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The Institute of Nautical Archaeology is a non-profit scientific and educational organization, incorporated in 1972. Since 1976, INA has been affiliated with Texas A&M University, where INA faculty teach in the Nautical Archaeology Program of the Department of Anthropology. The opinions expressed in *Quarterly* articles are those of the authors, and do not necessarily reflect the views of the Institute.

The World's Greatest Archaeologists

The November/December 1999 issue of *Scientific American Discovering Archaeology* featured the INA excavation at Uluburun as one of "The 10 Greatest Archaeological Discoveries of the Twentieth Century." This was the only underwater site among the ten, although the discovery of RMS *Titanic* rated an honorable mention. The nine greatest terrestrial discoveries were the Folsom Site in New Mexico; the decoding of the Mayan hieroglyphs; the cave paintings at Lascaux, France; the "Ice Man" found in a glacier near Bolzano, Italy; the Dead Sea Scrolls; Tutankhamun's tomb; ancient Ur in Lower Mesopotamia; the hominid remains in Oldavai Gorge, Tanzania; and the tomb of the first Chinese emperor Qin Shihuang.

The magazine describes each of the discoveries in a short article. Appropriately, George F. Bass wrote the report on Uluburun. Bass saw the promise of nautical archaeology in 1960 and developed the scientific techniques still used for underwater excavation. In 1984, he began the Uluburun excavation and directed the first two seasons. Dr. Cemal Pulak carried the work on to completion in 1994. A number of items on the ship date it to around 1300 BCE, and indicate that it came from the Near East. This went far towards rewriting the history of the period, since it demonstrated that Near Eastern merchants were a major factor in maritime commerce between the Eastern Mediterranean and the Aegean. The rich cargo of the Uluburun ship revealed the extent of Late Bronze Age trade networks. INA divers found items from as far away as Italy (a bronze sword), tropical Africa (logs), the Baltic (amber), and perhaps even Afghanistan (tin). Bass concludes, "Uluburun proved beyond doubt that properly excavated shipwrecks—with their unique insights, well-preserved artifacts, and the rarely seen

materials in their cargoes—have gone beyond promise and into the realm of spectacular reality."

Our cover honors the giants of archaeology named by the editors of *Scientific American Discovering Archaeology* as the most important pioneers of the last hundred years. At the top of the picture are Louis and Mary Leakey, the scholars whose work at Oldavai Gorge rewrote the story of human origins. Top right is Howard Carter, the discoverer of Tutankhamun's tomb, which excited the public like no other archaeological site. Below him is Dr. Bass in his "working clothes." At far right is Donald Johanson, who found "Lucy" (*Australopithecus afarensis*) in the Hadar region of Ethiopia. Leonard Wooley, at bottom right, excavated ancient Ur in southern Iraq. To his left is Mortimer Wheeler, who used his experience in the trenches of World War I to revolutionize archaeological excavation through his work at Roman and Indus Valley sites. Above him is Lewis Binford; his proclamation in 1962 of "The New Archaeology" sparked debates on the theoretical basis of the discipline that still continue. At top left is Flinders Petrie, excavator of el-Amarna and many other Egyptian and Palestinian sites. The picture in the top center is Willard Libby, whose development of radio-carbon dating was perhaps the most important technological advance in twentieth-century archaeology. At bottom center is Arthur Evans, whose epochal excavation at Knossos (begun in March 1900) launched a century of archaeological achievements.

INA is proud to rank among such legendary figures. In 2099, someone will undoubtedly compose a list of the greatest archaeological work of the twenty-first century. Thanks to the support of our members, we expect the Institute to be on that list also. ☞



Photo: INA

INA founder George Bass during the 1995 field season at the Bozburun, Turkey, excavation.

