

Stone anchors from the Mediterranean coasts of Anatolia, Turkey: underwater surveys and archaeometrical investigations

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This study is mainly based on the expeditions and underwater study of stone anchors from the Cilician coast, Bodrum Museum of Underwater Archaeology and the Kaş Uluburun wreck. The stone anchors found on the Cilician coast are very similar to eastern Mediterranean stone anchors with respect to shape and characteristics. The stone anchors from BMUA and KUW were examined by thin section and XRD analysis. They are made of volcanic, sedimentary and metamorphic rocks. The study indicates that the anchors are similar to others found in the Mediterranean.

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Key words: stone anchor, underwater archaeology, maritime trade-routes, METU Subaqua Society

Introduction

anchors are the potsherds of marine archaeology (Frost, 1970). Bronze-Age trade-routes in the Eastern Mediterranean can be determined with the help of anchors. Some wrecks in the western parts of the Anatolian coast became milestones of underwater archaeology,^[1] but only limited discoveries were made in the eastern part. The main reason for the lack of information has been limited underwater research.

The coast of Anatolia is considered to be an important eastern Mediterranean trade route. From 1992, METU-SAT began exploring the eastern part of the Anatolian coast and revealed new evidence for Bronze Age trade in this part of the Mediterranean^[2] (Fig. 1). Cilicia was the

name given to the region by the Roman emperor Vespasian in AD 72. During the Bronze Age the same geographical region was named Kizzuwatna, which was Hittite territory.

The main purpose of this study is to determine the types and characteristics of the stone anchors found on the Anatolian coast using archaeometric techniques. In addition to stone anchors from the eastern part of the Anatolian coast, others from Bodrum Museum of Underwater Archaeology (BMUA) and from the Uluburun wreck (KUW) (Fig. 2) have been used to correlate the trade-route relationships between the eastern and western parts of the coast^[3].

This article presents initial results of the attempts to analyse and put some stone anchors in a historical and archaeological context.

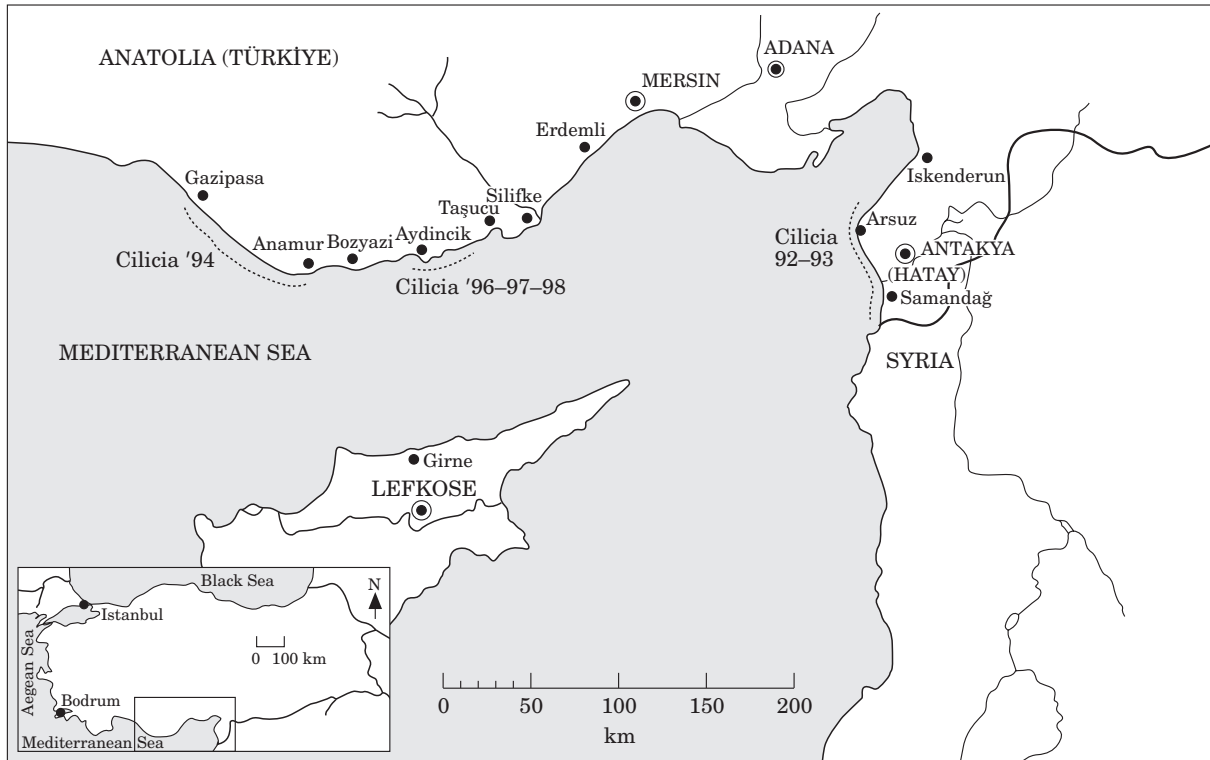


Figure 1. Cilician Research regions. METU-SAT underwater surveys along the Antakya-Syria border region in 1992–1993; Gazipaşa-Anamur region in 1994 and Aydıncık region in 1996–1997 and 1998.

History of research

Currently, underwater archaeologists are tracing evidence from ancient maritime trade-routes in order to understand the evolution of civilizations, and economic and cultural relationships between people. For this purpose, they have been conducting underwater searches to find shipwrecks. Since the wooden components of shipwrecks seldom survive on the seabed, there were only durable objects such as amphoras, stone anchors, metal and glass to use as a basis for study. A group of stone anchors did not prove the presence of a wreck-site, but hinted that a ship had sailed or got into difficulty in the region in the past. While it is important to bear in mind that ship and anchor losses tend to occur in stormy weather when a vessel may be blown hundreds of miles off course, mapping numbers of losses can produce data on ancient sailing routes. The shape, size, weight and other characteristics of stone anchors found or seen at specific coasts can help to relate them to other finds made elsewhere.

