



# SHIPWRECKS IN THE BODRUM MUSEUM OF UNDERWATER ARCHAEOLOGY

GEORGE F. BASS



Bodrum Museum of Underwater Archaeology Publications 3

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IN THE  
BODRUM MUSEUM  
OF  
UNDERWATER ARCHAEOLOGY**

**George F. BASS**

With a foreword by  
T. Oğuz Alpözen,  
Director of the Museum

Photographs by Donald A. FREY

MUSEUM OF UNDERWATER ARCHAEOLOGY

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Front Cover: The Castle; Back Cover: The Serçe Limanı Wreck  
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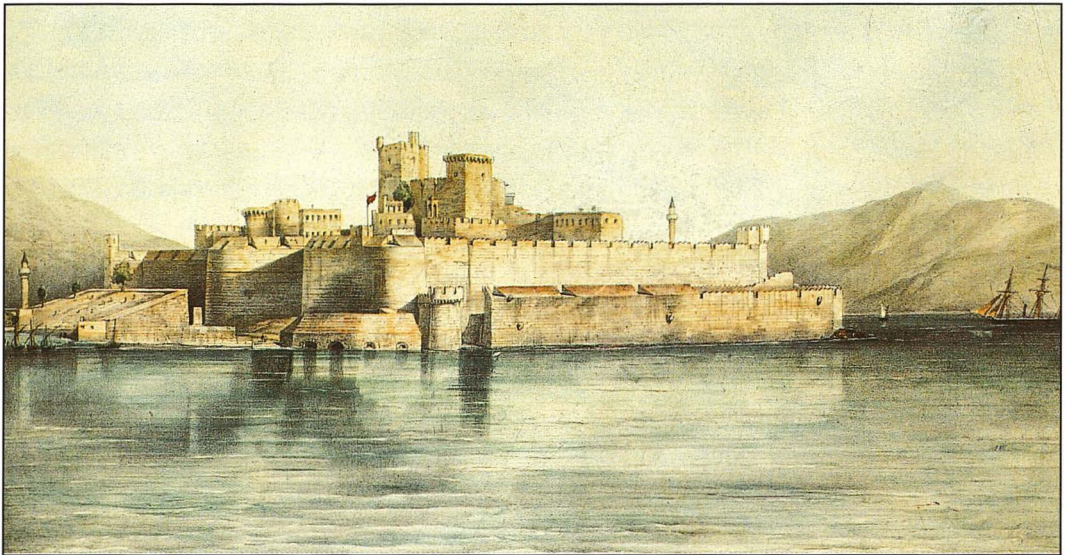
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Archives.

For  
**KEMAL ARAS**  
Without whom there would be no  
underwater archaeology as we know it.



Captain Kemal Aras  
Peter Throckmorton. National Geographic Magazine

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The castle of Saint Peter which houses the Bodrum Museum of Underwater Archaeology.

## FOREWORD

*"What an endless happiness  
to the sponge diver who  
saw the grouper fish."  
Kemal Aras*

Prof.Dr.George F.Bass is the father of contemporary underwater archaeology. Having been a team member on excavations carried out by this man who established blue archaeology, and having made hundreds of dives together with him to many shipwrecks, has given me endless happiness. When I came to Bodrum on the 5th of July, 1962, I was studying in the Classical Archaeology Department of Istanbul University, in the Faculty of Literature, and contemporary underwater archaeology was only two years old. As a young candidate in archaeology and a new member of a scientific team, I was going to dive to explore an ancient shipwreck, the seventh-century AD Byzantine shipwreck at Yassiada. In those days Bodrum was described by the local people with the following traditional saying

“Opposite Istantk y is Bodrum  
Two shops and one bakery  
From eating cheese and bread  
Neither taste nor smell has remained.”

The narrow streets of this forgotten and destitute town of Anatolia, with square white houses mostly roofed with red tiles and looking like blocks of goat cheese, one on top of another, the sponge-diver boats in the harbour, the sweet smell of the tangerine orchards, and the city walls reflecting the splendour of the past, deeply affected me. I was in the Bodrum described by the writer Cevat  akir Kabaa a , "The Fisherman of Halikarnassos," in his book *The Blue Exile*. Maybe I was also going to dance with an octopus under the sea and challenge the sharks while being under the protection of the grouper. <sup>(1)</sup>

Even after 30 years, I can still remember my first dive and big discovery at

<sup>(1)</sup> According to an old belief, if a grouper is seen swimming in the open it means that no shark is in the area.

Yassiada, a small island opposite Turgutreis on the Bodrum Peninsula. I also know that sharing this memory with you will give me the greatest happiness. I was not taken immediately to a depth of 32 meters, where the seventh-century AD Byzantine shipwreck was found. First I was provided with knowledge related to diving and given a few examinations. Then one day George Bass told me that I could dive to the wreck. It took only a few minutes for our boat to reach the diving barge from where we were camped at Yassiada, with the boat's oars pulled so strongly by the son of Efe Mehmet "Crazy" Hasib, even though he was an old man. With great excitement I got ready for diving. At last I was going to dive with the American specialists, see the shipwreck I had been dreaming about, and excavate the wreck as they did. Four archaeologists and I put on our air tanks and went into the water.

We checked our regulators. We signaled to the dive master, Claude Duthuit, who was keeping time on the barge, that we were ready to dive by raising our thumbs like the populace did during gladiator fights in Roman Times. The dive master adjusted his watch. Like a Roman emperor he raised his thumb up and then turned it down. The diving had begun. Our fin strokes were taking us to the depths. I raised my head up and the surface seemed like a silver tray. I looked down, but there was no ship at the bottom. The only thing was a pile of amphoras. My diving companions signaled and told me to stay at the side of this pile. They went closer to the amphoras, started measuring and taking photographs. I watched them do their work from a distance on the sea bed. There was neither the octopus nor the grouper around me, but everywhere was deep blue. I was tired of waiting and was beginning to feel the cold, so I began to explore my surroundings more carefully. A little farther from the amphora pile, I saw something covered with red sponges. I went closer. It was a heavy chest completely covered by concretion. I tried to open the lid, but did not succeed. I thought it must be the treasure chest of the sunken ship. I tried to call the American specialists, but there was no way, my shouting and stamping were of no use. I was saying to myself, "How could they possibly miss this? The treasure chest is over here." Then the dive was over. The specialists approached me. I was still pointing to the chest and laughing with joy inside. They would not take any notice of me, but insistently signaled that we should go the surface. Slowly we started to ascend. We made a decompression stop at 6 meters for 3 minutes, and also had to stop at 3 meters for 18 minutes. It seemed as if time had stopped. Finally, we surfaced. Very quickly I got hold of the ladder and pulled myself up onto the dive barge. At the top of my voice, I shouted: "I found the treasure chest." Nobody seemed to understand



anything. Haluk Elbe, the founding director of the Bodrum Museum, came near me and said, "Oğuz, keep calm, say it one word at a time." He translated my discovery to the American archaeologists, who were watching me with bewildered looks. All of a sudden they burst into laughter. I was very surprised. While taking my air tanks off, I went closer to Haluk Elbe and asked, "What happened, why are they all laughing?" He turned to me and said, "Oğuz, that is not the treasure chest, it is the equipment chest that they took down last year." My eyes were filled with tears. The voices of my professors, Prof.Dr.Arif Müfit Mansel and Prof.Dr.Jale İnan from the university, were echoing in my ears : "An archaeologist should never mention his idea without examining all the evidence." But now, in 1995, I can say with confidence that the Bodrum Museum of Underwater Archaeology is the largest and the most important underwater archaeology museum in the world.

With the endless support of the Ministry of Culture, the shipwrecks excavated by the Institute of Nautical Archaeology (INA) have been brought alive again. The visitors who come to the Bodrum Castle are able to hear the voices of the old sailors calling "Heave, ho, Pull away, boys, " the sound of the oars, and even the heartbeats of those sailors reflected by the artifacts exhibited in the different halls of the museum. George Bass and the INA team have acquired for the museum thousands of artifacts by excavating shipwrecks and by conserving and restoring these objects, providing a good model for other archaeologists who excavate in our country.

The shipwrecks mentioned in this book are on display now in the Bodrum Museum, and will be exhibited in forthcoming years. Through the power of blue archaeology, visitors to the museum will be able to progress from the oldest shipwreck in the world to the present.

George F. Bass is the first foreigner to be given the freedom of the town of Bodrum and to be made an honorary citizen. He and his team will continue to illuminate the mysteries of past civilizations through many future excavations and researches.

T. Oğuz ALPÖZEN

Director of the Bodrum Museum  
of Underwater Archaeology

BODRUM - 1995

# I

## INTRODUCTION

It has been my privilege to conduct archaeological research in Turkish waters for more than three decades.

It began in 1960. Two years earlier, Bodrum sponge diver Kemal Aras had described to American journalist Peter Throckmorton a sunken cargo of metal lying off Cape Gelidonya. Peter dived on the site in 1959, recognised it as the remains of a Bronze Age shipwreck, and reported it to the University of Pennsylvania, famed for its archaeological excavations. Soon afterward the university, where I was a doctoral candidate, asked me if I would learn to dive in order to direct the excavation of the wreck. I was delighted by the opportunity to return to Turkey, which I had first visited in 1953 as a university undergraduate, and in 1957 as a student assistant on the university's excavation staff at Gordion, near Polatli; in 1958 and 1959 I had also been, quite by chance, the only American army officer stationed in the Turkish Brigade in Korea.

At Cape Gelidonya in 1960 I did not dream that Kemal Aras's discovery would lead to the establishment of one of the world's great museums of underwater archaeology.

The museum began modestly. Peter Throckmorton, in the 1950s, had asked the sponge divers of Bodrum to place in a room of the castle any amphoras they found in the sea. He labelled each with the name of its donor and the place of its discovery. He suggested that the castle become a museum to benefit the town, in which sponging was then a major industry. With this concept, and with permission from the Turkish government, I turned the knights' dining hall into a storeroom for the finds from Cape Gelidonya. The next year, 1961, the Ministry of Education and my excavation at Yassıada provided four glass cases for the display of some of our finds. From such humble beginnings, an official museum was born in 1962, fully funded and staffed by the Turkish Ministry of Culture.

In 1962 the museum's first director, Haluk Elbe, a retired teacher of English from Pergamum, began the restoration of the castle and the planting of trees and

flowers that now make it so pleasant. His name is immortalized on the art gallery just inside the entrance to the castle.

It was also in 1962 that a young archaeology student from Istanbul University, Oğuz Alpözen, joined me as a volunteer at Yassiada, where he returned almost annually for many years. After he obtained his B.A. and served in the Turkish army, between 1966 and 1968, he was made assistant curator of the Bodrum Museum and then, between 1971 and 1978, of the Antalya Museum; even then, he often worked with my staff on assignment as commissioner from the General Directorate of Museums and Antiquities. On Oğuz Bey's return to Bodrum in 1978, as director of the museum, whose name he soon changed officially to the Bodrum Museum of Underwater Archaeology, he began the monumental task of improving and expanding the exhibits, as well as continuing Haluk Elbe's restoration and planting projects. By the middle of the 1990s virtually everything seen by a visitor was due to his vision and energy and to his able staff.

As the museum grew, another archaeological entity was born. In 1973, after a decade of directing shipwreck excavations under the auspices of the University of Pennsylvania, I left the university to form the Institute of Nautical Archaeology (INA), a private organisation whose multi-national board includes American, French and Turkish directors, and whose staff hails from America, Turkey, Great Britain, France and Israel. INA has now conducted underwater excavations, surveys and restoration projects on four continents, but its overseas base remains in Bodrum.

In 1976, while retaining its independence, INA affiliated with Texas A&M University, which established a post-graduate academic program in nautical archaeology that has attracted students from more than a dozen countries. Many return to their native lands with excavation and museum experience gained in Turkey.

The combination of the museum and INA have made Bodrum the centre for underwater archaeology in the Mediterranean. In the museum, where INA specialists are provided space to conserve, catalog, and illustrate for publication the artifacts we find, it is a great pleasure for me to continue the cooperation with Oğuz Alpözen that has lasted for more than thirty productive years.

This small book describes the shipwrecks that I and later INA Vice President Cemal Pulak have excavated off the Turkish coast. Oğuz Alpözen has been involved in all of the excavations after Cape Gelidonya. Everything we have found is stored in this museum. Because exhibits are constantly being changed and improved, not all of the ships and their belongings will be on public view at the same time, but I hope that the following chapters will guide visitors through the galleries that are open and hint at the surprises that will await them on future visits.

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Sualtı Sokak No. 2, Bodrum  
1995

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Excavation at Yassiada in 1967.  
Davis Meltzer, National Geographic Society.

## II

### NAUTICAL ARCHAEOLOGY

Underwater archaeology offers unique information about the past because artifacts found under water are often better preserved, and in larger quantities, than those found on land, where in the past ceramics and glass eventually were broken through use, metal objects were melted down and recast, raw materials were transformed into manufactured goods once they were unloaded from the ships that transported them, and organic materials simply disappeared. Further, if they are from a shipwreck that can be dated precisely, as often is the case, artifacts are equally well dated, thereby providing precise chronologies for various types of objects.

The archaeology of ships, called nautical archaeology (from the ancient



INA Research Vessel *Virazon*.

Greek word for ship, *naos*), also reveals design and construction details of various types of watercraft, including merchant vessels, warships, and fishing boats.

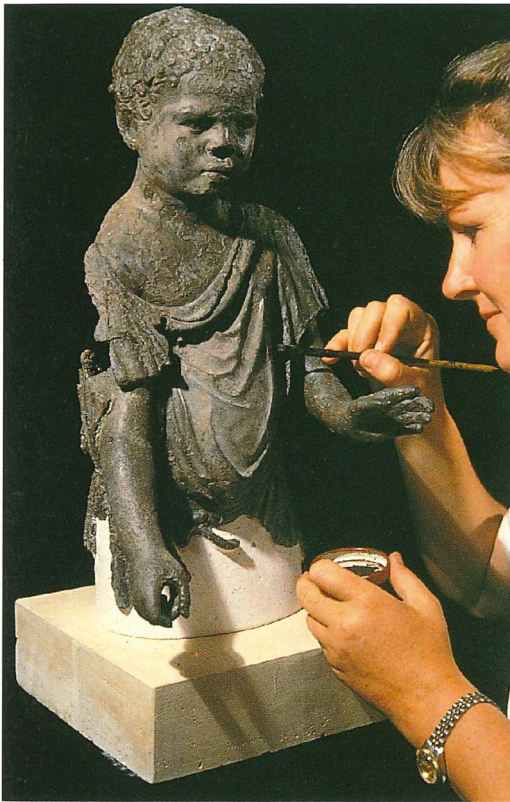
Many of the standard techniques of modern nautical archaeology were developed in Turkey, first by the University Museum of the University of Pennsylvania and later, since 1973, by the Institute of Nautical Archaeology (INA) which was formed by former University of Pennsylvania students.

Underwater archaeology began in Turkey, as elsewhere, with chance finds of fishermen, sponge divers and, after the invention of self-contained breathing apparatus (SCUBA), both sport and scientific divers. It was the chance discovery by sponge diver Kemal Aras near Cape Gelidonya that led in 1960 to the first complete shipwreck excavation anywhere on the floor of the Mediterranean. Our approach to that excavation was to adapt, as much as practical, standard land techniques to the underwater environment. We mapped the site by triangulation with meter tapes, adding details to plans from pencil drawings made under water on plastic paper, and from site photographs taken with cameras in watertight housings. Instead of shovels and wheelbarrows, we used air lifts (nearly vertical suction pipes) to remove overburden. Because sunken objects often become encased in layers of calcium carbonate over time, we had to chisel free from the sea bed large clusters of artifacts solidly concreted together. We raised these with balloons that we filled with air after attaching them to the clusters, and removed the rock-hard calcium carbonate on land.

At Cape Gelidonya we learned that the major problem in working under water is lack of time, for in order to avoid decompression sickness, each excavator could work only about an hour a day in two dives. Thus, in the 1960s, the excavation of Byzantine shipwrecks at Yassiada led to the development of devices to improve efficiency, especially in mapping. These included metal grids placed over each site to break it into squares two meters on a side; a scaffolding to support movable photographic towers; underwater plane tables; and ultimately a system of mapping stereophotogrammetrically by moving a cam-

era along a horizontal bar floated over the site. Later, the stereophotographs were taken from our research submarine, *Asberab*, which could glide above the seabed as an airplane flies over land. An air-filled Plexiglass hemisphere on legs, called an underwater “telephone booth,” allowed divers to talk to one another or, via a cable, to the surface, and a submersible decompression chamber allowed excavators to make longer dives by decompressing longer.