1999 Black Sea Trade Project

Cheryl Ward, Assistant Professor

During 1999, members of the Black Sea Trade Project spent nearly four weeks at sea near Sinop, Turkey, acquiring bathymetric and sonar data, truthing previously acquired sonar targets, and dredging along the suspected ancient shoreline (fig. 1). I led a four-member Institute of Nautical Archaeology team in cooperation with archaeologists, engineers, and students from the University of Pennsylvania, Massachusetts Institute of Technology (MIT), Wood's Hole Oceanographic Institute, and the Institute for Exploration (IFE). David Mindell (MIT) was principal investigator; Robert Ballard (IFE), Frederik Hiebert (University of Pennsylvania), and I were chief scientists.

The project extends four years of archaeological land surveys to the seabed. Since the shoreline of the Black Sea has undergone radical changes, team members sought not only ancient shipwrecks but also ancient settlements. A recent hypothesis builds upon a verifiable geological event, the sudden flooding of the Black Sea approximately 7,400 years ago. It suggests that the resultant dispersal of many different cultures formerly crowded along the coastline would account for flood myths in many religions. Perhaps the flooding of the Black Sea was "Noah's Flood." Although the premise of coastal crowding at the time of the flooding is unproven, the Black Sea Trade Project is interested in looking for the ancient coastline and the submerged remains of settlements along it—now more than 150 m below sea level and fifteen kilometers out to sea.

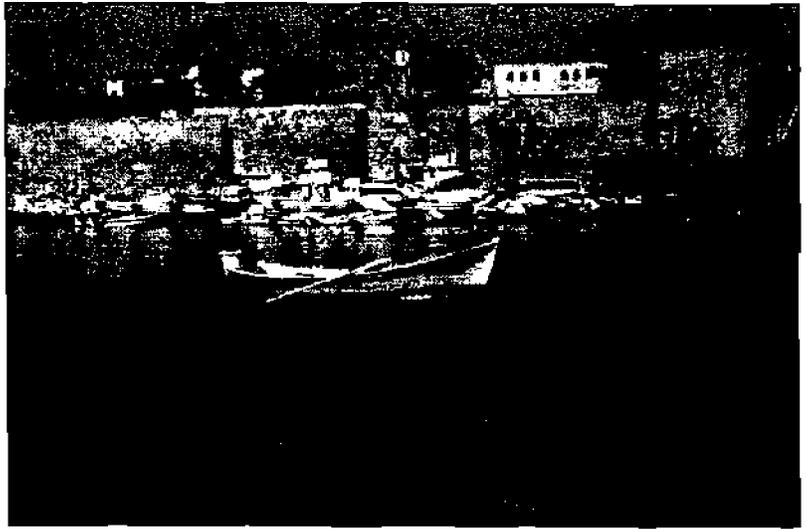


Photo: C. Ward

Fig. 1. For thousands of years, fishing boats, merchant vessels and ships of war sailed in and out of Sinop's harbor. Tucked at the base of Boz Tepe, the harbor today shelters primarily fishermen and pleasure craft. Steel ships are built beneath the medieval city walls.

The INA crew's role in the project was to analyze and interpret archaeological data and to become responsible for any ships that would warrant further investigation or excavation. In practice, this meant that Texas A&M University Nautical Archaeology Program (NAP) graduate students Ayşe Atauz, Kathryn Willis, and Erkut Arcaç worked closely with me, sonar specialists, and remotely operated vehicle (ROV) pilots to acquire, record, and analyze data (fig. 2). Side-scan sonar surveys by Marty Wilcox for Marine Sonics in 1998 had produced over two hundred targets, so our expectations for the 1999 season were high.

Three fishing boats and, briefly, the Turkish Institute of Nautical Archaeology's research vessel *Saros*, carried our crew of thirty, along with ten National Public Radio and National Geographic television and magazine staff. Two side-scan sonar crews and two ROVs, depth-finders, and a magnetometer on *Saros* made up our assets, along with navigational aids.

Our research design called for us to examine targets located in Sinop's harbor at depths of up to 65 m, learn to identify target signatures for particular types of archaeological or geological features, and move into deeper water (up to 200 m) with both sonar and ROV imaging systems. Support vessel size and wind-driven waves kept us closer to shore than was originally planned, so most activities took place within the large bay just beyond the port of Sinop.



