from KA1 and KA2, the anchors date back to the period of 580-460 BC.

The underwater survey we will carry out in front of the Karaburun lighthouse in the spring of 2024 will perhaps help unearth the shipwreck to which the wooden anchors belong.

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**References**