It was also in the 1960s that the first ancient wreck was located by side-scan sonar, near Yalıkavak, where Bodrum sponge dragger Mehmet Imbat had netted the bronze statue of a tunic-clad African youth, and where another sponge dragger soon afterward netted a statuette of the goddess Fortuna. At 85 meters, the wreck was too deep for diving with SCUBA equipment, so we



The bronze youth netted near Yalıkavak.



Bronze statuette of goddess Fortuna from near Yalıkavak.

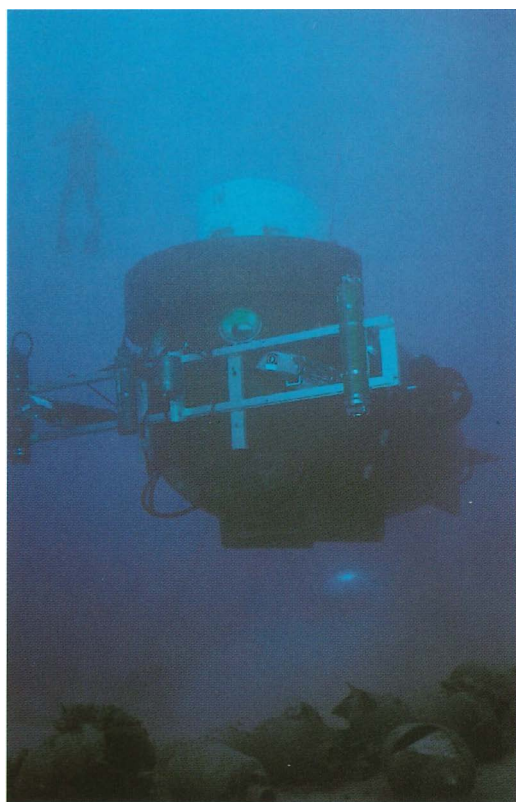


inspected it from the *Asherab*.

In the late 1970s, at Serçe Limanı, we sieved ceramic containers for seeds and other organic remains for the first time, with excellent results. There we also gained more diving time by decompressing on pure oxygen.

By the 1980s, the new techniques for underwater mapping were abandoned during the excavation of a Bronze Age wreck at Uluburun because of the rugged seabed terrain, and mapping was again done by hand-held meter tapes and plumb bobs, although a newly invented acoustic mapping system (SHARPS) was also used.

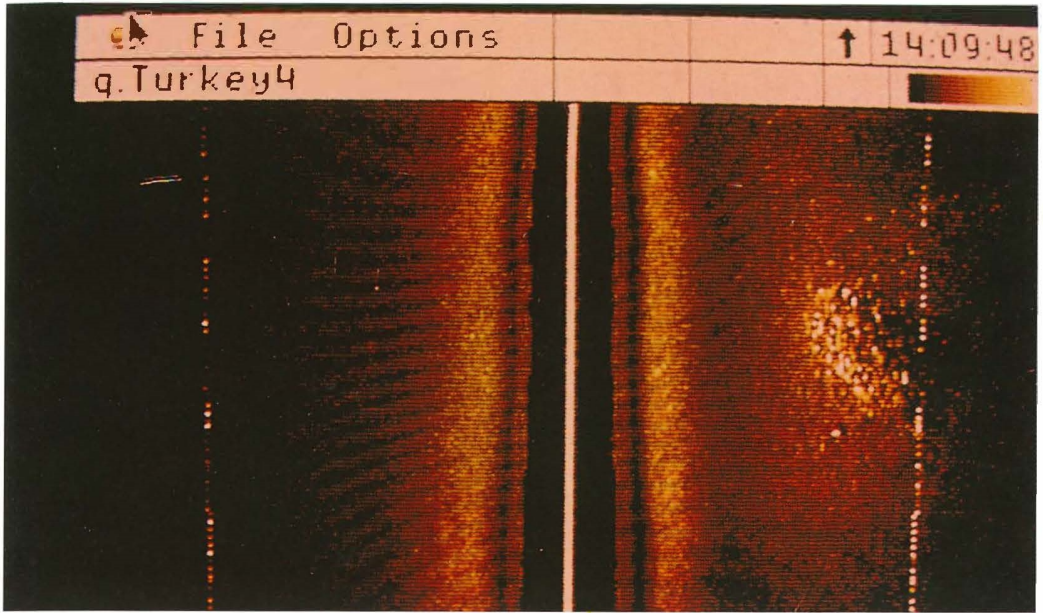
In 1990, we revisited the deep wreck near Yalıkavak with a one-person submarine, and videotaped it in its entirety with a remotely operated vehicle (ROV).



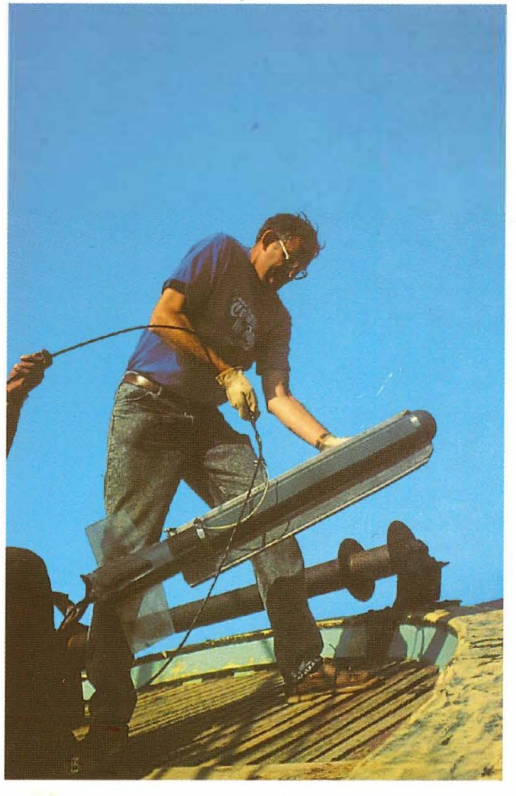
Except for limitations of time, the major difference between underwater excavation and that on land has to do with conservation. When an iron artifact falls into the sea, for example, it can be completely covered by calcium carbonate within a year. This thickens over the ages as the iron disintegrates through corrosion and mostly disappears, leaving a perfect mold inside. We plot the positions of hundreds of amorphous lumps of concretion on our site plans. We then X-ray the concretions to see the outlines of what once was inside. The natural molds of concretion are next broken into pieces, the

The *Asherab* at Yassiada.

C. Nicklin, National Geographic Society



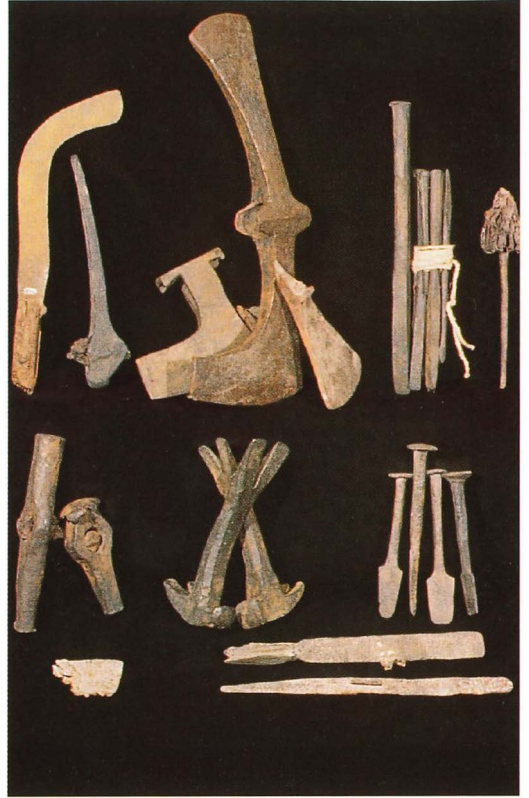
Sonar image of wreck near Yalıkavak.



INA's Marine Sonic Technology sonar.



Removing concretion from plastic replicas of iron tools cast in natural molds of seabed concretion.



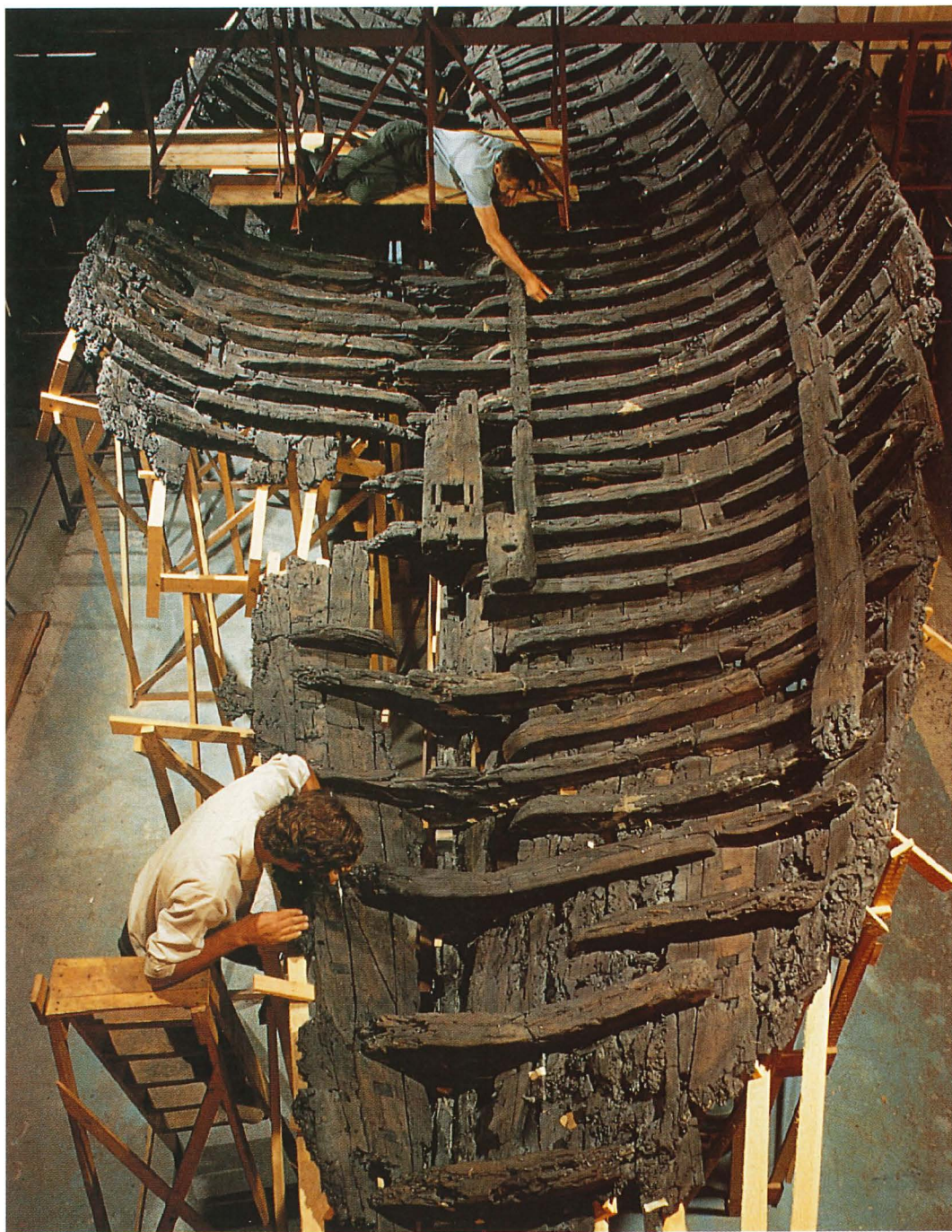
Plastic replicas of carpenter's tools from eleventh-century shipwreck at Serçe Limanı.

slight remains of rust removed, and the resultant cavities filled with epoxy. Once the epoxy is hard, we remove the concretion with pneumatic chisels, leaving exact replicas of the original implements. A thin coat of rust from the molds gives these plastic replicas the appearance of rusty iron. Virtually all of the “iron” objects displayed with other artifacts from the Serçe Limanı “Glass Wreck” are such replicas.

For the nautical archaeologist, no shipwrecked artifact is more important than the ship's hull, and understanding it requires special care. Waterlogged wood quickly shrinks and warps out of recognition in air as its cells collapse unless they are bulked with something before the water in them evaporates. Michael and Susan Katzev, excavators of the 4th-century BC Greek shipwreck



The shipwreck at Kyrenia.  
Bates Littlehales, National Geographic Society



INA staff restore the hull of the Kyrenia ship.  
Jonathan S. Blair, National Geographic Society



Soaking wood in polyethylene glycol.

near Kyrenia (Girne), Cyprus, using a chemical called polyethylene glycol for bulking, were the first to conserve and physically reassemble the fragmentary timbers of a Mediterranean ship, thereby bringing nautical archaeology to maturity. After spending years chemically treating the wood, they pieced together the hull in the early 1970s from thousands of fragments of solid wood held together with stainless steel wire. Detailed study of the hull, now displayed in a museum in Kyrenia's medieval castle, allowed a full-scale replica of the ship to be built and sailed along its original route. The same process of wood conservation was used in the 1980s and 1990s on the eleventh-century Serçe Limanı hull displayed in this museum, also in a medieval castle.



Kyrenia II, a replica of the Kyrenia ship.  
Susan Womer Katzev

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### III

## CAPE GELIDONYA

Cape Gelidonya, sometimes also Khelidonya, or Şilidonya Burnu, and more recently known as Taşlık Burun or Anadolu Burnu, is the Chelidonian Promontory of Pliny (*Natural History* 5.27.97) in Lycia. The cape marks the western extremity of the Bay of Antalya. Running south from the cape is a string of five small islands, the Chelidoniae of antiquity, called Celidoni by Italian sailors, and later Şelidonlar by the Turks, but today known simply as Beşadalar (Five Islands). Strabo (14.2.1 and 14.3.8) noted only three of them and Pliny (*Natural History* 5.35.131) only four.

In about 1200 BC, a merchant vessel apparently ripped its bottom open on a pinnacle of rock that nears the surface of the sea just off the northeast side of



Cape Gelidonya in background, expedition camp on beach in foreground.  
Peter Throckmorton



1960 expedition camp near Cape Gelidonya.  
Peter Throckmorton



Sponge-dragger *Lutfi Gelil* moored over Bronze Age wreck at Cape Gelidonya. Peter Throckmorton

Devecitaşı Adası, the largest of the islands (36° 11'40" N, 30° 24'27" E). Spilling artifacts in a line as she sank, the ship eventually settled with her stern resting on a large boulder 50 meters or so away to the north; her bow landed on a flat sea-floor of rock. At some point during the hull's disintegration, the stern slipped off the boulder into a natural gully formed by the boulder and the base of the island.

In 1954, Kemal Aras, a sponge diver from Bodrum, stumbled on the wreck's main concentration of cargo, between 26 and 28 meters deep. Four years later, he described it to American journalist and amateur archaeologist Peter Throckmorton, who was cataloguing ancient wrecks along the southwest Turkish coast. Throckmorton was able to locate the site in 1959 and, recognising its great age, asked the University Museum of the University of Pennsylvania if it would organise its excavation.

The subsequent excavation of this Late Bronze Age site, between the mid-



Stone hammers and bronze tools from Cape Gelidonya (wooden handles are modern).



Air-lifting at Cape Gelidonya.

dle of June and the middle of September 1960, was the first shipwreck excavation carried to completion on the sea bed, the first directed by a diving archaeologist, and the first conducted following the standards of terrestrial excavation. Visits to the site in the late 1980s by a team from the Institute of Nautical Archaeology (INA) at Texas A&M University showed, after more artifacts were recovered, how the ship had sunk. The sinking has been dated to the late thirteenth century BC by two nearly intact Mycenaean IIB stirrup jars discovered on these visits and by a radiocarbon date of 1200 BC  $\pm$ 50 years from brushwood on the wreck.