Photo: C. Ward

Fig. 2. Students on the project came from MIT, the University of Pennsylvania, and Texas A&M University's Nautical Archaeology Program. Their contributions were invaluable, and ranged from navigation to data recording and analysis to communicating our needs to Turkish ship captains.

Sonar tracklines have been laid around the perimeter of Sinop's bay and crisscross it at regular intervals. The technology used included 150khz and 600khz "SeaScan" side-scan sonars provided by Marine Sonics Technology, Limited (Gloucester, Virginia), combined with differential GPS accurate to about three meters and Edge Tech dual frequency DF1000 100/500 khz sonars provided by American Underwater Search and Survey, Ltd. (Cataumet, MA). We reacquired and examined many of the 1998 sonar targets, but most of those features were geological or biological in nature, as were many of the 1999 sonar targets (both new and revisited areas). The two ROVs made video recordings of all sites visited, and these will be extremely helpful in learning to identify the signatures of different target types.

Archaeological finds included an eighteenth-century anchor, two isolated storage jars, and a nineteenth-century shipwreck with twisted metal machinery and metal cubes, probably for water storage. The roughness of the sea prevented us from going much beyond the protected harbor area (up to 85 m) with sonar equipment. One of our three ships was large enough to work farther at sea, and it carried the "geological team" headed by Robert Ballard. George Bass was aboard on the day we successfully identified the ancient coastline and dredged along it, recovering freshwater mussel shells and stones similar to water-smoothed beach pebbles (figs. 3 and 4).



Photo: C. Ward

Fig. 4. We had to separate rocks, shells, and sediment dredged up and dumped on deck from 178 meters (about 500 feet) below the surface. Identifying the shells tells us not only what animal lived in them, but the conditions in which it lived. Dating them gives us even more information about the ancient Black Sea environment at the time of its flooding.



Photo: C. Ward

Fig. 3. George Bass, INA's founder (right), and Robert Ballard, explorer of the deep sea, have been friends and colleagues for many years. Shown here the day we found the ancient coastline, the two continue to inspire us all to undertake the impossible.

The nineteenth-century shipwreck was extensively explored by the smaller ROV, which captured both still and video images. Sonar images provided invaluable keys to locating ourselves on the site, but the lack of digital GPS and direct positioning capability on a vessel only 19 m long created difficulties in running transects over the shipwreck. The site, in only 15 m of water, provided a vivid example

of some of the difficulties to be overcome in using ROVs to analyze archaeological finds. It seemed as if every time we would get positioned, a current or wind shift would move either the ROV or the vessel off site and we would have to start over again. In addition, the ROV can see only what is within a meter-wide swath directly in front of it, so we could not easily acquire the angles we wanted at times. Still, we learned a great deal without getting wet.

Early interpretations of the sonar data, combined with reports by local informants, prompted pre-examination expectations. Perhaps this was a steam-driven ship belonging to the Ottoman Navy in its conflict with Imperial Russian ships during the war of 1853. Local reports described the vessel as having been salvaged for metals in the post-World War II years, when explosives were used to destroy the hull. Twisted metal strips and the overall pattern of timber dispersal agree with that description. The lack of identifiable remnants of boilers or steam engine machinery in our preliminary evaluation of video imagery suggests that this was not a

steam ship, but it may be that still photographs or further analysis of video footage will change that. Certainly, a few dives would be the simplest way to gain more information about this site.

No dives or snorkeling took place in 1999. The intent of the Black Sea Trade Project is to seek and explore submerged archaeological sites remotely. I was not discouraged, however, from planning a separate and independently organized underwater survey in the area. The project's main focus now is moving into deeper water to explore the anoxic layer. The 2000 season includes the use of a deep-sea research vessel in concert with the sophisticated and instrument-laden ROV *Argus*.

