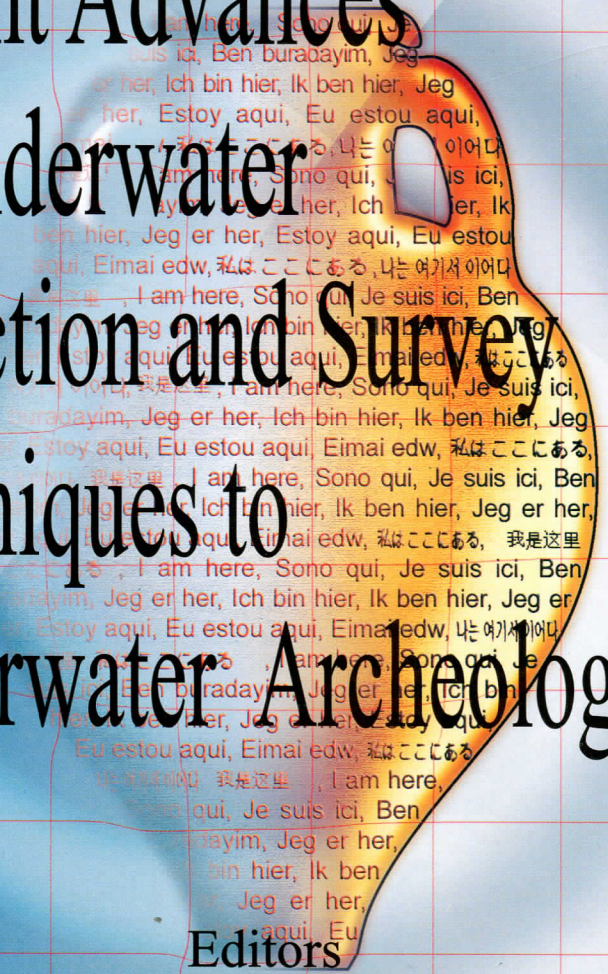
The Application of Recent Advances in Underwater Detection and Survey Techniques to Underwater Archeology



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UNDERWATER ARCHAEOLOGICAL SURVEY ON CILICIAN COASTS: DISCOVERING AN ANCHORAGE SITE – AYDINCIK-YILANLI ISLAND

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Since 1992, The METU Subaqua Society has conducted underwater archaeological surveys on the Eastern Mediterranean coasts of Turkey, known as the Cilician Coasts in Antiquity. During the 1998 Campaign, a number of stone anchors and a wreck site were discovered on the north face of an island in Aydıncık (Kelenderis), named as Yılanlı Island. After the final campaign in the 2003 Season, 36 stone anchors, 1 stone stock, 11 metal anchors, 1 lead stock with a collar and numerous types of amphorae, most belonging to the Roman Imperial period, were examined. It was seen that the repertoire of stone anchors spanned a period from the Late Bronze Age to Ottoman times. All anchors were measured, drawn and photographed. During our research campaigns, scientific diving guidelines and regulations, as well as advanced technical diving procedures were employed. The research area is in proximity to an antique harbour known as Celenderis, where archaeological land excavations are pursued since 1987. The findings from both sea and land complement each other. The underwater surveying of the Cilician coasts may expose us to important archaeological material adding considerable knowledge to our descriptions of the Eastern Mediterranean Maritime Trade Routes since the Late Bronze Age.

1 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 (Bass, 1972, 1996), but only limited discoveries were made in the eastern part. The main reason for this lack of information can be attributed to limited underwater research in these areas. The coast of Anatolia is considered to be an important eastern Mediterranean trade route.

The Middle East Technical University Subaqua Society (METU-SAT) was founded in 1985 by three students and three members of the academic staff, who channelled their amateur spirit to the service of science and recreational sports. METU-SAT is a university student society appreciated by the underwater arena for its scientific activities,

studies and research. METU-SAT Wreck Research Group (BAG) and Underwater Research Society (SAD) - Underwater Archaeology Research Group (SAAG) have been involved in the following research titled "Archaeological Underwater Survey on the Cilician Coasts" since 1992. The research areas were Antakya - Samandag - Syria (Antioch - Seleukeia Pieria) border in 1992-1993, Gazipasa - Anamur (Selinus - Anemurium) in 1994 and in the vicinity of Aydıncık (Kelenderis) between 1996 and 2003 (Fig.1).