Because of a lack of protective sediment, most of the ship's hull had been devoured by marine borers, especially teredos. We know, however, that its planks were held together with pegged mortise - and - tenon joints, the method of ship construction used in Greek and Roman times. Furthermore, its brushwood dunnage gave for the first time meaning to the brushwood Odysseus placed in a vessel he had built (*Odyssey*. 5.257). The distribution of cargo originally led to a published estimate of not much longer than 10 meters for the hull, but recent discoveries suggest that this estimate was low.

The bulk of the cargo consisted of the ingredients for making bronze implements, including

Thirteenth-century B.C. copper ingots from Cape Gelidonya.





Bronze swage (small anvil) and whetstones from Cape Gelidonya wreck.

both scrap bronze tools from Cyprus, intended to be recycled, and ingots of both copper and tin, meant to be mixed to form new bronze. The scrap, at least partly carried in wicker baskets, included broken plowshares, axes, adzes, chisels, pruning hooks, a spade, knives, and casting waste. The copper, mined on Cyprus, was shipped as 34 flat, four-handled ingots, weighing on average 25 kilograms apiece, of the type once thought to imitate dried ox hides in a pre-monetary form of currency; discoid “bun ingots,” averaging only about 3 kilograms each; and fragments chiselled from each type. The tin ingots were too badly corroded to reveal their original shapes, but seabed evidence suggests that at least one was a rectangular bar. In addition, there were 18 much smaller, flat, ovoid ingots, at least one of them bronze, that seem to have been cast in multiples of 0.5 kilograms.

The discovery on the wreck of a bronze swage, stone hammerheads of the kinds sometimes used for metalworking, many stone polishers and a whetstone, and a large, flat close-grained stone that could have served as an anvil suggest

that a tinker may have been on the voyage.

The wreck's importance derives from the historical conclusions drawn from it. At the time of its excavation, it was generally accepted that Mycenaean Greeks had a monopoly on maritime commerce in the eastern Mediterranean during the latter part of the Late Bronze Age, and that Phoenician sailors did not begin their great tradition of seafaring until the following Iron Age. Indeed, the main reason that Homer's *Odyssey* has been commonly dated to the eighth century BC by modern classicists is his frequent mention of Phoenician sailors and bronze-smiths.

The Cape Gelidonya shipwreck suggests new possibilities. The southeast end of the wreck, most probably its stern, held what may be considered personal possessions of crew and/or passengers, as opposed to the mostly Cypriot cargo and the shipboard mixture of Mycenaean, Cypriot, and Syrian pottery. These possessions included four scarabs and a scarab-shaped plaque, an oil lamp, stone

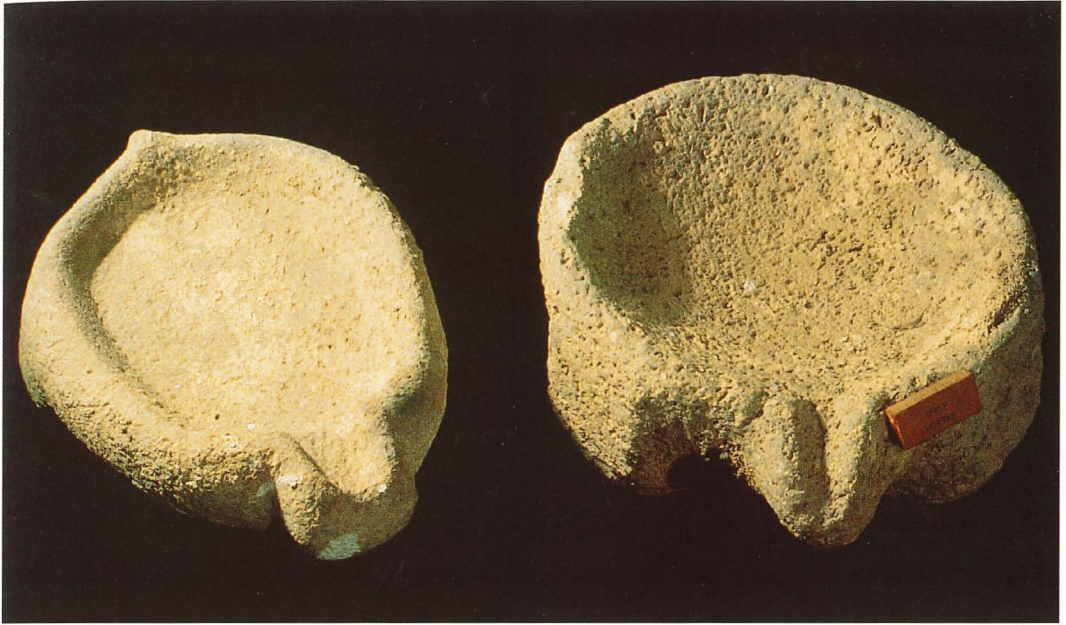


Syro-Palestinian scarabs from Cape Gelidonya.





Raising a Mycenaean jar from the Cape Gelidonya wreck.



Syrian stone mortars from Cape Gelidonya.



Canaanite lamp from Cape Gelidonya.



Syrian merchant's cylinder seal from Cape Gelidonya.



Stone pan-balance weights from Cape Gelidonya.

mortars, more than 60 stone pan-balance weights (including Egyptian *qedets*, and Syrian *nesefts* and *shekels*), and a merchant's cylinder seal, all apparently of Syrian, or Canaanite, origin; a razor is of Egyptian rather than Mycenaean type.

I concluded that the ship was probably Canaanite, or early Phoenician (the Canaanites being simply Bronze Age Phoenicians), although because so many Near Eastern artifacts are found on Cyprus from the same period, there was the possibility that the ship was Cypriot. Library research revealed that, with a single exception, contemporary Egyptian artists associated the trade in four-handled copper ingots, and tin ingots, solely with Syrian merchants (the only known mold for casting four-handled copper ingots was found after the Cape Gelidonya excavation, in a palace at Ras ibn Hani, the port of Ras Shamra/Ugarit, the greatest of Late Bronze Age Syrian port cities). Furthermore, the only foreign merchant ships depicted in Egyptian art of the time are Syrian. All this suggested that Homer's Phoenicians are not anachronistic in the Late Bronze Age of the Trojan War. The discovery in 1994 of the Cape Gelidonya ship's Syro-Canaanite or Cypriot stone anchor bolstered my contention that the ship was of Near Eastern origin.

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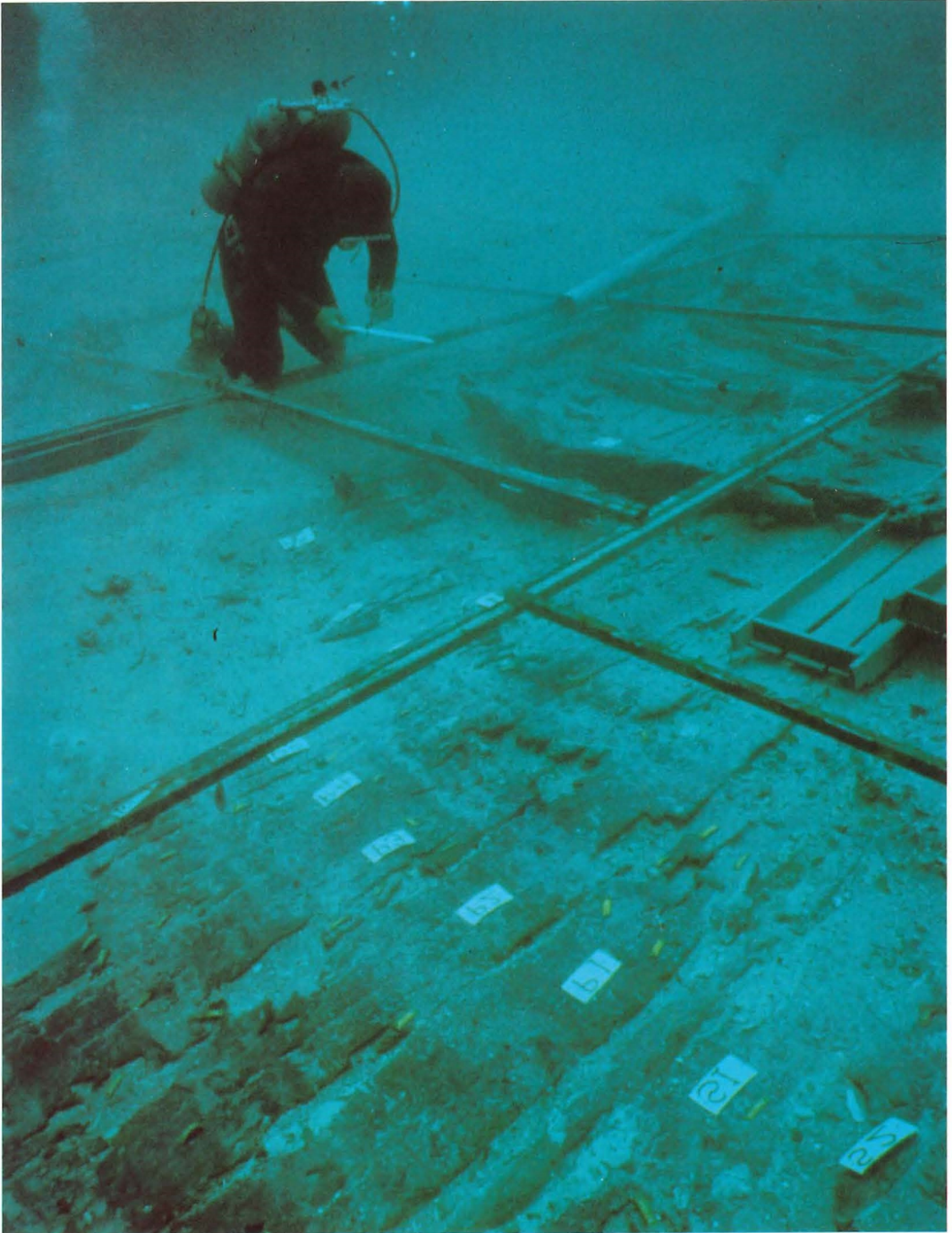
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Recording wooden hull planking on the eleventh-century Serçe Limanı Glass Wreck.

## IV SERÇE LIMANI

Serçe Limanı (36°34'25" N, 28°03'08" E), Turkish for Sparrow Harbour, is a small, protected bay with a deep, narrow entrance on the southwest, opposite the island of Rhodes and just northeast of the better-known bay of Loryma (modern Bozukkale) with its excellently preserved Hellenistic fortification. It was almost certainly the Portus Cressa of Pliny (*Natural History* 5.29) and Kresa of Ptolemy (5.2); it served the town of Kasara, probably a deme centre attached to Kamiros on Rhodes.

Underwater surveys show that the seeming tranquillity of Serçe Limanı attracted ships to an anchorage at the northeastern end of its entrance passage



The diving barge moored over the eleventh-century A.D. Glass Wreck inside Serçe Limanı ; the Hellenistic wreck lies nearer the harbour entrance.



Uncovering pottery on the Hellenistic wreck at Serçe Limanı.

from the Early Bronze Age until modern times. Its busiest period, as might be expected, was during the Hellenistic heyday of Rhodes. Ships that did not quite reach the safety of the harbour have left their remains outside it. These include a steamboat, perhaps from the nineteenth century, and a sixth-century BC wreck that has not been located, although it has yielded strap-handled amphoras to sponge draggers' nets.

Ships that did find shelter in this natural harbour still faced peril, for sudden winds channelled from different directions by valleys at the bay's ends make Serçe Limanı more dangerous than it seems. Two ships sank along the eastern side of its entrance passage, and two others just beyond these where the bay widens. One of these, just inside the harbour mouth, about 30 meters deep, is a Roman amphora carrier of the first century BC or AD. Farther inside the harbour, at a depth of 35-37 meters, are the remains of a Hellenistic wine carrier to which Institute of Nautical Archaeology (INA) archaeologists were directed by



Part of the cargo of wine amphorae from the Serçe Limanı Hellenistic wreck.

sponge diver Mehmet Aşkın of Bozburun in 1973. Already looted of almost all the amphorae that had been visible, the wreck was partially excavated by INA and Texas A&M University in 1978-1980. The excavation was stopped when it was discovered that much of the site had been covered by tons of boulders from a rockslide that took place at an unknown date after the ship sank, making the excavation more difficult and dangerous than anticipated. Nevertheless, around 600 Knidian-type amphorae, in two sizes, were uncovered, some with handle stamps that date the wreck, with its glazed and plain wares, to the middle of the first half of the third century BC. Other finds include the two components of a stone hopper mill, and the lower grinding platform of a quern. The ship itself was at least partly lead sheathed, in the custom of the day, and yielded a lead pipe that may be the earliest evidence of a bilge pump.

Next inside the harbour, approximately 150 meters north of the third-century BC wreck, is the eleventh-century AD wreck described in detail below. East

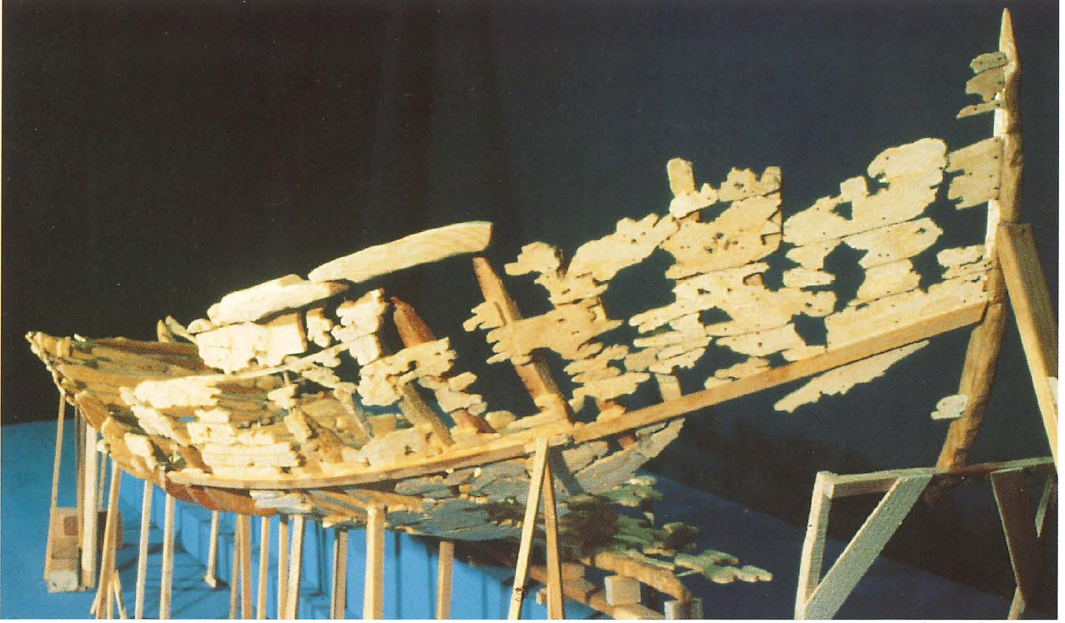


of it, closer to shore, appear to be the remains of another Hellenistic wreck, badly broken and scattered in shallow water.