Anatolia hosted the earliest civilizations. Information from land excavations all over Anatolia

provides important hints of maritime trade relationships. Since the 1960s scientists have started to focus study on the coast and under water (Bass, 1966; 1972). The Institute of Nautical Archaeology (INA) and its team members, comprising students, researchers from different disciplines and volunteers from all over the world, have surveyed wreck-sites and studied wreck contexts with permission granted by the Turkish authorities. For these studies the main sources of information were the local fishermen, especially sponge divers. All the important discoveries were achieved with their help (Frey, 1993). In the 1990s, Turkish scientists initiated studies with their own teams.

Numerous stone anchors have been found on these wreck-sites and these are mentioned in the INA reports (Bass *et al.*, 1984; Pulak, 1990; 1994; 1998). However, to date no detailed studies have been published on the stone anchors found. The Uluburun wreck and the studies conducted by Bodrum Museum of Underwater Archaeology (BMUA) (Alpözen, 1977; Subay, 1981; Özdaş, 1992) are the most important to date. The last three investigators studied the ancient anchors

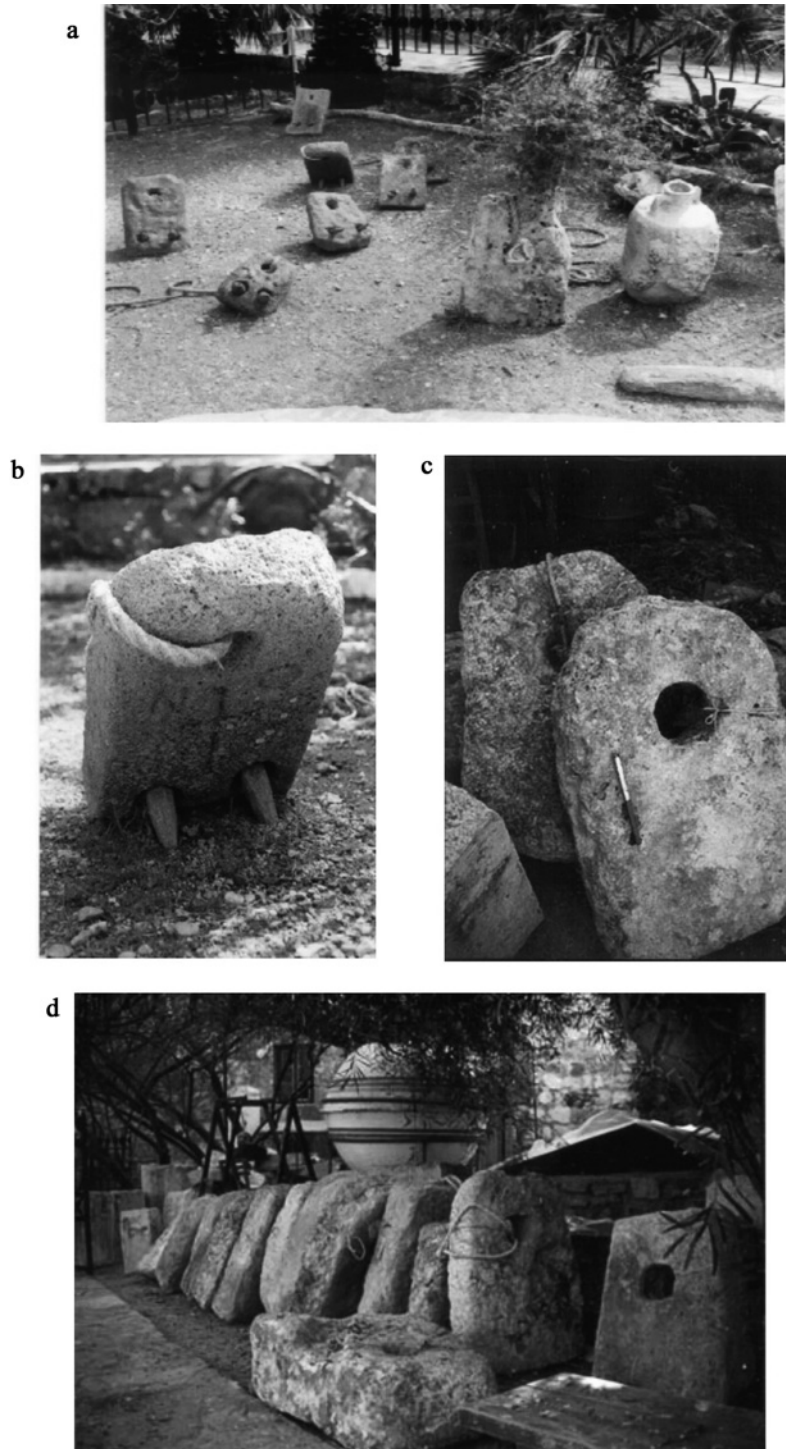


Figure 2. Stone anchors from Bodrum Museum and the Uluburun wreck. (a) Group of stone anchors from exhibition area of BMUA; (b) Stone anchor from BMUA (rope and flukes are for demonstration); (c), (d) Stone anchors from KUV in the conservation laboratory of Bodrum Museum.

exhibited in the BMUA and discussed some of these stone and lead stocks, and stone and iron anchors. The other important shipwreck is a

14th-century BC trading vessel, the Uluburun wreck, which had a cargo representing at least seven distinctive cultures. From a number of