The 1999 season was a success from several standpoints. NAP students received excellent reviews from other chief scientists and the principal investigator, and expedition leaders had the opportunity to work together to solve problems in a less stressful environment than a long-term, deep sea expedition. INA crew gained an understanding of the limitations and abilities of the remote vehicles, and an appreciation for issues that must be considered in planning deepwater work. We look forward



Photo: C. Ward

Fig. 5. Finds of amphoras and ancient anchors in Sinop's waters provide us with tantalizing proof of a vast trade network that linked the ancient city to the Crimean peninsula across the Black Sea. Thousands of years ago, Sinop's primary exports were olive oil and ceramics.

to returning in 2000 to continue the search for ancient trade routes, ships, and settlement sites (fig. 5). ☞

INA professor receives \$50,000 liberal arts award

Dr. Cheryl Ward (right), assistant professor in Texas A&M at Galveston's new Maritime Studies (MAST) program, has received an award for interdisciplinary achievement from the University of Louisville. Ward will receive a \$50,000 honorarium and be a scholar-in-residence this coming Spring in Louisville.

Ward was one of the first three recipients under a \$2 million grant to further liberal arts studies at the university. Each year, the Liberal Studies program will present awards to honor outstanding achievement in interdisciplinary scholarship, teaching, and service. Awards for 1999 also went to Simon Dinitz, emeritus professor at Ohio State University, and to Jan R. Carew, emeritus professor at Northwestern University.

Dr. Ward received degrees from Texas A&M University and



the University of London. An outstanding researcher in the fields of underwater archaeology, ancient ships, botany, and the history of technology, Cheryl Ward joined the Galveston faculty in 1998 to teach nautical archaeology in the campus' first liberal arts program. She formerly was director of the Institute of Nautical Archaeology's branch in Egypt, where she gained international attention for her exploration of the Sadana Island shipwreck and study of Red Sea trade.

In 2000, Dr. Ward is working as a principal investigator in the Black Sea Trade/Archaeology project led by Dr. Robert Ballard, discoverer of *Titanic*. Her reports have been published and she recently has been recognized by *National Geographic Magazine* and *U.S. News & World Report*. ☞

An Archaeological Trip to Bulgaria

Kroum N. Batchvarov, INA Research Associate

INA has recognized for many years the potential for nautical archaeology in the Black Sea. In 1992, INA representatives visited the countries bordering the sea (*INA Quarterly* 20.3, 12–16). Again in 1997, students from the Nautical Archaeology Program at Texas A&M University made the Crimea the focus of an expedition (*INA Quarterly* 24.4, 19–23). Another area of interest has been the Bulgarian coast. In 1999, a team again visited Bulgaria (fig. 1). Due to limitations on resources, it was impossible to carry out a full-scale survey with remote-sensing equipment. Instead, the team visited sites and potential sites that were already known to local archaeologists.

As a Bulgarian, I am naturally interested in the region and had potential contacts. Three associates offered to accompany me—Dr. Frederick Hocker of the Danish National Museum, Dr. John McManamon from Loyola University, Los Angeles, and Troy Nowak, an INA research associate and fellow student in the Nautical Archaeology Program. The participants covered their own expenses. We contacted the Varna Museum of Archaeology, the largest and possibly oldest archaeological museum in the Balkans. Dr. Ivan Ivanov, the Director of the Museum, organized the Bulgarian side of the expedition and was instrumental in its success.

Varna

The most famous of the sites that personnel from the Varna Museum have excavated is the Varna necropolis, where the oldest worked metal in the world has been found in the shape of complicated golden jewelry. The graves date to ca. 4800 BCE. The settlements to which the necropolis belonged are now beneath the shallow salt-water Varna Lake. Thirteen submerged settlements were found during an extension of the port facilities, and most fell victim to the dredging operation. Some of the settlements still survive, however, and the INA team had the opportunity to visit one.