The wreck for which Serçe Limanı is best known, also shown by Mehmet Aşkın, is that of an eleventh-century merchant ship with a cargo of Islamic glass excavated by INA and Texas A&M University between 1977 and 1979. The ship was about 15 meters long with a beam of about 5.2 meters. Its pine hull with elm keel, reassembled in the Bodrum Museum of Underwater Archaeology by Sheila Matthews, provides the earliest dated example of a seagoing vessel built in the modern, frame-first manner. Although only a few of its frames (ribs) were erected before the planks were installed, this framework was now the primary structure; the shipwright, however, was still essentially shaping the hull with planks. The ship's flat-bottomed, boxlike shape would have allowed it to navigate in shallow waters, including rivers. It carried two metric tons of ballast in the form of just over 100 boulders, with an additional half ton of cobbles. Its eight iron, Y-shaped anchors, with removable wooden stocks, were forged from



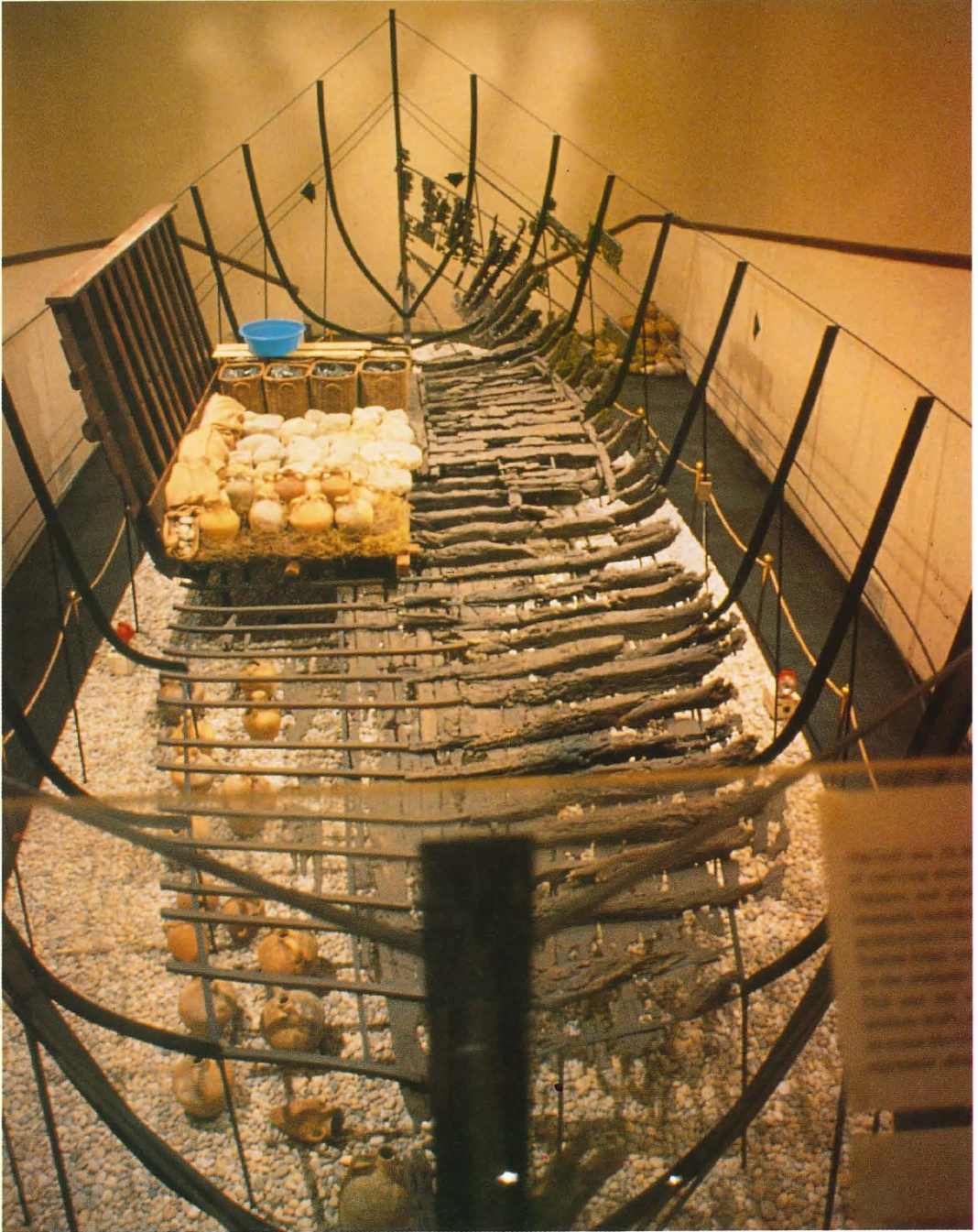
Plan of Glass Wreck.



A tenth-scale research model of the Glass Wreck hull remnants. Cemal Pulak.

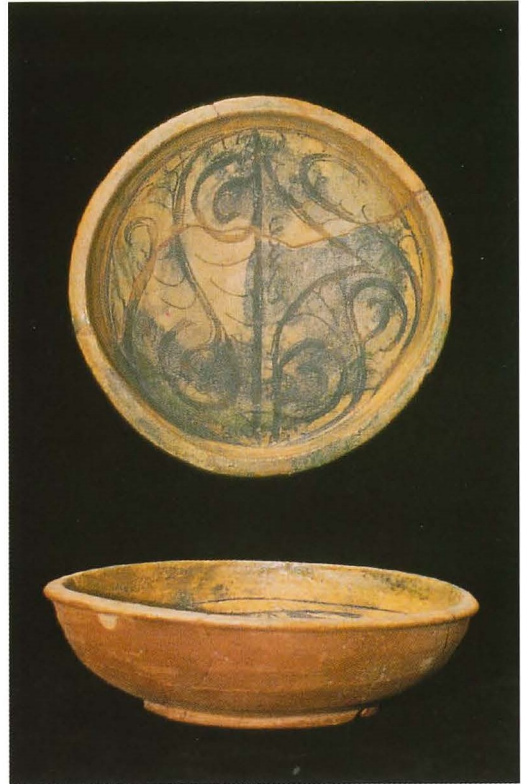


Gold earring from the Serçe Limanı Glass Wreck.



The restored hull of the Glass Wreck in the Bodrum Museum. Iron rods give the hull shape where wood was not preserved. Part of the hull has been fully restored with modern wood, and cargo and ballast put back in their original positions.

Glazed Islamic bowl from cargo of Glass Wreck.



short iron rods; three were bowers, two to port and one to starboard, with the remaining five stowed just forward of midships. A surviving halyard block and the hull design suggest that the ship sported two lateen-rigged masts.

There appear to have been three living areas: one at the bow (probably covered by a deck), an open space on the midships deck, and a stern cabin.

The ship probably sailed from the Black Sea or somewhere near Constantinople in about AD 1025 with Bulgar merchants carrying in the hold about one hundred of their own individual amphoras that had been fired in kilns around the Sea of Marmara. The voyage took the ship to the neighbourhood of Caesarea, in modern Israel, where it took on its cargos of Islamic glass and glazed bowls, and perhaps jewelry and copper and bronze vessels of Islamic origin; the glazed bowls and an earring of delicate filigreed gold find their closest

archaeological parallels at Caesarea, where apparently similar glass is also found.

Although much that the ship carried was of Islamic origin, it seems that many or most of the crew and merchants on board were Christian. Three of four Byzantine seals recovered have Christian scenes impressed in their lead: the Virgin Mary with the Christ child, the ecstatic meeting of Peter and Paul, and a warrior saint. One of the seals protected the writing of someone named Peter; the fourth had not yet been used. The Christianity of those on board is also indicated by the bones of pigs found among the food remains, less likely to have been eaten by Jews or Muslims, and the crosses (and in one instance the name Jesus) inscribed or molded inside some of the 900-odd folded-over and crimped lead fish-net sinkers used during the voyage.

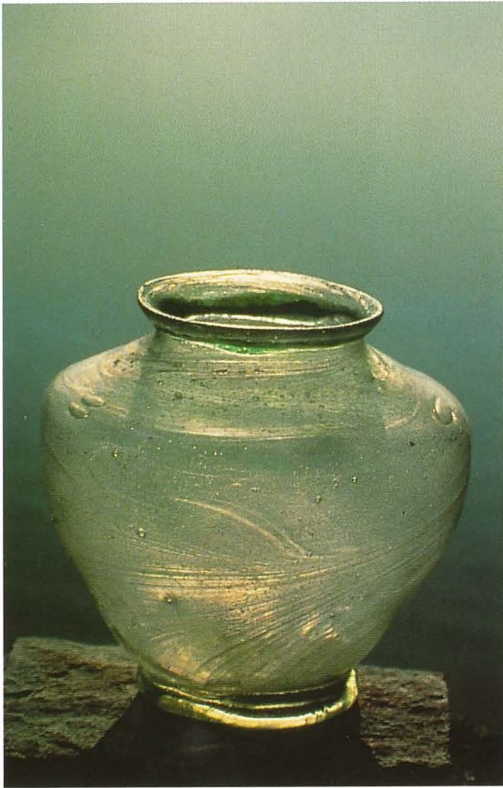
In the forward part of the ship's hold there must have been a cargo like



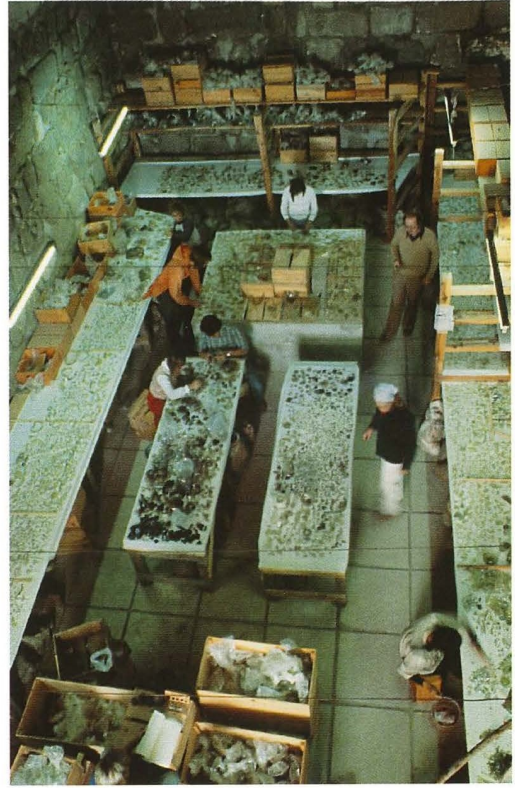
Intact glass bottles from living quarters on the Serçe Limanı eleventh-century ship.



Raising an intact glass bottle at Serçe Limanı.  
Robin Piercy



Intact glass jar from the Glass Wreck.



Sorting only a few of the million shards of glass from the Glass Wreck.

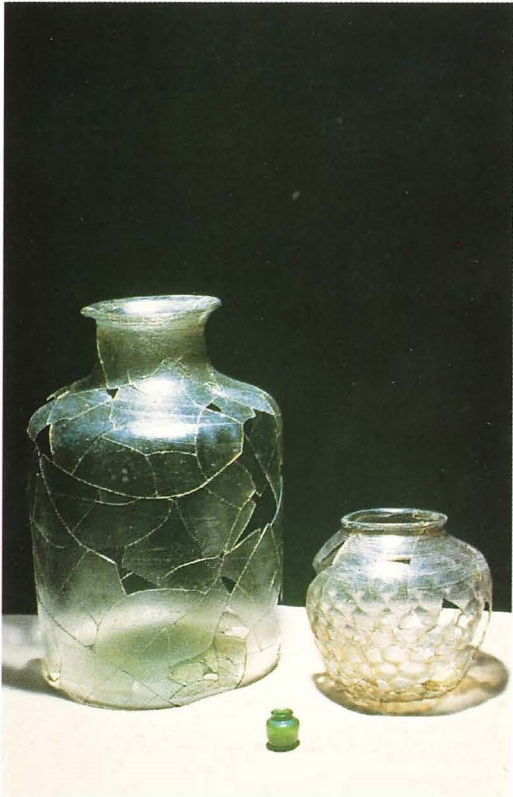
potash, because it has left no archaeological clue as to its nature. The wine amphoras were stowed in the centre and aftermost parts of the hold. In the after third of the hold three tons of glass cullet included two tons of raw glass and one ton of broken glass. The broken glass was largely waste from an Islamic glassworks that has not been identified. Cullet is needed not only for making glass vessels in places that do not produce their own glass, but also for making new batches of glass from its basic ingredients. Mending the glass cargo from between half a million and a million shards during a ten-year period revealed more than 200 different shapes, some unique, including varieties of cups, bowls, bottles, plates, lamps, beakers, jars, jugs, and ewers. It is estimated that these are the remains of between 10,000 and 20,000 vessels, many of which had engraved or molded designs. Altogether they form by far the largest and best

dated collection of medieval Islamic glass known. The colours are mostly various shades of green and purple, but dense greens and blues also occur. Above the cullet, the ship carried cargos of raisins and sumac, the latter believed to have been exported through Caesarea at about the time the ship sank.

Eighty intact Islamic glass vessels were also on board, perhaps once in bundles of merchants' goods; these were, without exception, in the bow and stern living quarters. The living quarters were identified by cooking and eating wares as well as by the bones of sheep or goat and pig; other food remains included almonds, apricots, plums, and olives, although which of these were for ship-board use and which for trade has not been determined. In the stern living area were eighteen Islamic glass weights that date the wreck to about AD 1025, a



Looking for joins among the glass fragments raised from Serçe Limani.



Free-blown glass jars of various sizes from Serçe Limani.

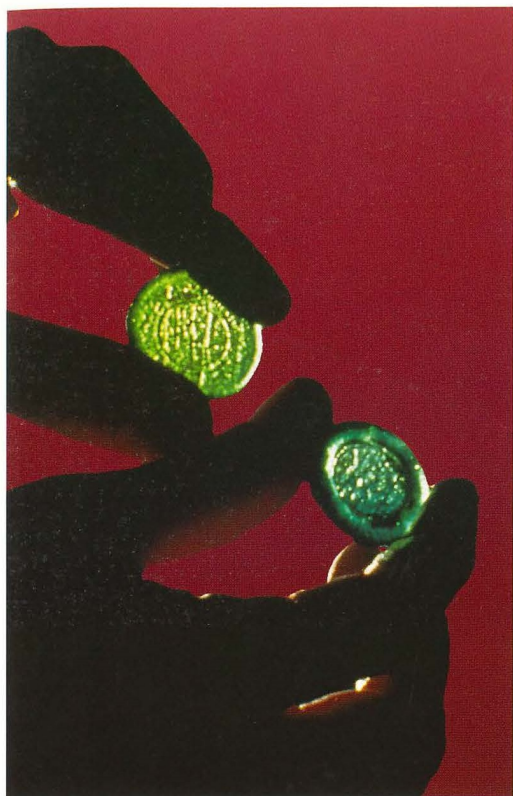




Medieval Islamic glass vessels mended from broken glass carried on the eleventh-cent. A.D. Serçe Limanı ship.



Mold-blown bottles from Serçe Limanı.



Inscribed Fatimid glass weights provide a date around A.D. 1025 for the sinking of the ship at Serçe Limani.



Small change was obtained from Islamic coins by simply cutting off tiny bits of gold and weighing them.

date supported by the Fatimid gold coins and Byzantine copper coins of Basil II recovered; this has allowed the closest dating of some of the types of Islamic glazed bowls on board. Weighing instruments included sets of both Byzantine and Islamic weights, three pan-balance scales, and a small Byzantine steelyard. Also at the stern were the ship's carpenter's tools, including bow drills, hammers, axes, adzes, saw, files, and the earliest known caulking tools. Those who shared this stern area played chess, some of whose wooden pieces survive, whereas what may well be a backgammon counter found amidships suggests a less intellectual game for the common sailors on board. Lastly, those in the stern were the only ones on board who had pork and fish for food at the time the ship sank.



Plastic replicas of some of the iron weapons from the Serçe Limanı ship.



Preparing a display of the Serçe Limanı carpenter's tools in the Bodrum Museum.

On display in the Bodrum Museum are copper buckets, wooden chess pieces, iron tools and weapons, fishing gear, and a personal grooming kit from the Serçe Limanı Glass Wreck.



Remains of the wooden hull and some of the cargo of the Glass Wreck displayed in the Bodrum Museum.



It seems that three fishing nets (each about 40 meters long, based on the sizes, numbers, and distribution of more than 900 lead net sinkers) were being mended on deck with net needles on the final voyage; eight bone spindle whorls of probable Syrian origin found near the net sinkers suggest that the sailors spun their own cords for this task. There was also a smaller casting net.

The ship was heavily armed with 52 javelins, eleven spears, and at least one sword (with a feathered bird on its bronze hilt, inside a wooden scabbard); the weapons were issued in sets of one spear and five javelins wrapped in a burlap-like cloth. Personal possessions on board included a grooming kit comprising a wooden delousing comb, a razor, and scissors; found nearby, near another comb, were piles of orpiment, a substance still used with quick-lime as a depilatory. The ship's ultimate destination is not known, but it may have been returning to Byzantium with its Levantine cargo.