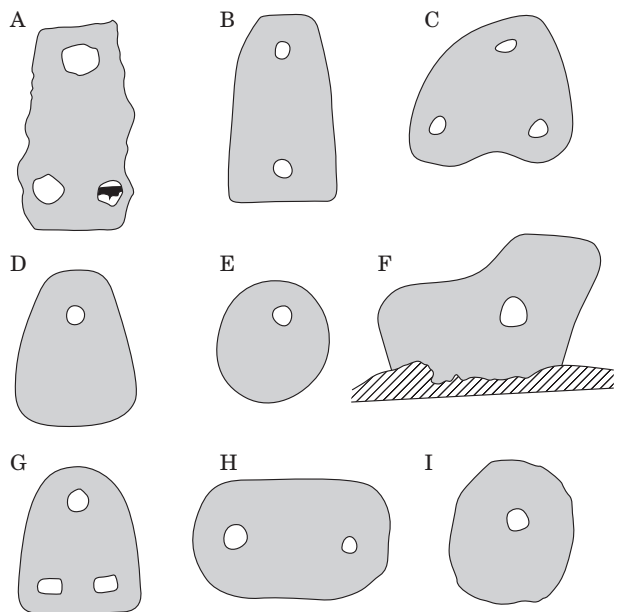


Figure 3. Stone anchors from the Cilician coast (not to scale).

Table 1. The descriptions of the stone anchors studied

Sample No	Location	Methods of Investigation
A, B, E, H	Cilicia'92-'93	Visual descriptions, drawing, taking photographs
F, G, I	Cilicia'97	Visual descriptions, drawing, taking photographs
C, D	Cilicia'98	Visual descriptions, drawing, taking photographs
1-15	BMUA	Visual descriptions, drawing, taking photographs, dimension and weight measurements, thin section petrography, XRD analysis
16 (4588), 17 (4010), 18 (2916)	KUW*	Visual descriptions, drawing, taking photographs, dimension and weight measurements, thin section petrography, XRD analysis

*We have studied only three samples out of twenty-four stone anchors from KUW. These anchors are still in the conservation laboratory of BMUA. Numbers in parenthesis refer to the catalogue numbers of the stone anchors from KUW in BMUA.

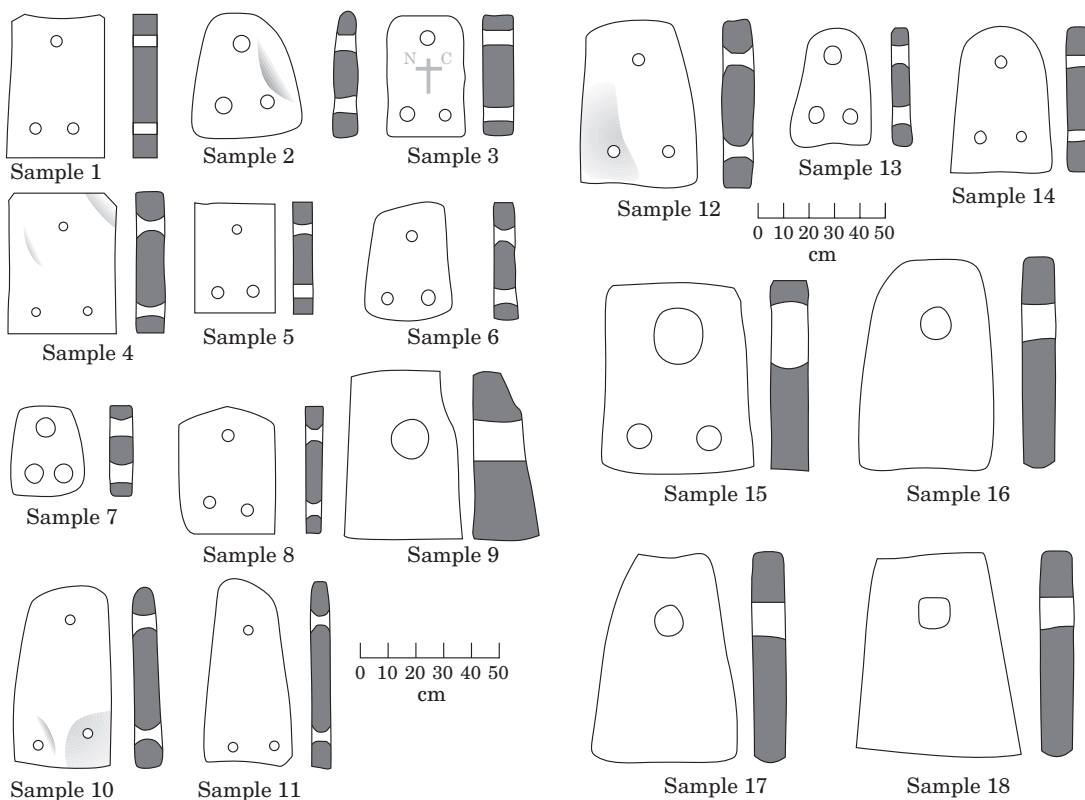
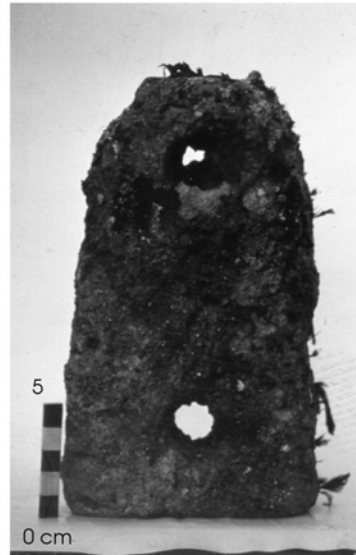