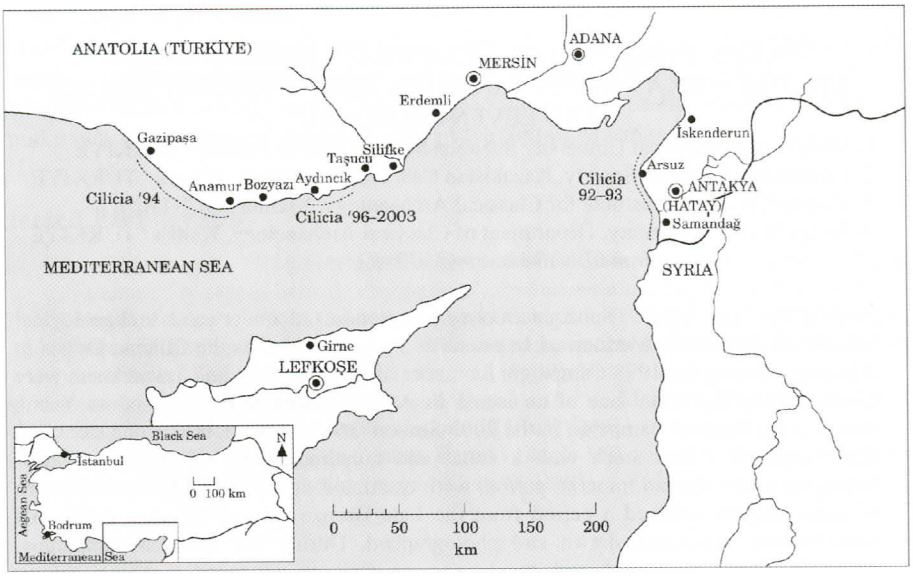


Figure 1. The investigated regions of the Cilicia Research Project (1992-2003).

The Mediterranean coasts of Anatolia are considered part of an important Eastern Mediterranean Maritime Trade Route. From 1992 onwards, METU-SAT has been exploring the eastern parts of the Anatolian Coasts belonging to the so-called Roman Imperial Province of Cilicia designated by emperor Vespasian in AD 72 (Fig.1). During the Bronze Age the same geographical region was named Kizzuwatna as a Hittite territory. Although the Cilicia Research campaigns were pursued in a limited number of areas, results so far obtained revealed that these coasts could have played an important role in the Eastern Mediterranean Maritime Trade Routes since the Bronze Age. Findings, especially stone anchors, show that the role of these coasts in the Eastern Mediterranean Maritime Trade Routes was not insignificant at all and worthy of future research. Therefore, we decided to dive into these waters and aimed at publishing our scientific results in international and national popular and scientific media (Evrin, *et al*, 1999, 2000, 2002).

Celenderis was one of the most important gateways to Anatolia and anchorage sites in the Eastern Mediterrenaen coasts of Anatolia with respect to its geographical position as a natural harbour belonging to a coastal settlement. The region maintained its importance partly because of its proximity to the fresh water sources and the cedar forests at its hinterland that played a major role in the shipbuilding industry. In addition to this, Celenderis was founded at a very strategic point on the mainland shore, where

land is at its nearest distance to Cyprus. Excavation results in the vicinity of the harbour of Celenderis and at the necropolis area motivated us in our research objectives. The peak of activity in Celenderis was mainly in the 5th and 4th centuries B.C. The Ptolemaios from Egypt governed the city for a short time in the Hellenistic period, and later it went under Roman rule. As a harbour city, it maintained its importance. The underwater research area is in proximity to the antique harbour known as Celenderis where archaeological excavations have been pursued since 1987.

2 Research Methods

Our Cilicia Research employed 3 consecutive methods: Gathering Information, Discovery Trips, and Underwater Survey.