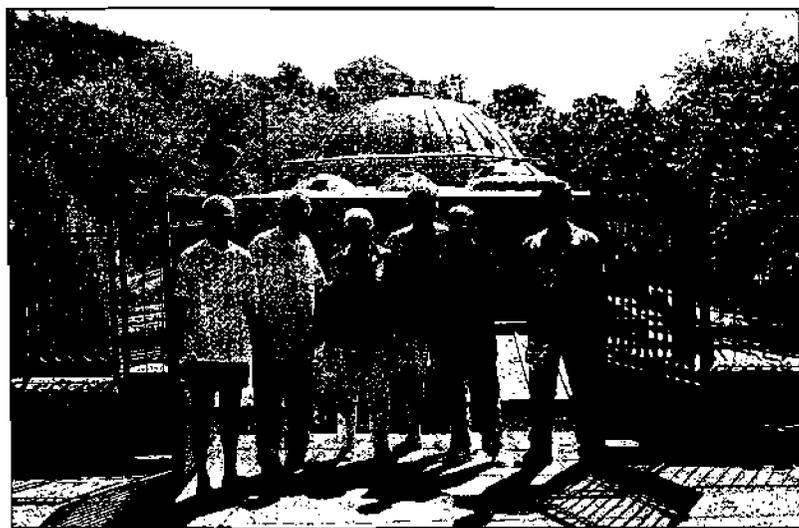


Photo: T. J. Nowak

Fig. 2. The team in front of the Kavarna Museum of Archaeology. From left to right: Dr. John McManamon, Mr. Assen Salkin, Dr. Mikhail Lazarov, Dr. Ivan Ivanov, Kroum Batchvarov, Dr. Frederick Hocker.



Drawing: K. Batchvarov

Fig. 1. Bulgaria and the sites visited by the team in June, 1999.

Despite poor visibility, it was clear that the settlement, barely 2.5 meters below the surface, is a treasure trove for archaeology. The bottom was covered with worked flint, long dagger blades, spear and arrow points, Early Bronze Age pottery sherds, and even the wooden corner posts of dwellings. These timbers date to the later period of occupation in the Early Bronze Age. Dr. Ivanov informed us that organic material retrieved from the site included bones and textiles. Not far away, a nearly intact dugout canoe was found in the early 1970s. Radiocarbon dating of the boat suggests a probable date in the thirteenth century BCE. The conserved vessel is presently on display in the Varna Museum.

Although the Museum has conducted methodical excavations of the site, lack of funding forced a temporary halt in 1992. Even so, much material removed from the site is presently undergoing study. There is a great potential for future work at Varna and the assistance of Dr. Ivanov would make it a valuable project for any interested scholar.

Kavarna to Kaliakra

After the investigation at Varna, the team undertook a trip toward the north under the guidance of Dr. Ivanov, accompanied by the doyen of Bulgarian underwater archaeology, Dr. Mikhail Lazarov. We began in Kavarna. The local Archaeological Museum was specially opened for the team by its Director, Mr. Assen Salkin, and we examined the rich collection there (fig. 2). It includes a large number of stone anchors, stone and lead stocks, and Greek, Roman, and Byzantine amphoras. We also saw part of a broken anchor, shaped like those from the Serçe Limani shipwreck. The Museum also displays a number of cannon from roughly the sixteenth to nineteenth centuries that were raised by fishermen and mine sweepers shortly after the Second World War.

Of special interest to Mr. Salkin is a site that was formerly on dry land, although a landslide has placed roughly half of it underwater. It is an impressive sight—the dry land part, known as the Chirakman, is perched on top of a rock that overlooks the sea. The broken medieval anchor was found in the waters of the Chirakman. Although we did not dive there, we learned that the bottom is covered with pottery sherds and amphoras, the majority of which are from the fifth and sixth centuries CE. After seeing the bottom of the Varna Lake, I no longer consider these reports exaggerated. Numerous grain storage caves dating to the same period surround the harbor. The evidence suggests that Kavarna was an active port in late antiquity and early Byzantine times.