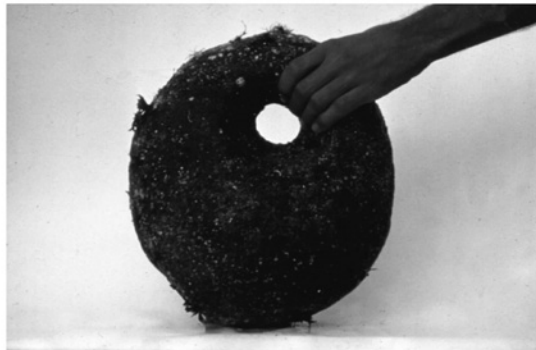
Figure 4. Shapes of stone anchors from Bodrum Museum (1-15) and the Uluburun wreck (16-18) (drawn to scale).



a. Cilicia Sample A



b. Cilicia Sample B



c. Cilicia Sample E



d. Cilicia Sample F

Figure 5. Stone anchors in the Cilicia Research study. Nos A, B, and E are in Antakya Archaeology Museum and F is an *in situ* view of one of the unrecovered anchors.

other archaeological sites 24 stone anchors were collected. The anchors were sampled for laboratory analysis by INA. It was hoped that the

results would provide the lithic source of the anchors, and, in consequence, the possible home port of the Uluburun ship (Pulak, 1990).

Along the eastern part of the Mediterranean coast of Anatolia, METU-SAT has undertaken research expeditions (Türe *et al.*, 1996a; b). In the reports some typological aspects of stone anchors have been discussed (Evrin, 1998; 2000; Evrin *et al.*, 1999).

METU-SAT Cilician research (1992–1998)

The Middle East Technical University Subaqua Society (METU-SAT) was founded in 1985 by three students and three of the academic staff, who directed their amateur spirit to the service of science and sports. METU-SAT is a university student community involved in all underwater areas with its activities, studies and research. The METU-SAT Wreck Research Group (BAG) has been involved in a research project ‘Archaeological Underwater Bottom Survey on the Cilician Coast’ since 1992.^[4] The research areas were the Antakya-Samandağ-Syria border in 1992–1993, Gazipaşa-Anamur in 1994 and the vicinity of Aydınçik in 1996–1997 and 1998 (Fig. 1). The 1992–1994 expeditions were carried out with the authority of the Turkish Ministry of Culture’s General Directory of Monuments and Museums and its representatives joined the team. Expedition reports were published in national and international symposium proceedings by BAG members.^[4]

Methods of study

In Cilician research, three consecutive methods have been used: Getting Information, Discovery Trips and Underwater Survey. METU-SAT members collect information on research areas from past and present literature. Target research areas can be determined easily with the help of this information. To discover the present state of the target areas, members make exploratory trips. Information is collected from local people, seamen and divers. They also communicate with the local authorities. After obtaining such information they organize expeditions to search selected regions. They use a range of methods to survey and explore the underwater environment according to the coastal conditions and underwater characteristics. In some areas, fishery sonar is also used (Türe *et al.*, 1996a). Findings,

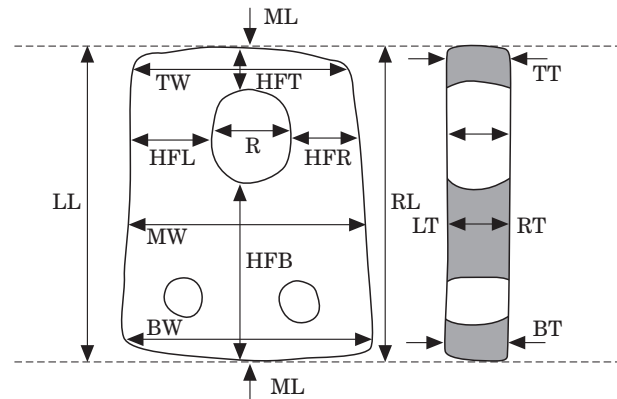


Figure 6. Parameters used to measure a stone anchor: LL: Left Length; RL: Right Length; ML: Middle Length; TW: Top Width; MW: Middle Width; BW: Bottom Width; TT: Top Thickness; LT: Left Side Thickness; RT: Right Side Thickness; BT: Bottom Thickness; R: Radius of Hole; D: Depth of Hole; HFL: Hole from Left Side; HFR: Hole from Right Side; HFB: Hole from Bottom; HFT: Hole from Top.

such as wreck-sites, a sunken church’s remains, amphoras, stone anchors, and stone and lead stocks, are recorded on videotapes, photographs and drawings.

Stone anchors from the Cilician coast

In this article, nine stone anchors are discussed with respect to their characteristics and importance as the main focus of the study (Fig. 3, Table 1). Four of them (examples A, B, E and H) were brought to the Archaeology Museum of Antakya by the authority of the Turkish Ministry of Culture in 1993. The other five anchors (examples C, D, F, G and I) were recorded *in situ* and only underwater photographs and descriptions are presented here, since sampling was not permitted.