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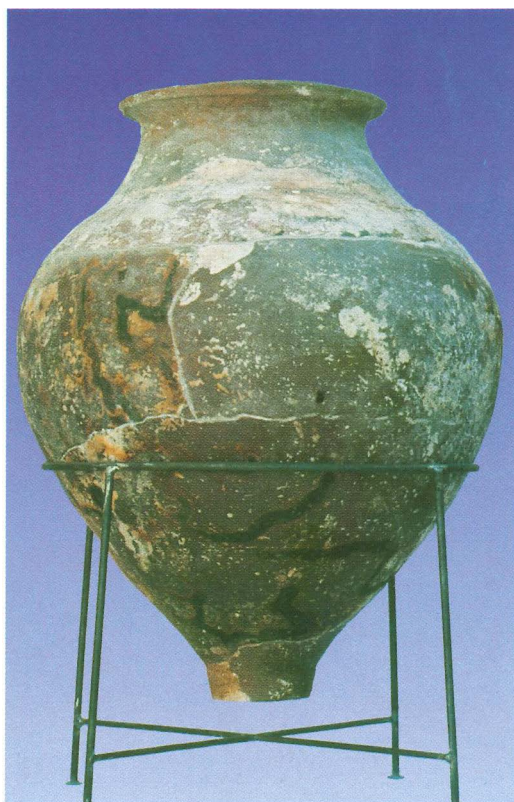
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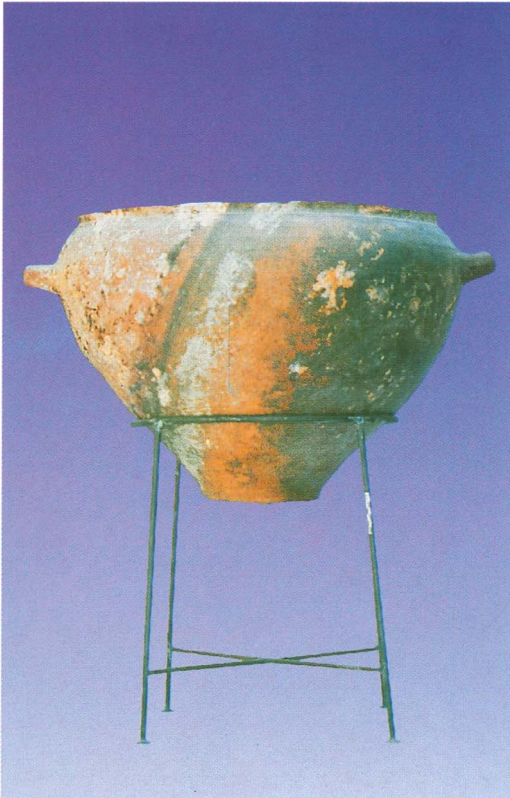
A two-handled pithos (large storage jar) from Şeytan Deresi. John Cassils



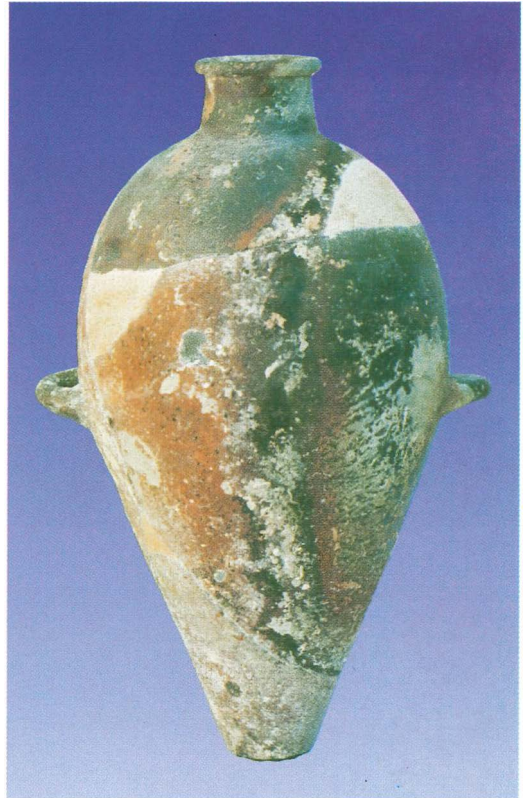
Another type of pithos from Şeytan Deresi.  
John Cassils

## V ŞEYTAN DERESİ

Şeytan Deresi (36° 59'45" N, 27° 41'40" E), Turkish for Devil Creek, empties into an open cove near the village of Mazı on the northern shore of Gökova Körfezi, the large bay south of the Halicarnassus (now Bodrum) Peninsula. In 1973 sponge diver Cumhuriyet İlik led archaeologists from the Institute of Nautical Archaeology to a place about 100 meters southwest of the southernmost point on the east side of the bay, to raise two intact jars he had spotted seven years earlier at a depth of 33 meters: one was a large krater (mixing bowl) and the other a two-handled pithos (large storage jar). We also raised fragments of other pots at the time, including part of a jar that vaguely resembled a Minoan amphora.

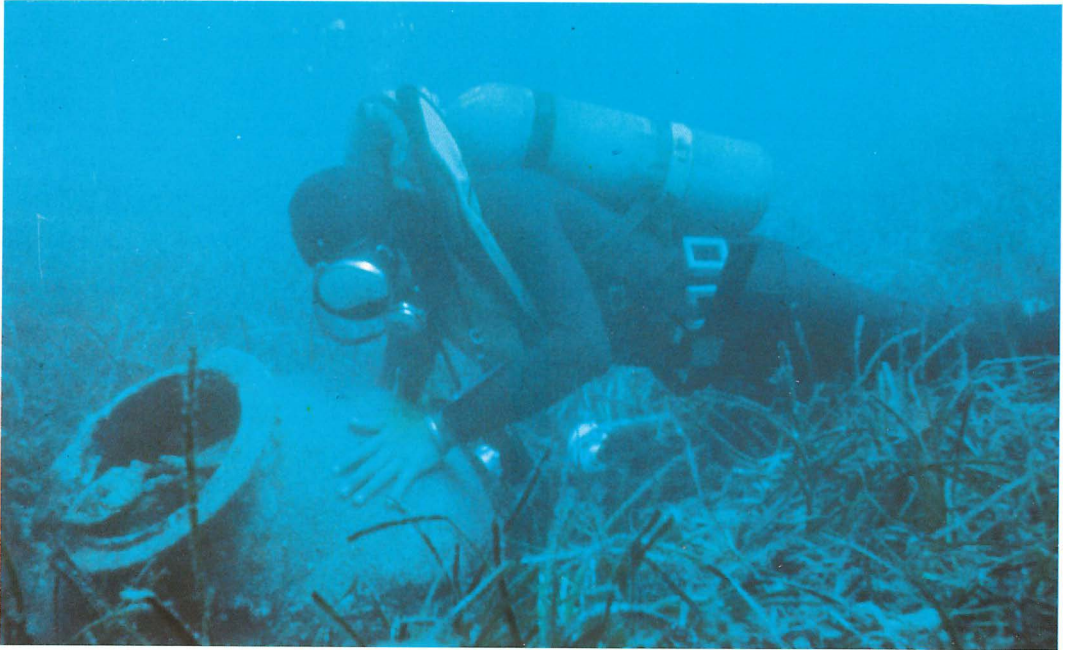


The krater (mixing bowl) from Şeytan Deresi.  
John Cassils



An amphora from Şeytan Deresi.  
John Cassils

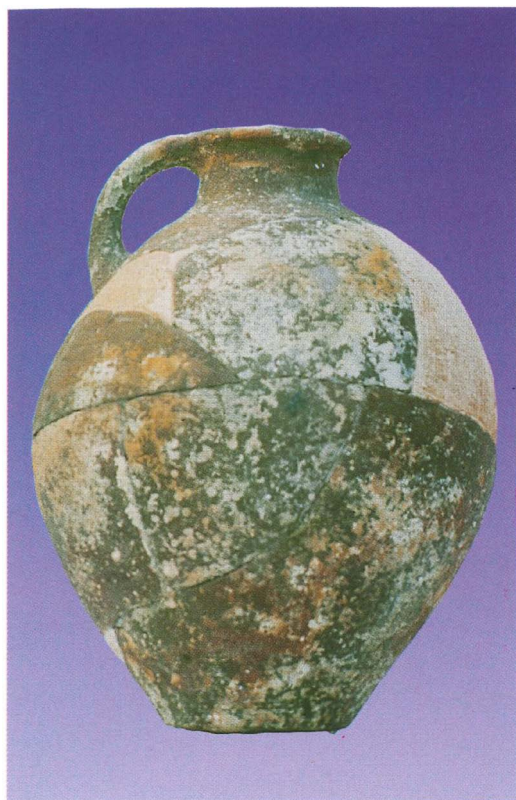




One of the large jars found at Şeytan Deresi.  
Ayhan Sicimoğlu



Mending the jars from Şeytan Deresi.  
John Cassils



Jug from Şeytan Deresi.  
John Cassils



Jar from Şeytan Deresi.  
John Cassils

The pottery's seemingly early date led INA to excavate the site in 1975, but it remains an enigma. Although the depth of sand was deep enough to have covered and protected any wooden hull remnants from marine borers, and a large area was cleared of sand down to bare bedrock, we discovered only pottery (except for a lead fishing sinker of perhaps later date). Furthermore, one of the six pithoi recovered (three with handles, and three without) lay about 30 meters from the others, at a depth of only 27 meters, so deeply buried in sand it could not have been moved there in modern times; found inside it was a sherd that joined a fragmentary pot found on the main part of the site. We concluded that some kind of watercraft must have capsized, causing some of the jars in its cargo to drift apart as they sank; pithos sherds found close to shore strengthen this conclusion. Individual sherds, however, were probably moved by the octopods that sometimes make their homes in jars.

The pottery is of a uniformly coarse brown fabric, except for several clearly intrusive sherds of later date; the collection comprises the six large storage jars, parts of three belly-handled amphoras similar to examples from Beycesultan stratum IVb, two one-handled jugs like some from Troy stratum VI, and parts of three amphoras that find their closest parallels on Middle Minoan III Crete. All these point to a tentative date of about 1600 BC, although scholarly acceptance of the Minoan parallels and this early date is not universal. Unfortunately, the pottery was raised and cleaned of mud before we had learned to identify the original contents of jars by carefully sieving the sediments found inside them.

After the excavation, a local sponge-dragger presented to the Bodrum Museum of Underwater Archaeology a two-handled pithos, similar to those excavated at Şeytan Deresi, that he had netted in Gökova Körfezi. Later, Cemal Pulak, one of the excavators of the site, noted, in a storeroom at the Bodrum Museum, a sea-encrusted amphora identical in size and fabric to those from the excavation; its label indicated that it had been given to the museum by a sponge diver many years earlier, at a time when the museum was simply a depot without records. These discoveries suggest that there may be a main site still undiscovered, or that more than one wreck of the same unknown and probably local culture lies in Gökova Körfezi. The mixture of Anatolian and Aegean traits in the pottery may reflect the time when Minoans who were arriving at Miletus, not far up the western coast of Anatolia from Şeytan Deresi, had contacts with inland Beycesultan.

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The *Virazon* moored directly over the Uluburun Wreck.

## IV ULUBURUN

Uluburun (36° 08' N, 29° 41'15" E), Turkish for Great Cape, lies 8.5 kilometres southeast of Kaş. In 1982 a Late Bronze Age shipwreck was discovered only 60 meters off its east face, 400 meters from its tip, by sponge diver Mehmet Çakır. After the site was identified and dated to the Bronze Age by divers led by Oğuz Alpözen of the Bodrum Museum of Underwater Archaeology, we began its excavation for the Institute of Nautical Archaeology and Texas A&M University in 1984. In more than 22,400 dives during eleven summer campaigns, the last nine directed by Cemal Pulak, this revealed a unique cargo lost in the late fourteenth century BC.



The *Virazon* is only a white speck over the Bronze Age shipwreck on the right side of Uluburun.  
Cemal Pulak.



The oldest glass ingot ever found.



Uncovering stacks of copper ingots from Cyprus at Uluburun.



A log of Egyptian ebony from tropical Africa.



Hippopotamus teeth.

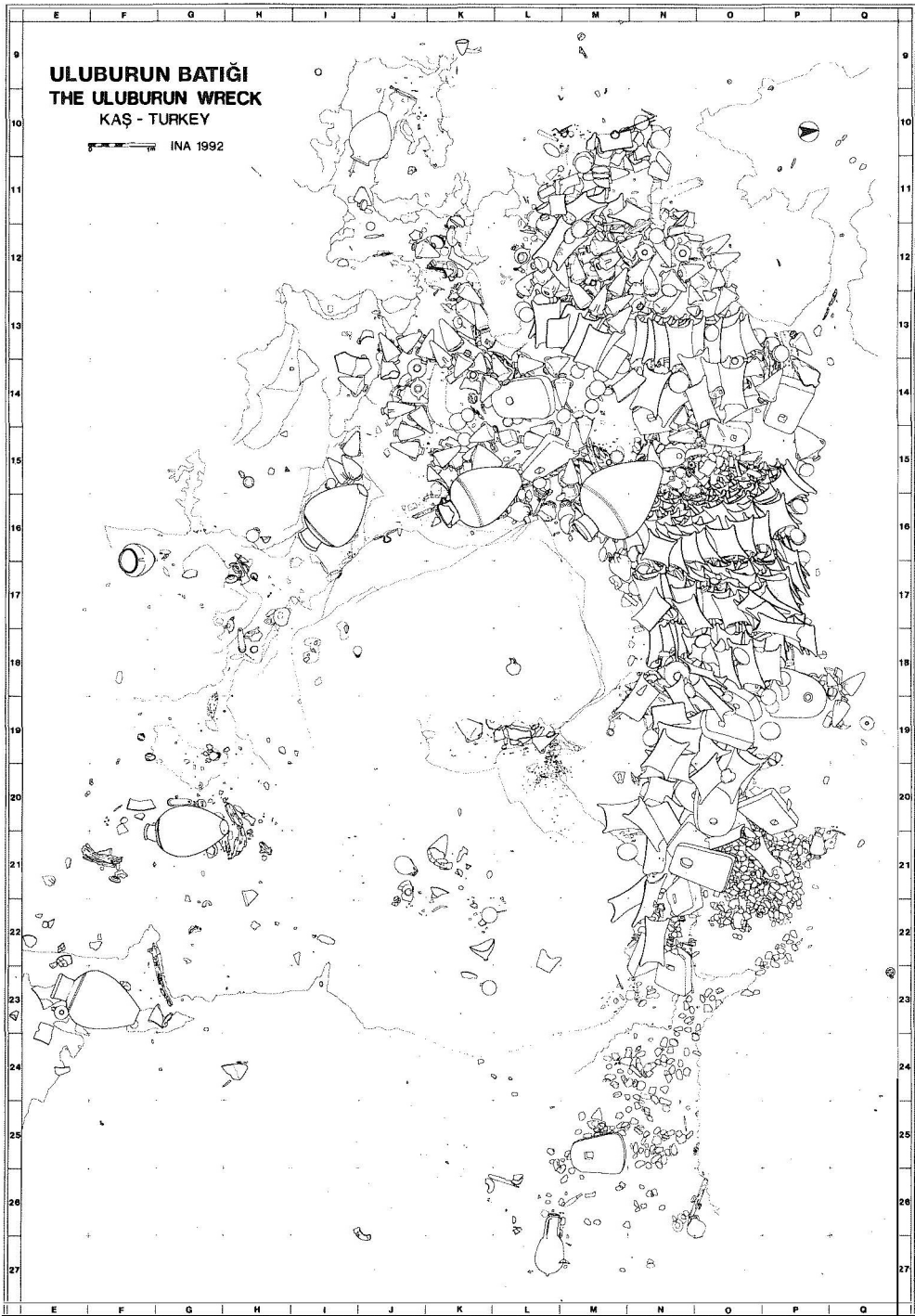
The ship lay on a steep slope with its stern at a depth of 44 meters and its bow at 52 meters, with artifacts tumbled down to 61 meters. Built of cedar in the ancient shell-first tradition, with pegged mortise-and-tenon joints holding its planks together and to the keel plank, it was about 15 meters long. A fence of wicker is reminiscent of fencing seen on Egyptian depictions of contemporary Syrian ships and of the wicker fence Odysseus constructed to keep the waves out of his vessel (Odyssey 5.526).

The cargo consisted mostly of raw materials, items of trade already known to the excavators primarily, and in some cases only, from ancient cuneiform texts or Egyptian tomb paintings. The major cargo was ten tons of Cypriot copper in the form of 318 flat, four-handled ingots weighing about 23 kilograms a piece; 31 otherwise identical but two-handled ingots (which disprove the questionable notion that four-handled ingots were cast in imitation of dried ox hides); five flat, pillow-shaped ingots; and plano-convex discoid “bun” ingots. Nearly a



Cypriot export pottery from Uluburun.