Farther north, the team visited Cape Shabla and Lighthouse Shabla. There have been confirmed reports of at least three post-medieval wrecks lying in no more than ten to fifteen meters of water, 150 meters off the beach. One wreck can possibly be dated by an 1834 coin to the first half of the nineteenth century. This site reportedly includes a steam engine, most of which is still in place, as well as the propeller. The sides of the ship, with beams and some deck planking, seem to survive above the turn of the bilge.

The other two Cape Shabla wrecks lie about five hundred meters further south. Cannon recovered from these sites suggest that these wrecks are either frigates or sloops of war from the second half of the eighteenth century. However, the guns may have formed part of the quarterdeck armament of a small ship of the line. This period was characterized by extensive wars between the Ottoman Empire and the emerging Russian Empire. Several encounters between the opposing fleets took place off this stretch of the coast and mostly ended in favor of the Russians. Local opinion holds that the shipwrecks were Russian. Few Russian warships of the Age of Sail have been archaeologically excavated, with the exception of the pink *Eustafii* and the thirty-two-gun frigate *Nicolay* from the Baltic fleet. That makes Cape Shabla a potentially important site.

Diving on the wrecks is normally easy but, as luck would have it, the waves were too high this day for safe diving. The dive master engaged by the Varna Museum has visited the sites before and reported extensive hull remains, often completely exposed with knees and beams still in place. In his estimate, the wrecks are about thirty to thirty-five meters long, or slightly more. An unspecified number of cannon are still in situ. Most of the salvaged cannon are presently in the Naval Museum in Varna, along with a large log windlass from Cape Shabla. The latter probably came from the steam wreck, as warships usually had a capstan. However, the older wrecks may have been merchant ships converted for naval use. There are records showing such vessels in Admiral Ochakov's fleet in this period.

About a kilometer south of the beach, at Lighthouse Shabla, the team inspected an ancient jetty, completely submerged at present and surmounted by a modern jetty. The open construction of the new jetty, fortunately, has not completely obscured the site. The little bay was used for breaking up ships in the 1960s and traces of this activity are still visible. Large quantities of ceramic sherds and other artifacts suggest that this was an important port from the Classical period to late antiquity. Especially numerous are sherds from the Roman period and lead anchor stocks. A few hundred meters offshore is a mound covered with Roman ceramics and marble mortars, probably from a shipwreck. Mr. Salkin and Dr. Lazarov believe that the Lighthouse Shabla site may be Carolliman. This was a famous harbor in antiquity mentioned by Strabo and Diodorus. Due to the waves, no diving was possible on the site.

The next stop was the Iailata archaeological preserve, perched on top of cliffs about ten to twenty meters above the present level of the sea. An impressive network of single and double chamber graves has been found there, closely paralleling the ones at Mycenae. The examples in Bulgaria may be the latest that we have of this type of tomb, as they date to the second to sixth centuries CE. The chamber graves are located on the northern extremity of a shallow bay that was much larger two thousand years ago. On the southern horn of the bay is a fortress built in the late Roman period, finally abandoned around the third quarter of the sixth century CE. More than half of it has slid into the sea and its stones are clearly visible from the shore. The bay contained a large number of lead anchor stocks, about fifty to one hundred meters out from shore. Many of these are presently in the Kavarna Museum, but even more remain on the bottom. Numerous sherds found in the sea point to the same date as the land survey.

Iailata is in sight of Cape Kaliakra, the next stop of the expedition. Extensive ruins of pre-Roman, Roman, and Medieval fortifications survive. The Cape forms one of the very few good natural harbors on this stretch of the coast,

which was extensively used through the centuries. In the fourteenth century CE, it was the capital of Despot Dobrotitza, a Bulgar ruler of Dobrudja. Extensive records in the Genoese archives show the harbors of Kaliakra and Kavarna as the bases of his gal'leys. Since the Genoese lost a large number of ships to Dobrotitza, they usually refer to him as a pirate.

In 1791, Cape Kaliakra supposedly witnessed the destruction of a superior Turkish fleet by the Russian Admiral Ochakov. Underwater surveys carried out in 1962 and 1963 failed to locate any material to support the Russian claim, but have found extensive evidence of the rich maritime history of the Cape. Large quantities of stone anchors, lead anchor stocks, and grapnel-type anchors have been discovered, along with extensive ceramic finds.