Stone anchors from BMUA and KUW

As a separate task, sample chips were taken from stone anchors exhibited in the BMUA (Fig. 4, Table 1, nos 1–15) and from KUW (Fig. 4, Table 1, nos 16–18). These anchors were recovered from the Aegean coasts of Turkey and western Mediterranean coasts of Anatolia. All examples were studied carefully according to their physical characteristics, and their respective geometric dimensions were measured. In addition, they were analyzed using archaeometric techniques. Table 1 shows the methods of study used. In the visual description, the geometric shapes of the stone

Table 2. The dimension measurements of the investigated stone anchors from BMUA (1–15) and KUW (16–18). (Dimensions are in cm, weights are in kg)

Stone Anc.	Weight (kg)	Length				Width				Thickness*				Hole Properties				
		Right	Left	Mid	Bot.	Mid	Top	Right	Left	Top	Bot.	Place	Radius**	Depth	From Left	From Right	From Bot.	From Top
1	30	49	51	49	35	34	33	9	9	9	9	top	4	8	14	15	37	7
												right	4	8	22	9	8	36
												left	4	8	10	22	9	36
2	20	40	37	45	39	35	24	4	9	5	8	top	6	6	11	11	32	8
												right	5	6	25	10	10	28
												left	6	7	8	28	8	30
3	31	42	42	43	28	28	27	11	11	11	11	top	5	10	13	12	33	6
												right	4	11	19	6	5	34
												left	5	11	5	18	5	32
4	44	50	50	50	34	34	34	10	10	10	12	top	5 (3)	13	15	13	35	10
								right	5 (3)			12	22	6	7	37		
								left	5 (3)			12	6	22	6	38		
5	15	40	40	40	29	29	29	7	7	7	7	top	5 (4)	7	11	13	28	7
												right	4.5	7	6	19	6	28
												left	5.5	7	5.5	18	6	28
6	20	36	40	42	31	31	25	9	10	8	8	top	6 (4)	8	10	12	27	10
								right				5.5 (3.5)	10	22	5	6	26	
								left				4	8	7	22	6	31	
7	7.5	32	32	32	26	25	21	8	9	8	7	top	7	8	8	9	21	6
												right	6.5	7.5	16	4	6	19
												left	6.5	7.5	5	15	5.5	20.5
8	18	39	38	45	34	36	34	5	5	6	5	top	5 (3.5)	5	13.5	15	32	9
												right	5 (4)	5	21	8	6	30
												left	5 (3.5)	5	9	20.5	9	31
9	69	60	58	60	42	40	31	11	11	10	23	top	13	18	15	12	28	17
10	43	64	60	62	35	35	28	9	9	7	10	top	5 (3.5)	10	12	14	50	10
												right	5 (4)	12	22	7	11	46
												left	5 (4)	6	7	23	7	47
11	27	53	57	64	31	28	20	7	7	7	7	top	5 (3)	7	7.5	9.5	48	11
												right	4 (3)	7	24	3	10	41
												left	3.5 (3)	7	5.5	22	8	50
12	67	56	58	65	46	45	34	11	13	10	10	top	7 (5)	11	15	16	47	13
								right	6 (7)			13	32	8	11	39		
								left	6 (5)			11	13	27	11	41		
13	16	42	40	45	32	28	22	7	7	7	8	top	7	7	9	8	31	7
												right	5.5	6	21	6	8	31
												left	6	7	6.5	21	8	30
14	36	69	71	73	60	54	48	15	14	14	15	top	18	13	21	13	44	8
												right	7	7	40	12	8	52
												left	7	6	7	46	10	54
15	91	52	50	56	40	40	30	10	10	10	10	top	6	10	14	14	40	11
												right	5	10	25	10	13	36
												left	6	10	10	25	12	36
16	122	78	70	75	65	56	44	16	16	18	16	top	11	14.5	20	23	46	20
17	135	70	74	80	57	50	37	21	20	19	21	top	12	20	18	17	48	20
18	141	76	81	80	51	53	43	20	22	19	22	top	15	21	16	18	46	20

*Two values in thickness means upper value is taken from the top side and lower value is taken from the bottom side.

**The value in the parentheses shows the inner radius of hole.



a. BMUA Sample 8



b. BMUA Sample 14



c. BMUA Sample 4



d. BMUA Sample 2

Figure 7. Stone anchors from Bodrum Museum showing various types of alteration.

anchors were described and drawn. Petrographic analysis was carried out using thin sections. The thin sections were prepared to show the surface and interior of the sample. Microphotographs were obtained by using a polarising microscope with a camera attachment. During mineralogical analysis, stone anchor samples were powdered

using an agate mortar; after drying them at 80°C overnight, unoriented mounts were prepared for XRD analysis. In the XRD analysis, a Philips PW 1320 model X-Ray diffractometer was used to obtain X-ray traces by applying Co K_{α} radiation at 35 kV/10 mA. Samples were scanned with 2θ values ranging from 6° to 75°.

Table 3. Results of archaeometrical analysis of the stone anchors from BMUA (1–15) and KUW (16–18). AN: analcime; AM: amphibole; B: biotite; C: calcite; CL: clay; CPX: clino-pyroxene; F: feldspar; H: hornblende; K-F: potassium-feldspar; M: muscovite; MR: metamorphic rock; MQ: metamorphic quartz; O: olivine; P: plagioclase; PX: pyroxene; Q: quartz; S: serpentine

Sample #	Rock Type	Thin Section	XRD
1	Dacite (Volcanic)	Q, F, C	Q, K-F, C
2	Conglomerate (Sedimentary)	Q, C, MR, S	Q, C, S
3	Andesitic Basalt (Volcanic)	CPX, P, H, C	—
4	Basalt (Volcanic)	PX, F	P, PX, K-F, C
5	Olivine Basalt (Volcanic)	PX, O, P, C	P, PX, O, C
6	Basalt (Volcanic)	P, K-F, PX	P, PX, K-F
7	Fossiliferous Limestone (Sedimentary)	Q, Fossil Shells	Q, C
8	Schist-Gneiss (Metamorphic)	M, Q, AM, P-F	Q, M, P
9	Clayey Siltstone (Sedimentary)	MQ, M, F, C	Q, F, C
10	Basaltic Volcanic Rock (Volcanic)	P, O, K-F	P, O, F
11	Siltstone (Sedimentary)	Q, F, M, C	Q, C
12	Andesitic Basalt (Volcanic)	B, PX, P, Q	P, PX, B, C, Q
13	Andesite (Volcanic)	H, P, C	P, AN, C
14	Silty Claystone (Sedimentary)	MR, S, F, PX, CL	S, PX, F
15	Micritic Limestone (Sedimentary)	Q, C, Fossil Shells	Q, C
16	Fossiliferous Limestone (Sedimentary)	Q, Fossil Shells	Q, C
17	Limestone (Sedimentary)	Q, F, Fossil Shells	Q, F, C
18	Limestone (Sedimentary)	Q, C, Fossil Shells	Q, F, C