A faience drinking cup.



A terra-cotta wall bracket of uncertain use.



A gold chalice, a Syrian flask, and a Mycenaean drinking cup are uncovered at Uluburun.

Canaanite gold jewelry and the unique gold scarab of Queen Nefertiti of Egypt.





An ivory cosmetics box shaped like a duck.

ton of virtually pure tin ingots (the earliest known) in both the four-handled and bun shapes, represent the correct ratio, if mixed with the copper, to have formed eleven tons of bronze; the source of the tin is not known.

More than 150 discoid glass ingots, in cobalt blue, turquoise and lavender, are likely the *mekku* and *eblipakku* listed on tablets from Ugarit and el-Amarna as items traded from the Syro-Palestinian coast, and the cakes of “lapis lazuli” and “turquoise” (as opposed to “genuine lapis lazuli” and “genuine turquoise”) shown as tribute from Syria in a relief of Thutmose III at Karnak, Egypt. They are the earliest intact glass ingots known. Those of cobalt blue are chemically identical to blue glass in eighteenth-dynasty Egyptian vases and in Mycenaean pendants, suggesting a common source for all.

Logs of what the Egyptians called ebony, now known as blackwood (*Dalbergia melanoxylon*) from tropical Africa, and of cedar are also unique



An ivory figurine of an acrobat.



A ceremonial stone mace, probably from Rumania.



A Canaanite sword with ivory and ebony inlaid hilt below a Canaanite dagger and a Mycenaean sword.



A bronze pan-balance weight in the form of a sphinx.

archaeological finds.

A ton of terebinth resin from the *Pistacia terebinthus* or *Pistacia atlantica* tree, known to have grown in the Near East and on the islands of Cyprus and Chios, was carried on the ship in more than one hundred Canaanite amphoras. This is the first scientifically identified find of this substance, which may be the Egyptian *sntr* brought in Canaanite jars from the Near East to the pharaoh to burn as incense in religious rituals.

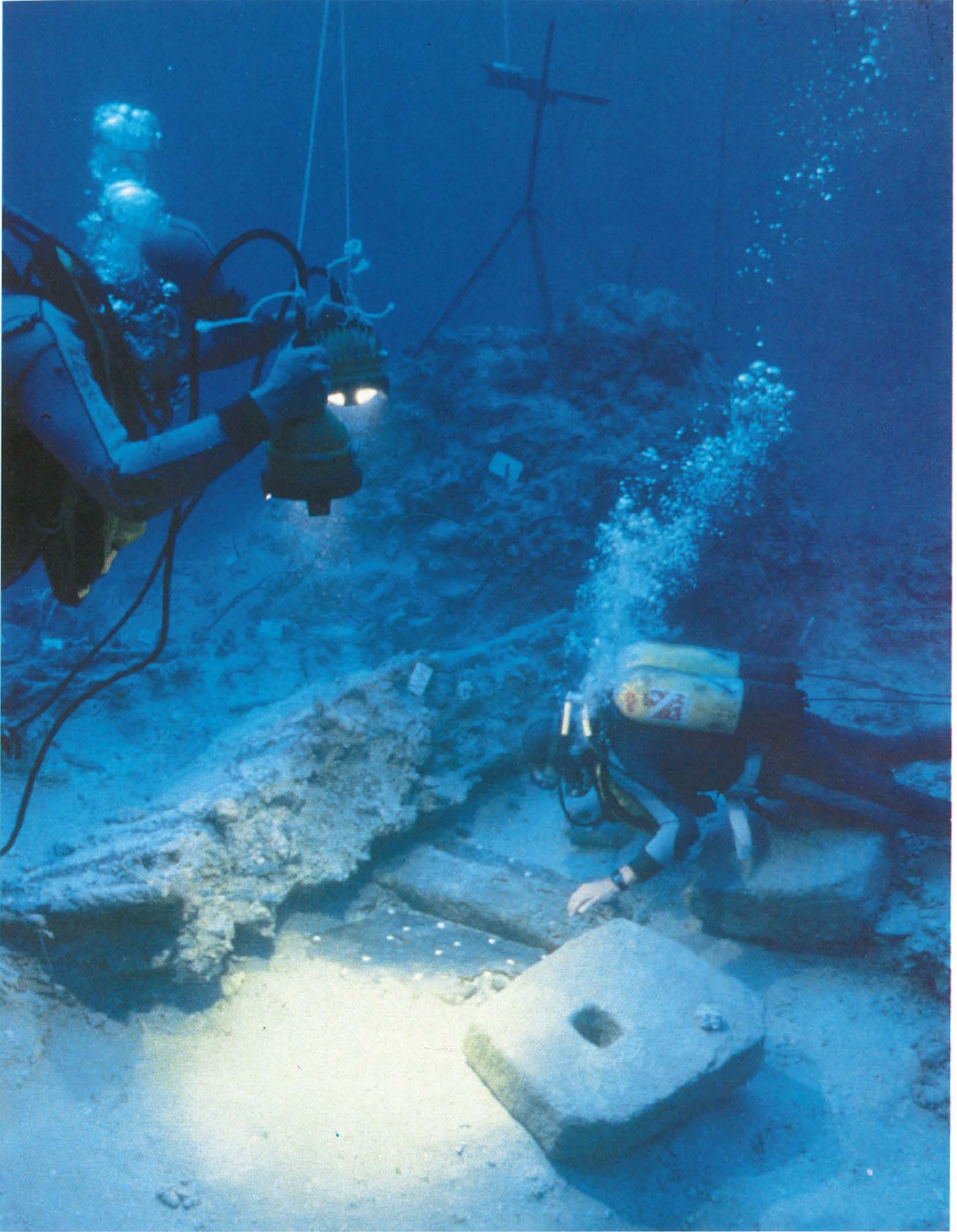
Other raw materials include ivory in the form of whole and partial elephant tusks and more than a dozen hippopotamus teeth; *murex opercula*, a possible ingredient for incense; tortoise carapaces, possibly intended as sound-boxes for musical instruments; and ostrich eggshells that were probably intended to be



The smallest of the animal-shaped weights from Uluburun was a bronze housefly.



A cloaked cowherd and the remains of his three calves top the most ornate Bronze Age weight ever found.



One of twenty-four stone anchors lies almost on top of the ship's surviving keel plank, which protrudes from beneath hundreds of copper ingots from Cyprus.

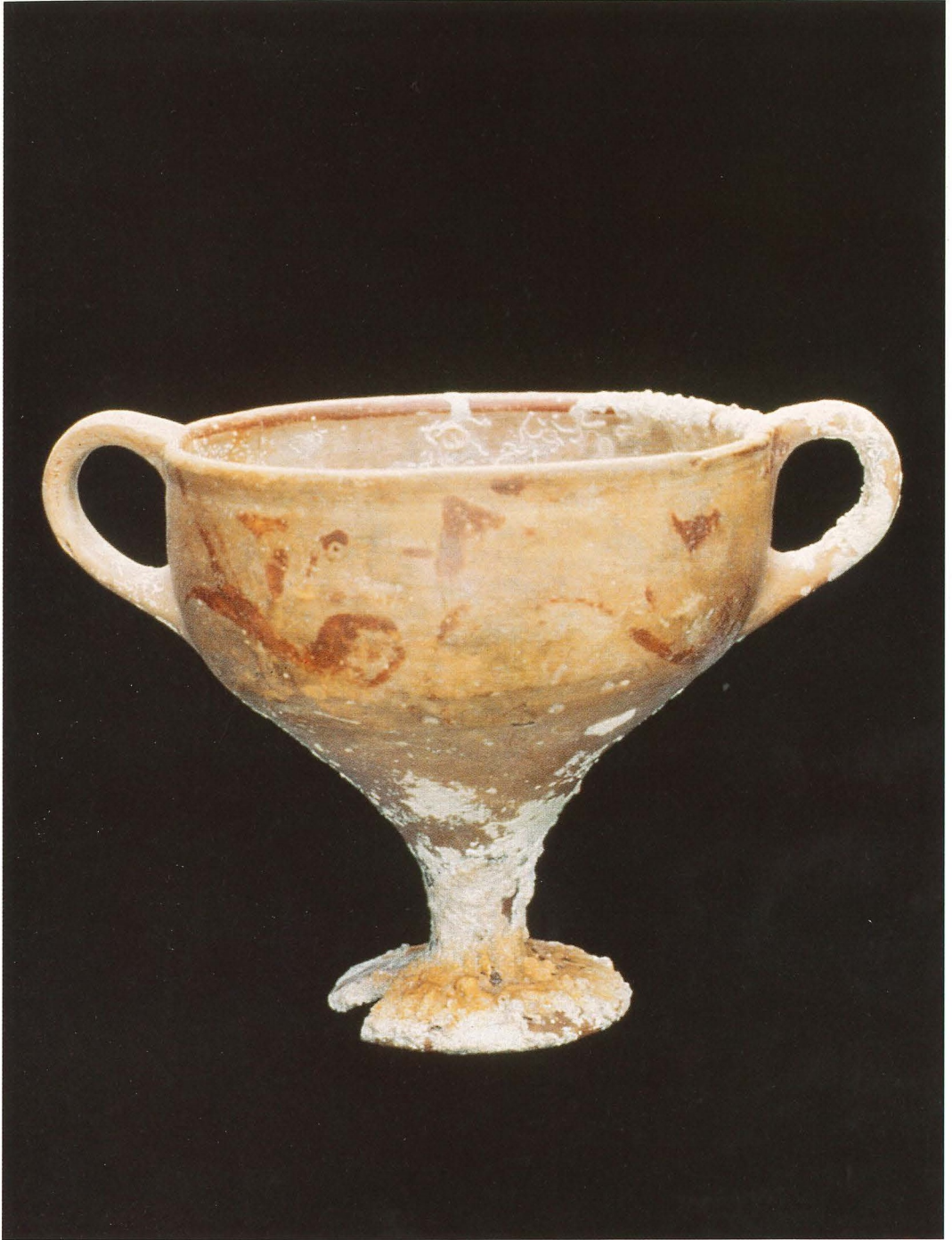




Uncovering Syrian jars at Uluburun.

embellished with faience or metal spouts to create exotic canteens.

Manufactured goods were also on board. At least two of nine large pithoi (storage jars) contained Cypriot export pottery, including Base-ring II, White Slip II, White Shaved and Bucchero wares; lamps; and probably the wall brackets of unknown purpose found near them. Several faience drinking cups were crafted as the heads of rams or, in one case, a woman. Canaanite jewelry includes silver bracelets, or anklets, and gold pendants, one with a nude goddess in relief holding gazelles and another with a falcon grasping hooded cobras. A gold goblet is of uncertain origin. Assorted beads are of agate, gold, faience, glass, and Baltic amber. Other artifacts include two duck-shaped ivory cosmetic boxes with hinged-wing lids, copper caldrons and bowls, a trumpet carved from a hippopotamus tooth, and more tin vessels than had previously been found throughout the Bronze Age Near East and Aegean. A stone ceremonial mace is of a type otherwise known only in Rumania.



A Mycenaean kylix (two-handled cup).



A merchant's stone seal was first carved in Mesopotamia in the eighteenth century B.C. and later re-cut with new images in Assyria in the fourteenth century B.C.

Bronze weapons on board include arrowheads, spearheads, daggers, and Canaanite, Mycenaean, and probably Italian swords. Bronze tools include awls, drill bits, a saw, chisels, axes, and adzes. The largest collection of Bronze Age zoomorphic weights includes a sphinx, cows and bulls, lions, ducks, frogs, and a housefly, with one ornate weight bearing the figure of a cowherd kneeling before three of his calves.

Foodstuffs, whether as cargo or for shipboard use, include almonds, figs, olives, grapes (or raisins or wine), black cumin, sumac, coriander, and pomegranates, with a few grains of wheat and barley. Lead net sinkers, netting needles, fishhooks, and a bronze trident are evidence of fishing from the ship.

A tentative date of around 1316 BC for the ship's sinking has been obtained by tree-ring analysis of a log (perhaps cargo, perhaps firewood) that presumably had been freshly cut when the vessel last sailed. This matches the fourteenth-

century BC date of the Mycenaean pottery, and the date of a unique gold scarab of Egypt's Queen Nefertiti that could not have been put on board before her time in the middle of that century. The scarab was found near a jeweler's hoard of scrap gold (Canaanite medallions), silver (Canaanite bracelets), and electrum (an Egyptian ring); if it was part of this hoard, the suggestion is that the ship sank after the reign of Nefertiti, at a time when her scarab would have been worthless except for its gold value.

Ascertaining the nationality of the ship is problematic. Assyrian, Syrian and Kassite cylinder seals were recovered but do not necessarily mean that there were merchants on board from those lands because collections of seals were commonly sent as tribute or gifts from Near Eastern rulers to both Egyptian and Aegean rulers. Most of the cargo could have come from the Syro-Palestinian coast and Cyprus, but cargos do not identify the nationality of the ships that carried them either. Stronger evidence of nationality comes from the ship's 24



A faience cylinder seal with its impression in modern clay.



A bronze Canaanite figurine partly covered with gold.

stone anchors. They are of a type virtually unknown in the Aegean but often found in the sea off the coast of Israel. Also found reused as building blocks in temples and tombs in Ugarit, Byblos and Kition, this type of anchor seems to have been manufactured at Tell Abu Hawam and Tel Nami in Israel. An ivory-hinged boxwood diptych whose interior would have held wax writing surfaces (now missing) was found in a jar of whole pomegranates; parts of other diptychs appeared elsewhere on the site. Although of the type mentioned by Homer in his only reference to writing (*Iliad* 6.169), these diptychs are most likely of Near Eastern origin. A partly gold-clad bronze statuette of a female, perhaps the ship's protective deity, is Canaanite. On the other hand, the Mycenaean glass pendants, bronze pin, weapons and tools, merchants' seals, and eating ware (cups and a pitcher) suggest the presence of at least two Mycenaean on board.

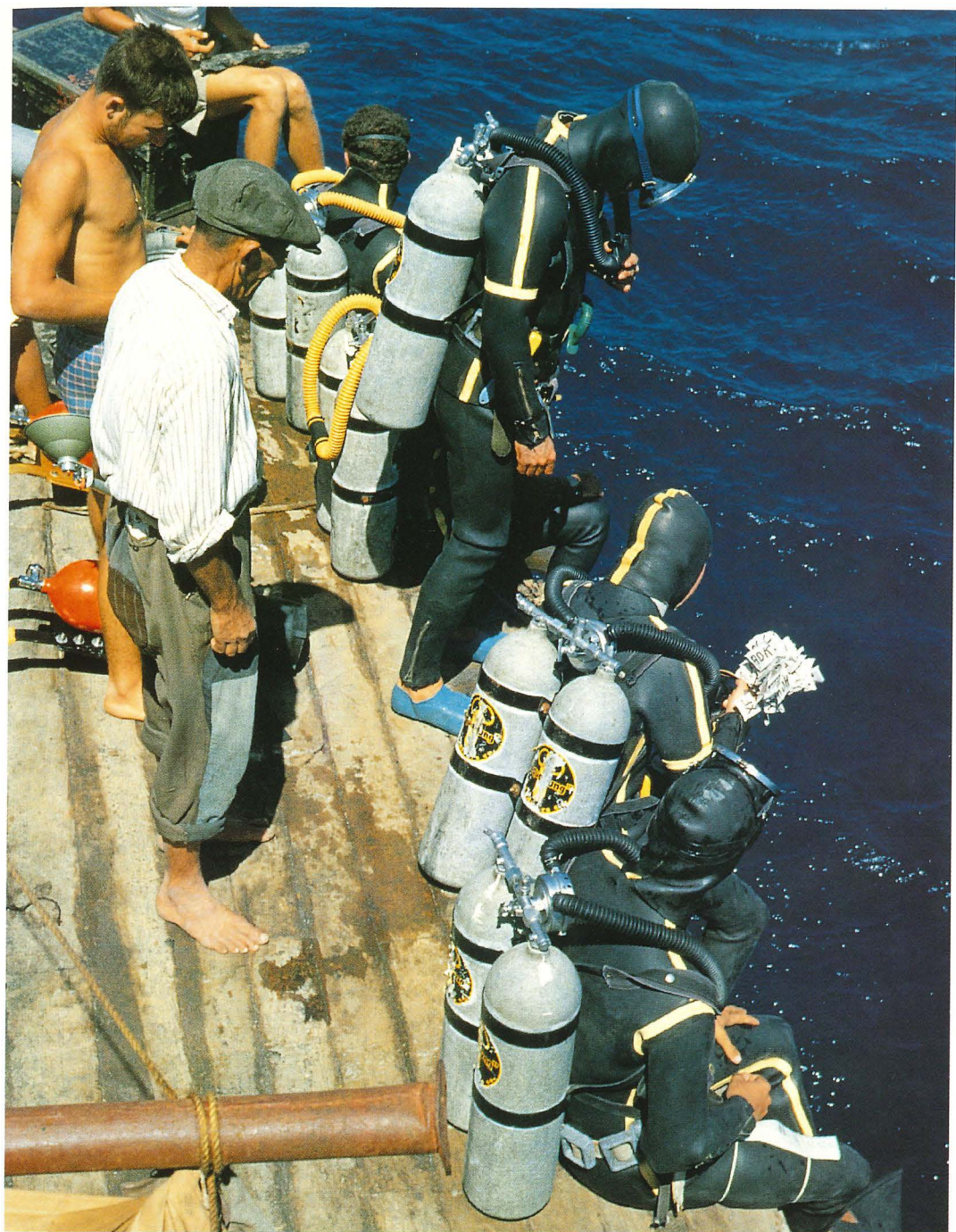
*Cemal Pulak and George F. Bass*



The "Oldest Book".