Sozopol and vicinity

The following day found the team in Sozopol, where Dr. Ivanov had arranged a meeting with the Director of the Center for Underwater Archaeology, Mrs. Christina Angelova (fig. 3). After a brief summary of the work carried out by the Center, Mrs. Angelova took the team to visit two of the most important sites on which they have worked.

The Bay of Kiten, known in antiquity as Urdoviza, contains at least three shipwrecks. Two divers from the Center accompanied the INA team and served as their guides. One of the wrecks was completely covered by sand, even though it had been clearly visible as late as April. The remains of two other ships were exposed and a rapid study was possible.

Both wrecks survive to just short of the turn of the bilge and are in approximately six meters of water in

Kiten's harbor. We could easily identify some of the ships' skeleton. One of the vessels had a timber cargo, part of which was still lying on top of the ceiling planking. The most impressive characteristic of these exposed wrecks is the excellent state of preservation of the wood. It is extremely hard and shows no trace of damage caused by wood-eating worms. Mr. Kalin Dimitrov, an archaeologist with the Center, showed Dr. Hocker and me a concreted gudgeon and the body of a wooden pump. We could trace the length of the pump for two meters from the point where it was buried in the sand. It is certain that more survives. The plunger, also made of wood and well preserved, was visible in the exhaust opening of the pump body.

In close proximity to the wrecks are the remains of another inundated settlement that dates to roughly the same period as the settlements in Varna Lake. A preliminary report has been published in English. Peter Kuniholm from Cornell University has also published a dendrochronological study of the corner posts of the houses. Dr. Kuniholm describes the longest and oldest uninterrupted oak ring sequence for the Aegean and Black Sea regions. The late cultural levels at Kiten that begin this sequence can be accurately dated within the Early Bronze Age. Unfortunately, lack of funding has also stopped the excavation of this exciting site.

A shipwreck that likely dates to the sixteenth century was uncovered in 1982 during the early stages of the work in the bay, before the time of Mrs. Angelova. The artifacts it contained were recovered, but the hull has never been recorded, as the expertise needed was not available. The wreck has been sandbagged and backfilled to ensure its survival. Although the site has not been revisited, we were shown the approximate location in about nine meters of water, close to the shore in the protected waters of the bay. According to visual material provided by a diver and photographer who worked on the site, the hull is in impressive condition. Amidships footwaling and ceiling planks are still in situ. We saw floors, futtocks, and exterior planking on the video footage of the excavation. Around what seems to be the bow, the planking is still standing to about 1-1.5 m above the turn of the bilge. A breast hook is also in situ.

The last site we visited was near the Ropotamo River, off the beach of one of the old Communist hunting preserves that have been practically undisturbed by the public. There are Neolithic, Copper Age, Early Bronze Age, Iron Age, Roman, Byzantine, Bulgar, and Ottoman ceramics lying together on the bottom. In addition, another Early Bronze Age inundated settlement has been located there. Obviously, an active port existed here for millennia. It is believed