Results

Stone anchors from the Cilician coast

During the project (Fig. 1), numerous dives were made and wreck and anchorage sites, amphoras, ruins of a submerged church, stone anchors, and stone and lead stocks were found.^[6] Here only the results of the survey of stone anchors are given. As seen in Figure 3, samples A, C and G are from three-hole, B and H are from two-hole, while D, E, F and I are from single-hole anchors. Shapes range from almost rectangular, circular to triangular (Fig. 5). The anchors are classified by shape and other characteristics.

Stone anchors from BMUA and KUW

Geometric dimensions and weights of 18 samples from BMUA and KUW were recorded (Fig. 6; Table 2), and drawn to scale (Fig. 4). All the anchors appear to have deteriorated. Depending on the rock-type, lichens (no. 8), exfoliation (no. 14), coloration (no. 14), cracking (no. 4) and granulation (no. 2) can be observed (Fig. 7). Thin-section analysis of the 18 anchors revealed their rock types, textures, mineralogy and alterations. The mineralogical compositions of the 17 powdered samples were further investigated by means of XRD analysis (Table 1). Sample 3

proved to be insufficient for XRD analysis (Table 3). Petrographic examination of thin sections of stone anchors showed that the rock type of nine stone anchors is sedimentary (Table 3, nos 2, 7, 9, 11, 14, 15, 16, 17, 18). The rock type of eight stone anchors is volcanic (Table 3, nos 1, 3, 4, 5, 6, 10, 12, 13), while only one anchor is made of metamorphic rock (Table 3, no. 8).

Discussion

Stone anchors from the Cilician coast

These anchors have various shapes with almost rectangular, circular and triangular sections. Only nine samples are presented here. The first sample is much deteriorated (Figs. 3A and 5a), but with its three holes and rectangular shape it is of either Cypriot or Canaanite (Athlit) origin (McCaslin, 1980). Degradation of the stone impedes identification, but it appears to be either limestone or sandstone. Estimated sizes are 40–45 cm in height and 20–25 cm in width. The second three-hole anchor has an irregular triangular shape (Fig. 3C); it is similar to Cypriot and Canaanite types (McCaslin, 1980). The last three-hole sample is trapezoidal in shape with rounded top. It is 50–55 cm in height and 40–45 cm in width (Fig. 3G). It is similar to Ugaritic and Cypriot forms. There