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Diving at Yassada in 1961.  
Robert B. Goodman, National Geographic Society.

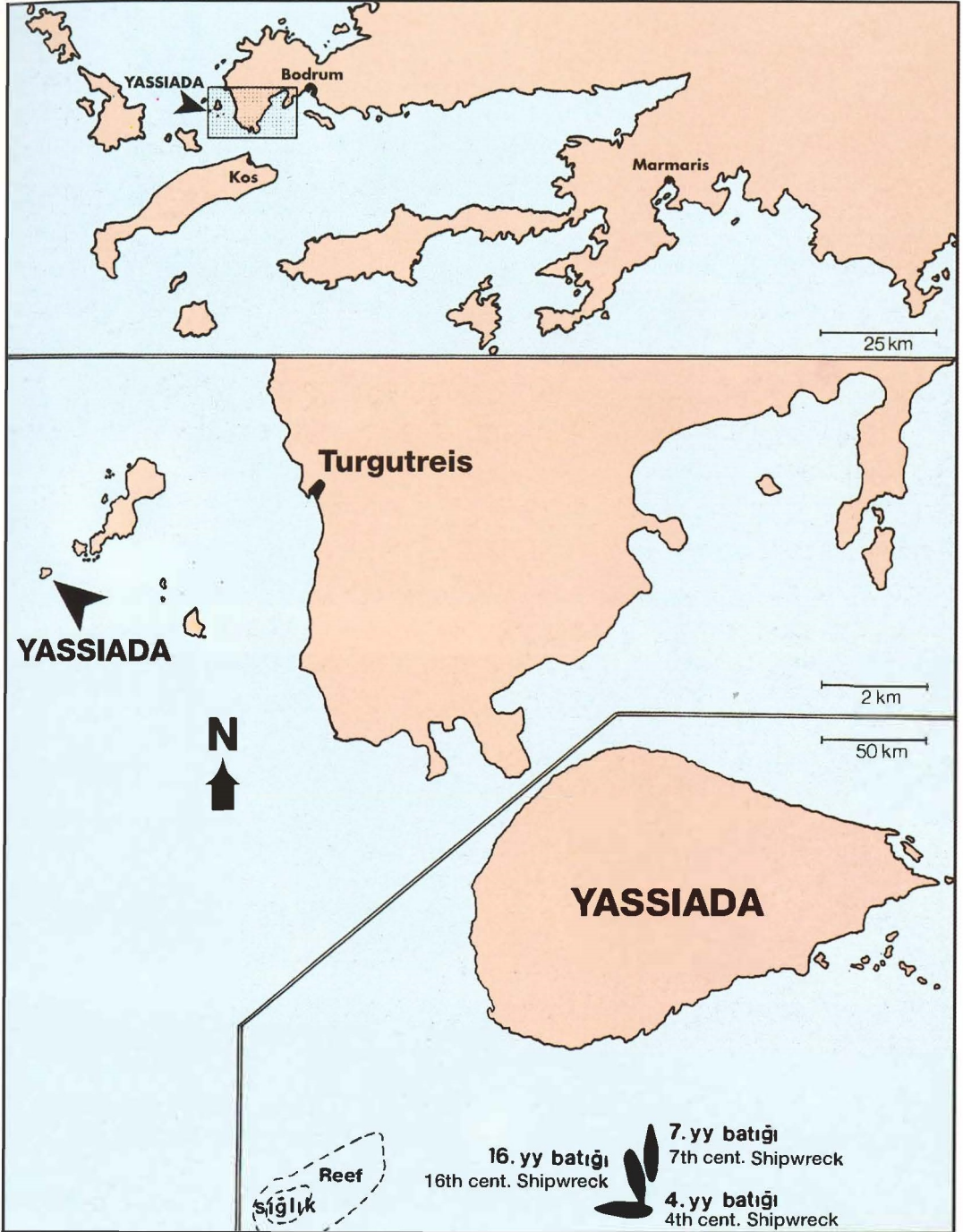


## VII YASSIADA

Yassıada (36° 59' 30" N, 27° 11' 45" E), Turkish for Flat Island, lies between Turgutreis and the Greek island of Pserimo; it is sometimes called Lodo. The island is small, only 200 by 150 meters, with a maximum elevation of 11 meters. A reef that extends 200 meters southwest from its southwest corner is especially treacherous, for it rises to within two to three meters of the surface about 125 meters off shore. An unknown number of ships have run onto this reef and sunk, including a Lebanese freighter in 1993; cannonballs are mixed with amphoras on the reef top, with more coherent cargoes of Roman-period amphoras and plates lying deeper on its sloping sides. Bodrum sponge divers reported raising a ton of glass cullet from the northwest side of the reef in the 1950s, but other than a scatter of glass on that slope, there are no clues to its



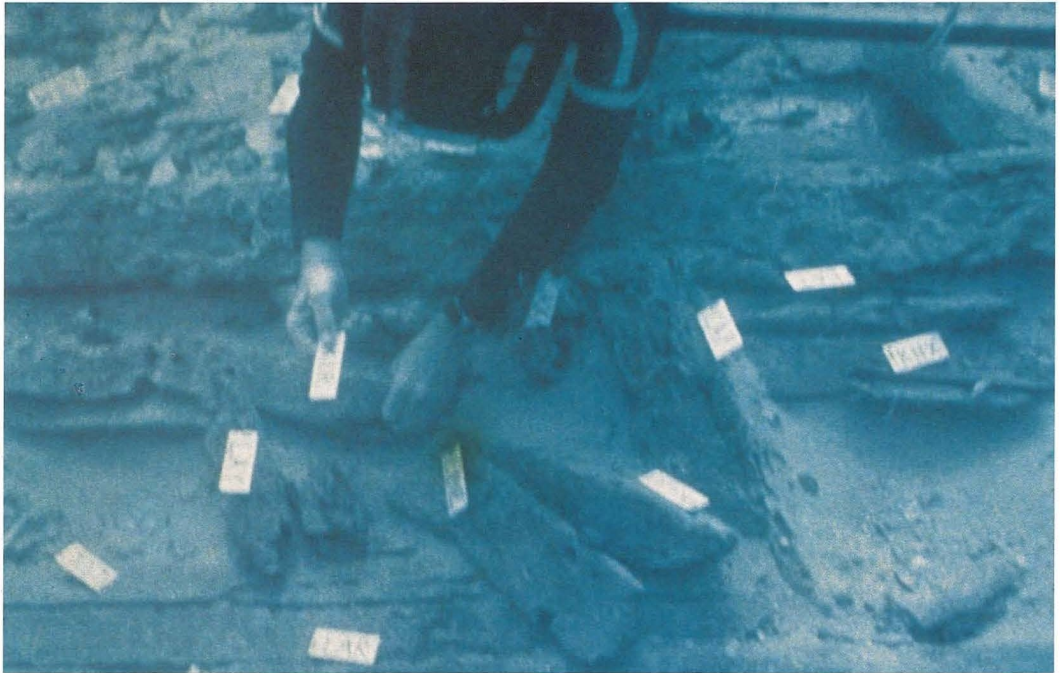
Yassıada (Flat Island).



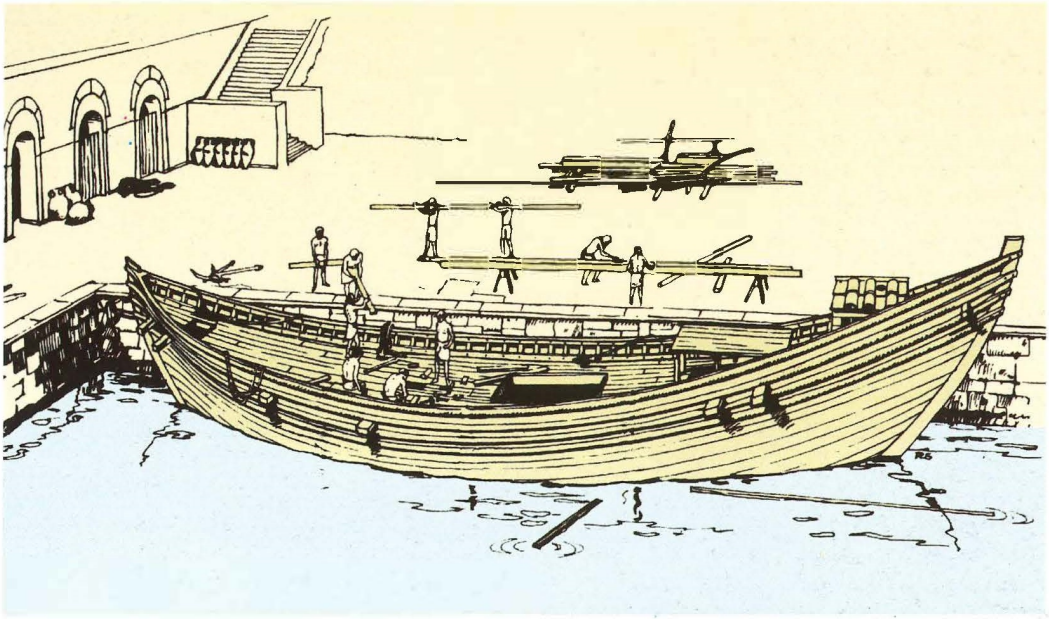
The location of the fourth-, seventh-, and sixteenth-century wrecks found off the southwestern Aegean coast and Yassiada.



The diving barge used at Yassiada throughout the 1960s.



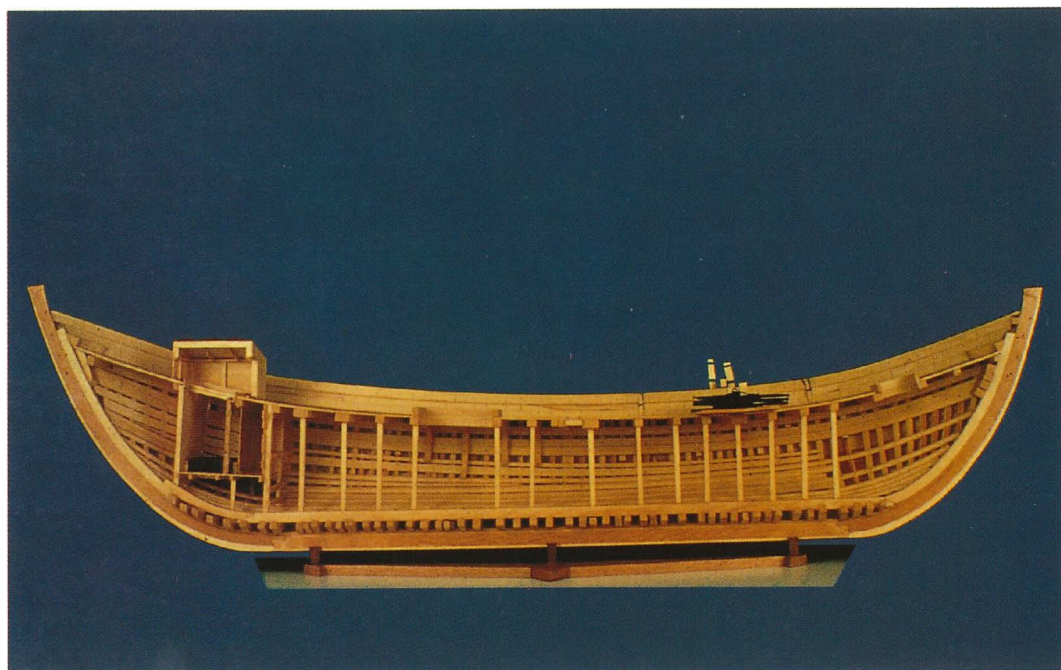
Putting identification labels on wooden hull remains of the Yassiada seventh-century wreck.



The seventh-century A.D. Byzantine ship.  
Richard Schlecht.



Byzantine gold coins from the seventh-century A.D.  
Yassiada wreck.



A tenth-scale replica of the Yassiada seventh-century wreck.  
Bobbe Baker

whereabouts.

At least three ships ripped their bottoms open on the reef, presumably while sailing before the northwest summer wind, and crossed over it to sink close to one another in deeper water off the island's south side. Reports of two of these wrecks by Bodrum sponge diver Kemal Aras to Peter Throckmorton led me to excavate one of them for the University Museum of the University of Pennsylvania between 1961 and 1964. This wreck, of a seventh-century Byzantine ship lying at a depth of 32 to 39 meters approximately 75 meters south of the island, is dated to about AD 626 by fifty-four copper and sixteen gold coins found in it.

Of 60 tons burden, about 20.5 meters long with a beam of 5.2 meters, the ship was built in the ancient shell-first manner below the waterline, with its pine planks held together by loosely fitting and widely spaced mortise-and-tenon joints. Above the waterline, however, it was built in the modern frame-first

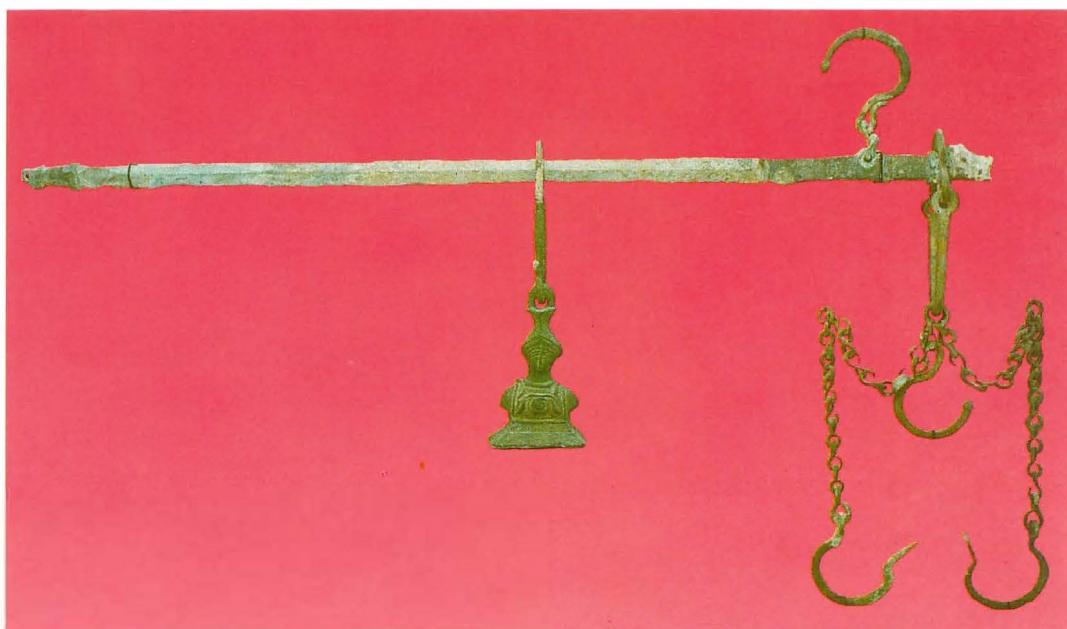


Raising Byzantine amphoras with the aid of an air-filled lifting balloon.