The METU-SAT members

1. collected information from past and present literature concerning the research area (library and internet research, etc.).
2. defined the target research area and the nature of the expeditions.
3. made discovery trips in order to assess the current conditions of the research area (gathering information on culture, people, logistics, local seamen and divers, etc.).
4. communicated with the local authorities (obtaining diving expedition permission, etc.).
5. organized the expeditions at the target research area (accommodation, travel, logistics, budget, etc).

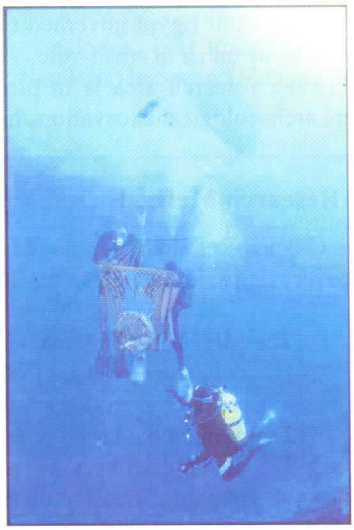
Research members employed various methods to survey and explore the underwater environment: snorkelling, shallow scuba diving, deep scuba diving, pulling a diver with an underwater shuttle and likewise. The techniques used were chosen with respect to the coastal conditions and underwater characteristics. In some areas, fishery sonar was also used. Findings such as wreck sites, a sunken church's remains, amphorae, stone anchors, stone and lead stocks were recorded on videotapes, photographed and described by drawings.

Since 1996, some discovery dives were made in the Aydıncık region. Especially, around the antique harbour of Celenderis and neighbouring islands, some important hints to archaeological remains were detected. Then, the underwater team decided to work in collaboration with the land excavation team in Celenderis. Our specific research began in August 2002 under direction of Prof. Dr. Levent Zoroglu with the permission of the Turkish Ministry of Culture - General Directorate of Monuments and Museums.

In the 2002 season, 14 research divers and 8 support divers made 122 scuba dives in 10 days. The total bottom time was 6744 minutes and maximum depth was 60 meters. 30 dives were to 0-25 meters; 74 dives were 35-45 meters and 18 dives were made deeper than 45 meters. Later, in the 2003 season, 8 research divers and 10 support divers made 148 scuba dives in 14 days. Between 0-25 meters, 25 dives (total bottom time was 1213 min.); between 25-40 meters, 74 dives (total bottom time was 3526 min.); and to 40 meters and deeper, our divers made 49 dives (total bottom time was 2314 min.). Total bottom time was 10644 min. (3591 min. in decompression stops) and maximum depth was 61 meters. All dives were planned with scientific diving software and directed by

diving computers. In order to work under safer conditions, pure oxygen was used in the decompression stops at 6 and 3 meters at the end of deep dives after completing all air decompression processes.

A – Divers on the wreck site. Photo by Ali Ethem Keskin



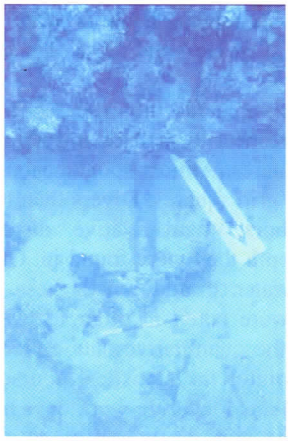
B – Divers get an amphora out. Photo by Ali Ethem Keskin

C – Divers measured a stone anchor. Photo by Ali Ethem Keskin

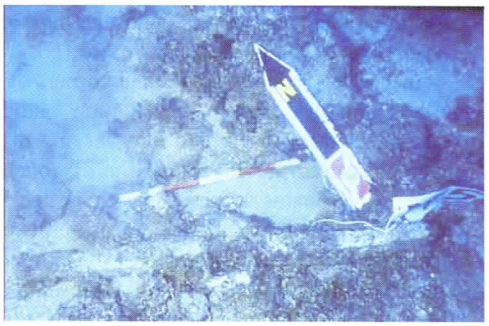
D – Divers were in decompression stop. Photo by Okan Taktak

Figure 2: Scenes of the research operations

3 Results and Discussions



A. Metal Anchor – Photo by Oytun Tuzcu



B. Lead Stock – Photo by Ali Ethem Keskin

C. Lead Collar – Photo by Okan Taktak

D. Stone Stock - Photo by Ali Ethem Keskin

Figure 3: Some of the anchors: Metal anchor, lead stock and its collar, another stone stock

In the 2003 season, our main goal of study was to complete the map of the anchorage site. Over 30 anchors were registered in the previous season and new ones were still discovered until the last day of the campaign. Therefore, we had to develop a more sophistacated underwater mapping technique for the 2003 season to serve our needs better. All anchors were measured with respect to their relative positioning to one another, sketched and photographed for typological studies.