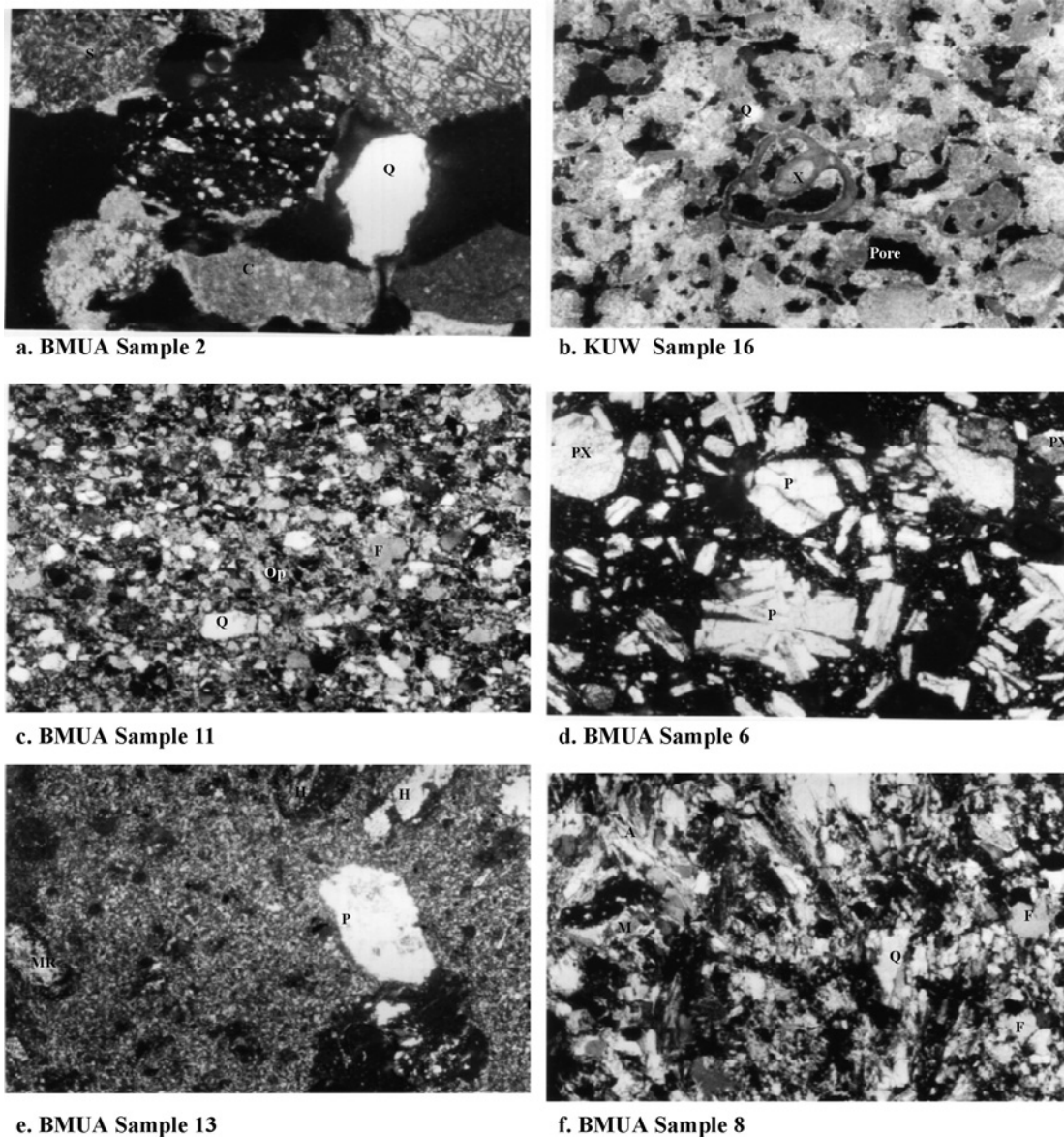


Figure 8. Photomicrographs of stone anchor samples. (a) Conglomerate, (b) Fossiliferous limestone, (c) Siltstone, (d) Basalt, (e) Andesite, (f) Schist-Gneiss. Q: Quartz; F: Feldspar; P: Plagioclase; PX: Pyroxene; MQ: Metamorphic Quartz; C: Calcite; S: Serpentine; O: Olivine; op: Opaque; H: Hornblende; X: Fossil; FeS: Iron Staining; MR: Metamorphic Rock; M: Muscovite (x nicols, 100 ×).

are also single-hole anchors, probably net-weights, or anchors for small boats (Figs 3E,I; 5c). Such stones were widely used in the past, and are still used today. However, one of the single-hole anchors has a triangular shape with rounded corners (Fig. 3D). It is probably from Ugarit or Byblos (Wachsmann, 1998). The last group has two holes. The almost triangular one (Figs 3B, 5b) has a height of 35–40 cm and width of 25 cm. Most probably it is of Ugaritic origin; less probably it is from Byblos, because two-hole Byblos

anchors are quite rare. Of this group the second (Fig. 3H) has an elliptical shape and is very similar to the Byblos samples. According to Dimitrov (1979), some two-hole stone anchors can be seen at Sozopol Bay in the Black Sea.

Stone anchors from BMUA and K UW

These were visually described, drawn, and photographed. Dimensions and weights were measured. They were analyzed by thin-section petrography

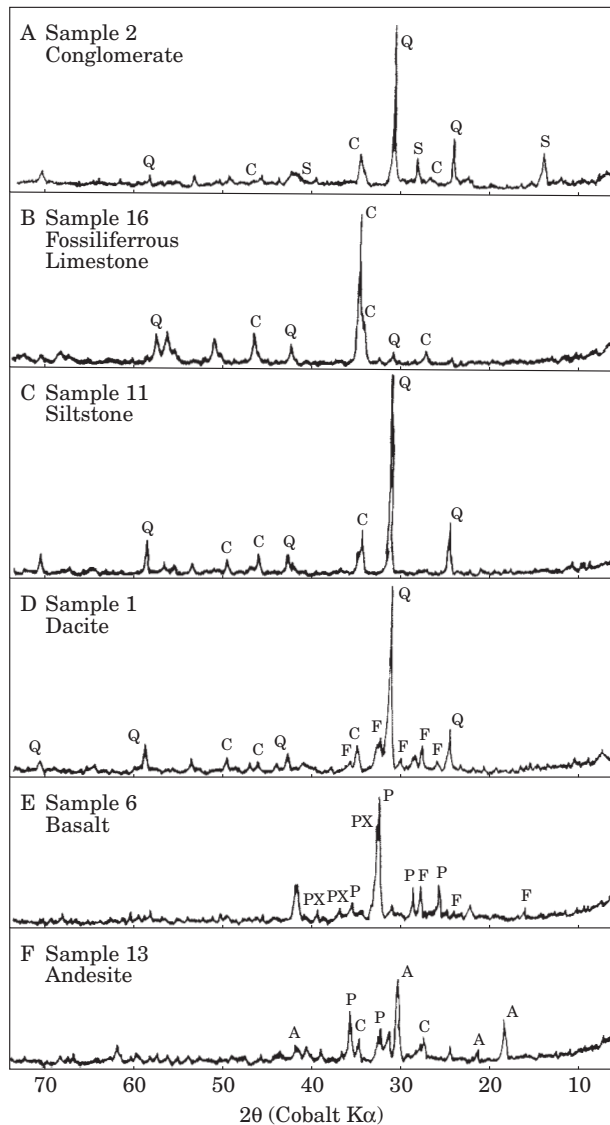


Figure 9. XRD patterns of six samples. A: Analcime; C: Calcite; F: Feldspar; P: Plagioclase; PX: Pyroxene; Q: Quartz; S: Serpentine.

and XRD analysis (Table 1). All those made of volcanic and metamorphic rocks are three-hole anchors (Fig. 4; Table 3). These types of rocks are very hard to work and needed more sophisticated tools. Examples 1, 4 and 5 are quite similar and are rectangular (Fig. 4; Table 2). Examples 6, 10, 12 and 13 have an irregular rectangular shape with a narrow top. No. 3 is also rectangular but has rounded upper corners. On one face, there is a cross and incised letters 'N' and 'O', so that these could be interpreted easily (Fig. 2b). Although there is insufficient information to date the other samples, this stone anchor could be dated, and is probably Early Christian. The metamorphic stone

anchor (no. 8) is a thin rectangular slab with a trapezoidal top side.