Seventh-century terra-cotta oil lamps.  
Robert B. Goodman, National Geographic Society.

manner, its planks nailed to the ship's elm frames (ribs) with iron nails. This provided the first evidence that modern ship construction evolved, and was not an overnight invention. The keel, sternpost and probably the stem were of cypress. A pair of iron bower anchors rested on either side of the bow, ready for use, with an additional seven iron anchors stacked just forward of the mast. The ship probably carried a single sail and seems to have been steered by sweeps that extended between through-beam extensions on either quarter of the hull. It carried in its hold a cargo of about 1,000 wine amphoras in two basic shapes, globular and hourglass; they lack the knobs on their bottoms that had proved helpful in earlier times for pouring. The disappearance of the knobs may have been the result of the invention of the "wine thief," a kind of pipette found on the wreck, which could draw liquid from a container without tipping it; the oldest known wine thief is from a wreck near Marzamemi, Sicily, from the sixth century.



The steelyard belonging to Captain George, Elder, from the Yassiada Byzantine ship.



The counterweight from Captain George's steelyard is a lead-filled bronze bust of Athena.  
Robert B. Goodman, National Geographic Society.



The ship's stern galley, separated from the hold by a bulkhead, was roofed with terra-cotta tiles, one with a smoke hole over a tiled firebox that supported an iron grill. Virtually all of the personal possessions of those on board were stored here. In addition to the table and cooking wares, which comprise the largest well-dated collection of seventh-century ceramics, including the earliest-known Byzantine glazed pottery, were 24 terra-cotta lamps and various copper vessels. The ship's captain, owner, or merchant -or, perhaps all three-was one Georgios Presbyteros Naukleros, whose name was inscribed on one of the ship's steelyards, the largest known from antiquity. It was he who must have carried a complete set of Byzantine weights, marked one pound, six ounces, three ounces, two ounces, and one ounce. The ship's carpenter stored his tools, the largest collection known from the seventh century, forward in the galley, whereas the boatswain's tools for gathering firewood and digging for water were in a separate storage area at the very stern, along with a grapnel for the ship's boat



The 1/1 scale reconstruction of the seventh-century A.D. Byzantine shipwreck.  
Oğuz Hamza



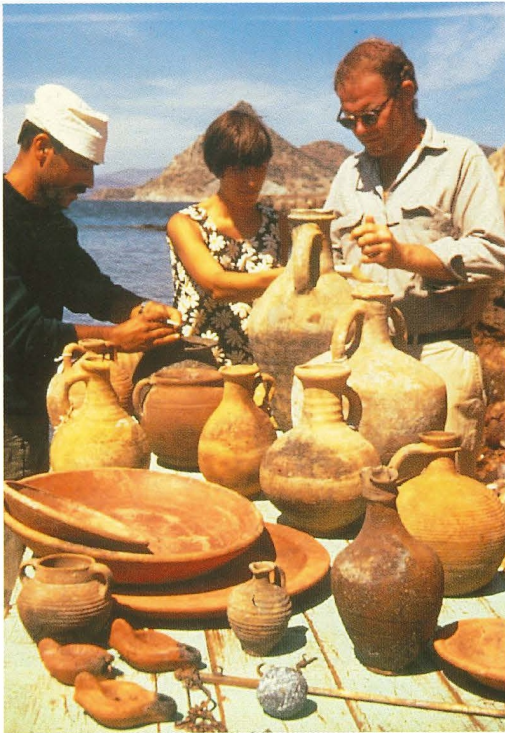
Late fourth- or early fifth-century A.D. amphoras on the Late Roman wreck at Yassiada.  
Mustafa Kapkın



Cleaning hull remains of the Late Roman wreck at Yassiada.  
Mustafa Kapkın



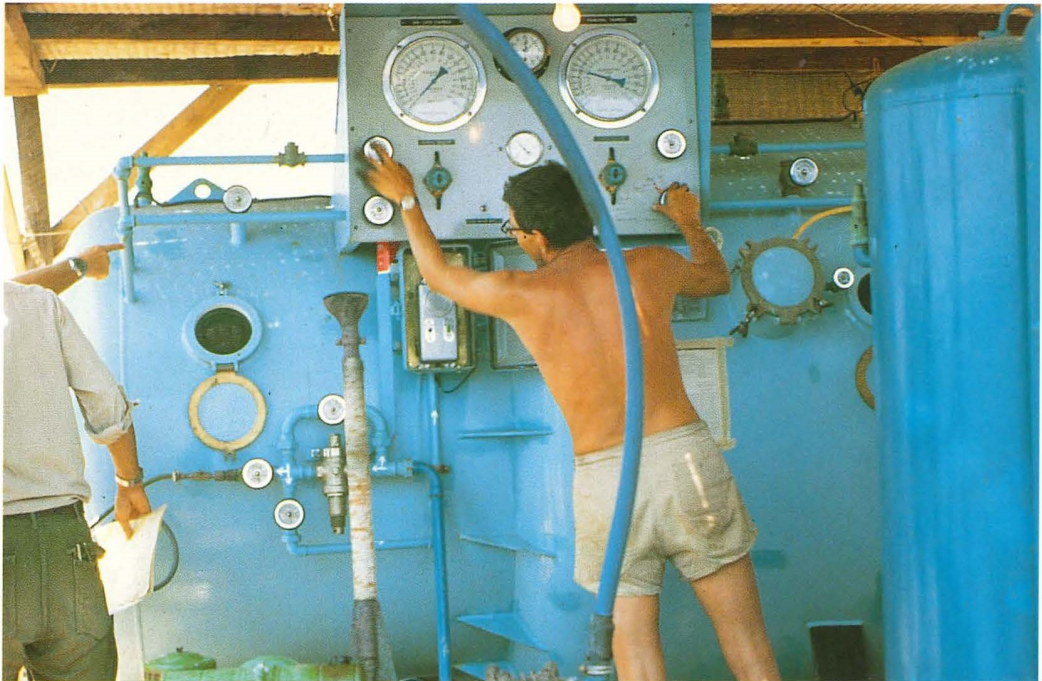
A horse decorates the top of a  
Late Roman oil lamp.  
Warren Riess



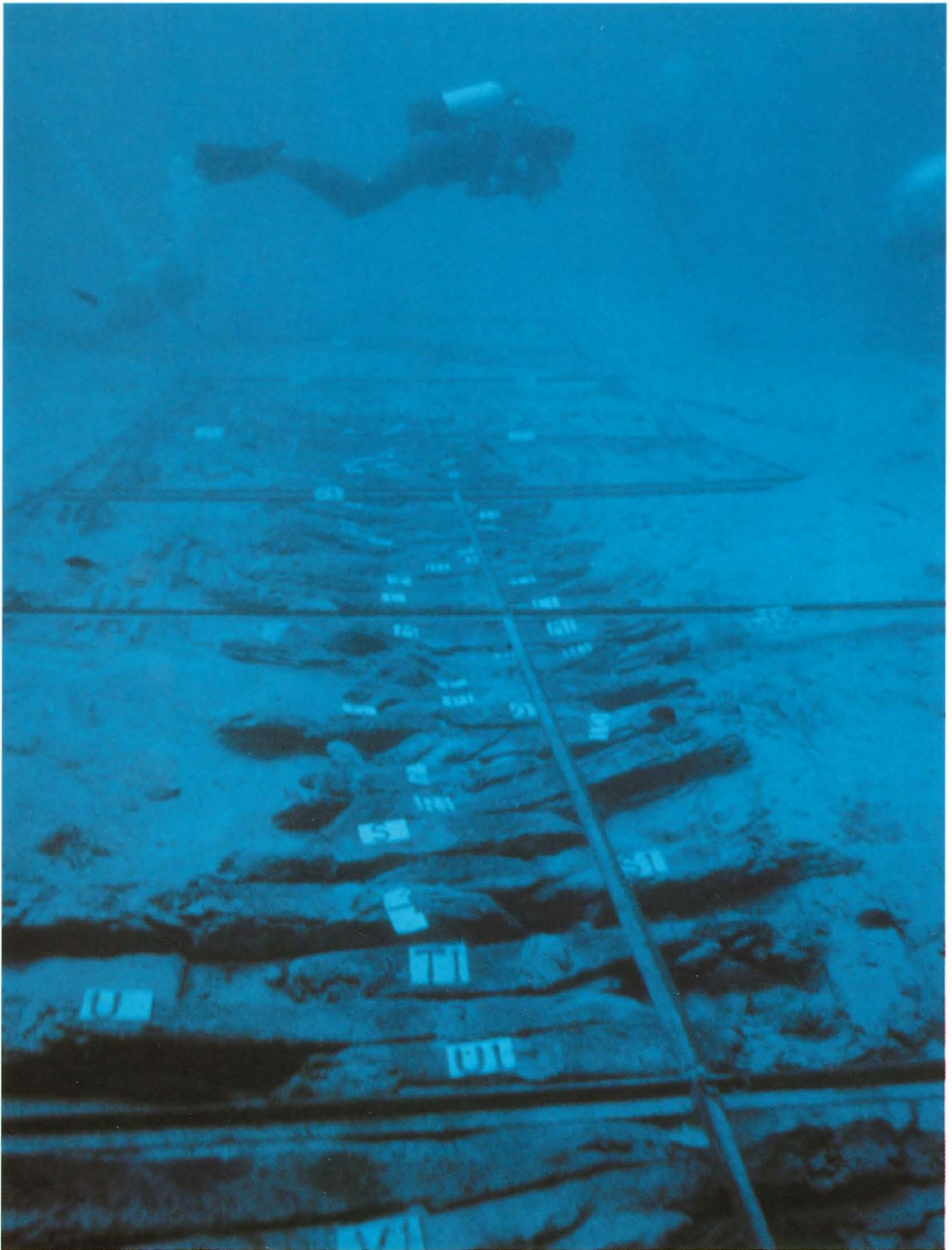
Tablewares from the Late Roman shipwreck  
at Yassiada.  
Mustafa Kapkin

and net needles for mending fishing nets; that the crew fished is also indicated by lead sinkers. The finds suggest that the ship was sailing southward from a port on the Black Sea, or somewhere in the vicinity of Constantinople, on her last voyage.

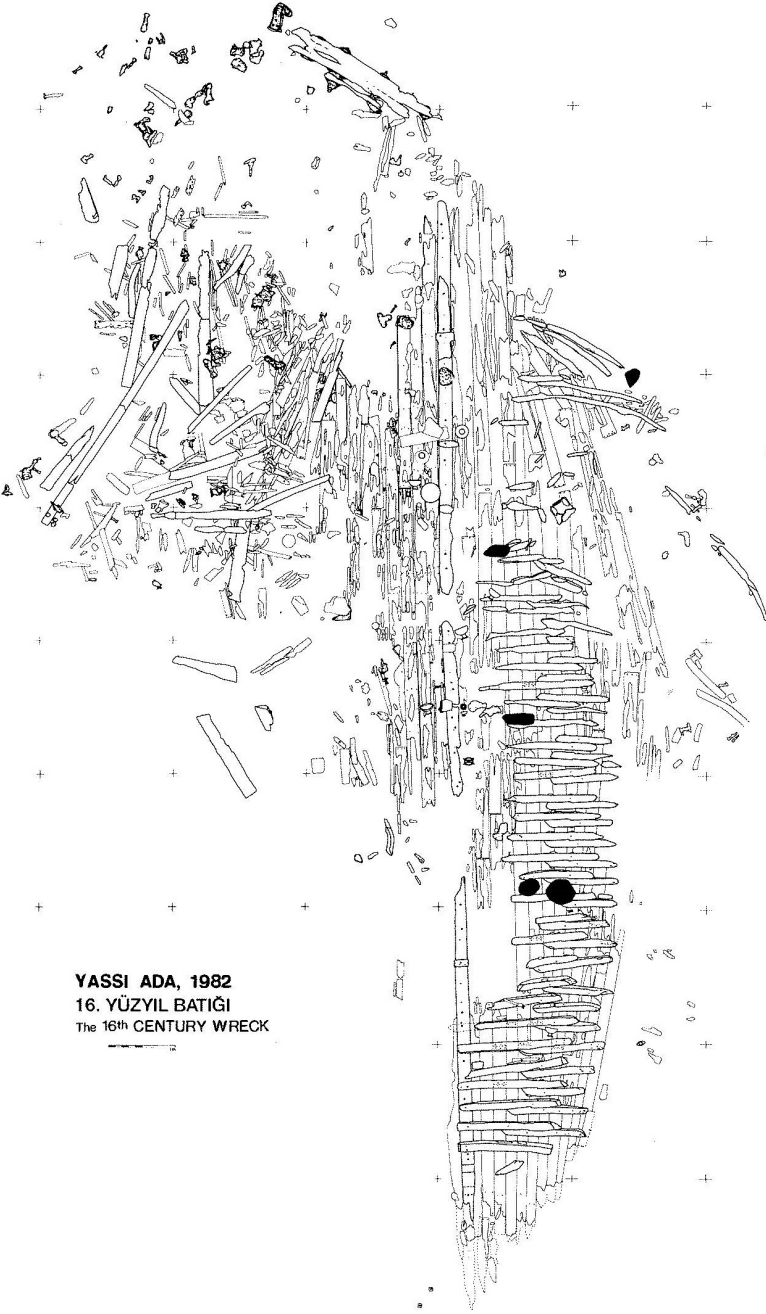
Lying slightly deeper (36 to 42 meters), about 100 meters south of Yassiada, is a Late Roman wreck of the late fourth or early fifth century. I partially excavated it under the auspices of the University Museum in 1967 and 1969; a later excavation campaign, in 1974 under the auspices of the Institute of Nautical Archaeology, was halted by the outbreak of hostilities on Cyprus. The ship was 19 meters long, with a length-to-beam ratio of 3:1. Its hull, mostly of cypress, but with a keel of white oak, was built in the shell-first Greco-Roman manner. Its pegged mortise-and-tenon joints were weaker and farther apart than those of most earlier vessels, however, although not so widely spaced as the unpegged joints of the later seventh-century ship (see above). These factors,



The recompression chamber on Yassiada is used to treat a diver with the bends. Ellen Herscher.



Hull remains of the sixteenth-century Ottoman wreck at Yassiada.



**YASSI ADA, 1982**  
**16. YÜZYIL BATIĞI**  
The 16<sup>th</sup> CENTURY WRECK

and evidence for the early erection of half frames amidships to help the shipwright shape the hull, provide further proof of a slow evolution toward modern, frame-first construction. We did not find the anchors for the ship, which carried around 1,100 amphoras in its hold. The stern yielded Late Roman plates, a dish, a bowl, pitchers, a cup, cooking pots, two large storage vessels, and four terra-cotta lamps. The shapes of the lamps, one with the initials of a known Athenian lamp maker who flourished at the time, provided the approximate date for the ship's sinking. Excavation deeper on the sloping sea bed would surely reveal other artifacts that tumbled down slope as the ship disintegrated.

During the excavation of the second wreck, a previously unknown Ottoman hull that overlay part of it and nearly reached the seventh-century wreck was partly uncovered. The Institute of Nautical Archaeology, by now affiliated with Texas A&M University, subsequently excavated it under the direction of Cemal Pulak in 1983. The ship was about 20 meters in length, built of oak. It was initially dated by a coin of Philip II to the 16th century. Its construction is now dated more precisely, by the dendrochronology of its keel, to sometime after 1572. It was almost barren of artifacts save for tools, glazed bowls like some from Çanakkale on the Asian side of the Dardanelles, lead shot, and both stone and cast-iron cannonballs, the last suggesting that this was a naval vessel, perhaps a supply ship, that was salvaged before being abandoned.

A Roman helmet of a type that is dated to the late third or second century BC, found close to shore on the same side of the island, is matched by a helmet in the Bodrum Museum of Underwater Archaeology. A sponge diver brought the museum's helmet from an unknown place, very likely Yassıada, which has been commonly worked by sponge divers. The two helmets suggest that a warship is hidden under the sand.



Raising a glazed Ottoman bowl at Yassiada.



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