Our experience from previous studies showed that we could not use reference sticks underwater because of the hard-to-penetrate-volcanic-rock seabed. This has limited us in a way that we could not make use of any underwater mapping software application. We decided to create an underwater grid system mainly used in land excavations. As a result, we were to complete the underwater operations in two weeks with eight technical divers. We began placing the lines from 9 to 45 meters as a vertical base line (Figure 5 – I). To the east and west of this line additional perpendicular lines with 8m intervals each have been installed. In some cases, the rough seabed interfered with the work and hindered the reliable installation of a line, hence some squares were not exactly 8 x 8 meters.

However, the overall structure was maintained securely. After the completion of the line installation, 84 squares were ready to work in. The perpendicular lines were identified with alphabetical letters, and the horizontal lines with numbers. By this way, the nametags of the grids were created (F3...F9, G3...G9, O3...O9, etc.) and these tags were attached to the upper right hand corners of each grid.

After the grid system installation and tagging were completed, the research team members were assembled into varying diver teams with respect to their diving abilities and measured the edges and the diagonals of the grid squares. Almost spontaneaously, other diver teams tagged the anchors that fell within these grid squares. Divers then took the individual geometric measurements of the anchors, their relative distance measurements to the corners of the grid square and the depth they were found in. Other teams worked on documentary draftings on slides underwater. In addition to these, for documentation purposes, photographs of these anchors were taken in order to clarify their positioning, geometric forms and types. Everyday, the quantitative data collected underwater was transferred into a digital platform to monitor the statistical course of events, and based on this information, the dive and work plans for future work days have been maintained, whereas by the help of design tools the area drafts and maps were created in 2D and 3D.

In order to identify the exact position of the anchorage site, there were four points labeled with the help of reference balloons and their coordinates taken by GPS (Figure 5 – G4, H3, I4, J5). All the data collected was then translated into mathematical methods. With the help of the Pisagor triangle, the measurement data was then transferred to the computer for completing the site map (Figure 5).

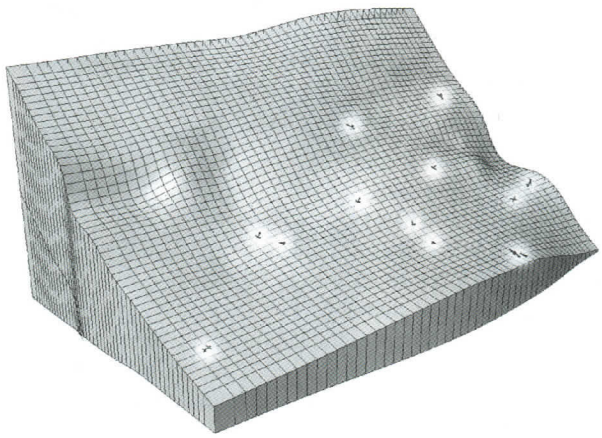
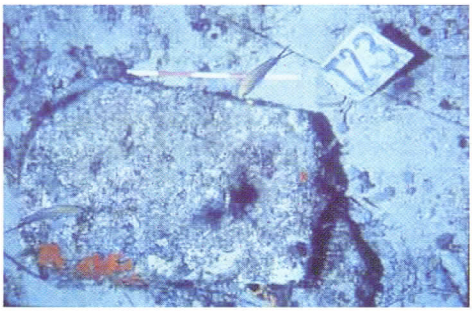


Figure 4: 3D view of only metal anchors distribution on the north face of Yılanlı Island (Drawn by Korhan Bircan and Tahsin Çetinoglu).