The stone anchors made of sedimentary rock are nos 2, 7, 9, 11, 14, 15, 16, 17, 18 (Fig. 4). Examples 2, 7, 11, 14 and 15 are three-hole stone anchors and of widely different shapes. Nos 2 and 14 are almost triangular in shape with rounded corners and similar to forms from Cyprus and Ugarit. No. 7 is too small for a ship; it might have belonged to a small boat. It was not a hawser weight, because its fluke holes are too large relative to its size. No. 11 has a roughly long rectangular shape with small holes. It is similar to no. 10, but not comparable with others. No. 15 has almost the same shape as the Cypriot forms, especially examples from Hala Sultan Tekke (Frost, 1970; McCaslin, 1980). Among the examples from the Bodrum Museum, there is only one single-hole anchor, no. 9, which is similar to forms from Cyprus and Ugarit.

Petrographic examinations and XRD analysis revealed that sedimentary rock types such as conglomerate, limestone and siltstone were used to produce the anchors. Conglomerate has grains larger than 2 mm. These grains mainly comprise quartz, calcite, serpentine and metamorphic rock fragments, identified in thin section and by XRD analysis (Figs 8a and 9). Limestones may be fossiliferous or micritic (Fig. 8b), and contain mollusc shells and *Globigerina* fossils. Quartz and calcite can be detected by XRD analysis (Fig. 9). The stone anchor made of siltstone is rich in quartz grains cemented by calcite (Figs 8c and 9). Muscovite and opaque minerals are also present.

Volcanic rock types mainly used in the production of anchors have dacitic, andesitic and basaltic compositions. They all have a porphyritic texture. No. 1 is made of dacite in which phenocrysts of quartz and feldspar are distributed in an aphanitic matrix. In the X-ray diffractograms, quartz, feldspar and calcite can be identified (Fig. 9). Calcite is a secondary mineral formed as a result of feldspar alteration. Basalt, on the other hand, has pyroxene and feldspar phenocrysts, which are distributed in a groundmass consisting of feldspar microliths or volcanic glass (Figs 8d, 9). Andesites have hornblende and plagioclase phenocrysts. The groundmass is rich in glass and includes feldspar microliths (Fig. 8e). The XRD pattern indicates the presence of plagioclase, analcime and calcite, the two latter being the alteration products (Fig. 9).

In the study-group, only no. 8 made of a metamorphic rock is identified as schist-gneiss. It



Figure 10. Eastern Mediterranean trade routes: 1. From Egypt to other areas; 2. From the Levantine Coast to Cyprus and Egypt, 2a. From southern Cyprus and 2b. From northern Cyprus; 3. From Cyprus to western Anatolia and the Aegean Sea; 4. From Crete to mainland Greece and the Aegean Sea; 5. From Cyprus and the Levantine coast to the Cilician coast.

exhibits schistosity, and the major minerals are muscovite, quartz, amphibole and plagioclase (Fig. 8f). Amphiboles show chloritization, and iron oxide forms as another alteration product. Nos 16, 17 and 18 from the K UW have almost the same characteristics (Fig. 4). They are single hole, limestone, trapezoidal shapes probably used as weight anchors. Although petrographical studies of the 24 K UW anchors have yet to be made by INA, they assumed that they were shaped from sandstone or limestone (Pulak, 1990). The three samples studied here are of limestone and the general characteristics of the others are almost the same. Similar forms were used in Cyprus, Ugarit

and Byblos (Frost, 1970; McCaslin, 1980; Galili, 1985). Other artefacts showed that the K UW belongs to the 14th century BC. Therefore, these dated stone anchors are of prime importance in classifying samples with similar characteristics.

The stone anchors made of sedimentary rocks, for instance, limestone, sandstone, or siltstone, were commonly used in the Mediterranean, especially its eastern parts. There are numerous stone anchors made of sedimentary rocks from Cyprus, Ugarit, Byblos and Egypt.^[6] Stone anchors made of volcanic and metamorphic rocks were not used widely in this region. In Europe there may be anchors made of volcanic rocks but

there is not enough published information to make comparisons.

Finds from coastal settlements confirm that Cilician coasts were part of the Eastern Mediterranean maritime trade routes as indicated by stone anchors (Fig. 10)^[7].

Conclusion

The results show that stone anchors are not alien objects on the Anatolian coast. They are very similar to others found in the Mediterranean. The western part of the Anatolian coast is a known part of maritime trade routes in the Late Bronze Age (McCaslin, 1980) and these comparative results show that the Cilician coasts were also used for trade during the Bronze Age and later periods.

The study revealed that the stone anchors from the Anatolian coast had similar shapes and characteristics to their East Mediterranean counterparts.

The archaeometrical data obtained will be of use in determining the provenance of these stone

anchors. In particular, the anchors from BMUA composed of volcanic and metamorphic rocks may have derived from local stone on the western Anatolian coast. However, this awaits further study.

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Notes

- [1] Bass *et al.*, 1984; Frey, 1993; Delgado, 1997; Pulak, 1998.
- [2] Türe *et al.*, 1996a,b; Evrin, 1998; Evrin *et al.*, 1999; Evrin, 2000.
- [3] The director of Bodrum Museum, Oğuz Alpözen and Dr Cemal Pulak of INA granted permission to study them.
- [4] In this study only the 1992–98 expeditions are mentioned. However, the project has continued in related regions.
- [5] Türe *et al.*, 1996a,b; Evrin, 1998; Evrin *et al.*, 1999.
- [6] Frost, 1963; 1970; 1993; McCaslin, 1980; Galili, 1985; Galili *et al.*, 1994; Nibbi, 1993; Basch, 1985; 1994.
- [7] Zoroğlu, 1994; Jones, 1971; Türe *et al.*, 1996a,b; Evrin, 1998; Evrin *et al.*, 1999.

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