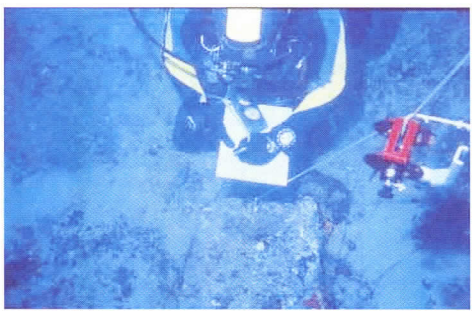
Figure 5: The Map of AYDINCIK - YILANLI ISLAND Anchorage Site (Drawn by Mert Ayaroglu, Çigdem Toskay Evrin, Korhan Özkan and Volkan Evrin)

With the help of the detailed mapping studies followed underwater, including formerly unidentified and undocumented findings, a total of 36 stone anchors, 1 stone stock, 11 metal anchors, 1 lead stock and its lead collar were mapped and registered (Figure 4 – 5). 3 of the stone anchors and 1 of the metal ones could not be denoted on the map, for basically they fell out of our underwater grid. However they were still sketched and measured. There are still a few stone and metal anchors and stocks that have been encountered during our underwater discovery dives, but these could not be tagged and measured.

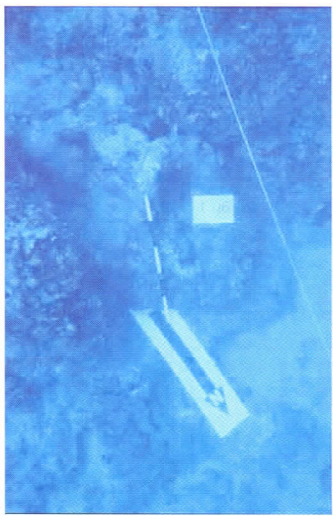


A – Probably a stone anchor from Late Bronze Age. Photo by Ali Ethem Keskin

B - Probably a stone anchor from Late Bronze Age. Photo by Ali Ethem Keskin



C – A diver measured and sketched a stone anchor. Photo by Okan Taktak



D – A stone anchor with a single hole. Photo by Ali Ethem Keskin

Figure 6: Some of the stone anchors

Some anchor types (Figure 6 – A-B) probably dating to the Late Bronze Age, were mostly found as samples lying close to one another, such as is the case for other samples found at other parts of the Mediterranean as prior research has shown (Frost, 1970 - McCaslin, 1980 - Pulak, 1994, 1998). Important findings such as these will be individually considered in order to understand and find out more about the role of Yılanlı Island in ancient times. The stone anchors with single or multi-holes, the stone stock, lead stock and its connection part, the T- and Y type metal anchors and the wreck site lie very close to one another within the same region. In underwater archaeological research, it is a rare incident to discover a high amount of different types of anchors and a wreck site together, some belonging to different historical periods. Therefore, we believe, it is worthwhile to continue exploring these coasts to find out more on the trade routes since the Late Bronze Age and to work out a preliminary typology concerning the anchors found so far.

4 Conclusion

The Anchorage site, the anchors and the wreck site found at the front of Aydıncık - Yılanlı Island showed that Celenderis is an important antique harbour-city of the Cilicia region, at the East Mediterranean coast of Anatolia. Stone anchors are not alien objects to the Anatolian coasts, as recent research done by METU-SAT and SAD provides positive evidence of their existence in the much neglected region of Cilicia. These stone anchors are very similar to their counterparts found in the Mediterranean. The western part of the Anatolian coast is known as a part of the Maritime Trade Routes in the Late Bronze Age. Comparative results showed and will show that the Cilician coasts have also been used for trade during the Late Bronze Age and in later periods as well.

Acknowledgements

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This book represents the proceedings for a conference held at Bodrum, Turkey on 3-7 May 2004. The aim of the congress was to focus on recent advances in underwater detection and surveillance techniques that apply to the location and inspection of shipwrecks and their cargoes lying on or below the seabed. In particular, the latest developments in underwater acoustics, magnetics, and optical techniques, including methods employed in mine countermeasures, have direct application to underwater archeology. Here we provide a forum for researchers from acoustics, mine countermeasures, and underwater archaeology to exchange ideas and explore future challenges in the application and implementation of new technologies to underwater archaeology.

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