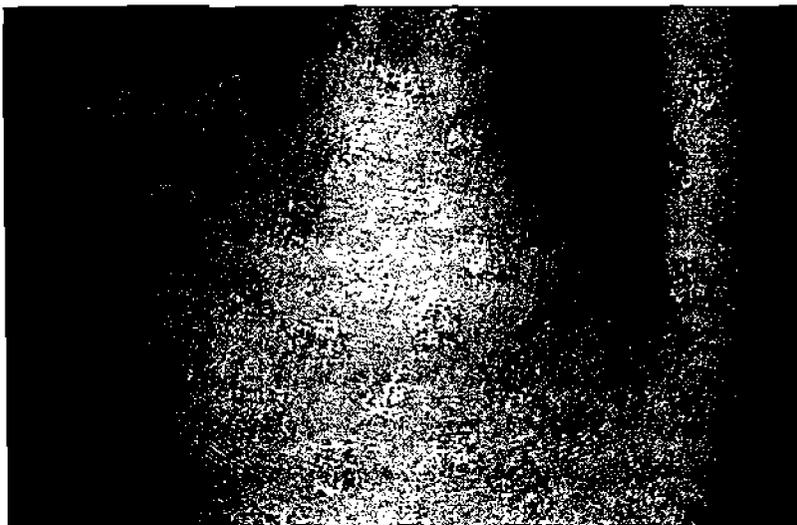


Photo: K. Batchavrov

Fig. 3. Graffiti on a thirteenth century CE amphora in the Sozopol Museum of Archaeology, showing a medieval ship with a square stern, a most unusual feature.

that a jetty lies below the surface, but this has not been positively located, so far, since the lack of funds has restricted study. Kalin Dimitrov found, and retrieved for further study and analysis, an amphora that Dr. Hocker believed a close match to those found at Bozburun. A jug found on the same dive may be Roman (fig. 4).

Mrs. Angelova showed us a reconstruction of the ancient coastline, based on the extensive work by Bulgarian archaeologists since 1960. The bathymetric measurements clearly show capes and bays that have long since sunk. The coast of Bulgaria still settles at approximately five millimeters annually. As work has so far been carried out on sites formerly on dry land, it is not surprising that relatively few wrecks were easily accessible for the team to visit. We expect that most are now at depths between twenty and forty meters. Fishing trawlers are constantly reporting amphoras, pottery, timber, anchors, and other artifacts caught in their nets. Unfortunately, lack of funding has prevented Bulgarian archaeologists from venturing farther offshore to search for shipwrecks. They have devoted their limited resources to the study of the inundated sites that are contemporary with the famous Varna necropolis. These sites reveal a highly developed culture that prospered even before the emergence of the Thracians, let alone the arrival of Greek colonists. The Varna sites most probably antedate the Egyptian pyramids.



Photo: K. Batchvarov

Fig. 4. An amphora, an amphora sherd, and a jug from Ropotamo. The whole amphora is a close parallel to some of the Bozburun examples.

The group returned to Varna, where Dr. Hocker and Dr. McMannamon departed. Troy Nowak and I remained to study the collection of the Varna Museum for a few more days (fig. 5). Besides the treasures from the necropolis, among the rich possessions are also examples of the jeweler's art from the second half of the fourteenth century CE. Dr. Ivanov provided us with the opportunity not only to study anything in the museum but also to photograph everything we found of interest. The staff disassembled the armored cases in which they keep the most valuable finds to allow us to photograph some of the more interesting items. We can hardly express our gratitude to Dr. Ivanov and his staff.

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Prospects for future work

The material that our Bulgarian colleagues possess would be available to INA researchers for projects carried out in Bulgaria. The local scholars are most willing to cooperate. We have already identified promising regions for sonar, magnetometer, and sub-bottom profiler surveys through the preliminary study of Bulgarian measurements and old coastal line data.

The INA Archaeological Committee has approved a proposal to follow up this summer's project with the re-excavation and recording of the wreck in the Bay of Kiten. The extensive hull remains may tell us more about the maritime history of the Eastern Mediterranean and Black Sea. Dendrochronological analysis of the timbers should provide a more definite date or even suggest the origin of the ship. If it proves to be from the sixteenth century and was built within the limits of the Ottoman Empire (most probably Bulgaria itself), it will



Photo: K. Batchvarov

Fig. 5. A thirteenth century BCE dugout boat from Varna Lake. Presently in the Varna Museum. Courtesy of Dr. Ivanov.

provide new insights on previous INA research. Specifically, it may allow us to determine whether the Ottoman wreck from Yassiada was a captured Iberian vessel or an indigenous product of the Empire. This will give us a better knowledge of the dispersal of shipbuilding technology within the Mediterranean and Black Sea basin.

The project is to be a cooperative venture with the Center of Underwater Archaeology. Mrs. Angelova has agreed to help by loaning the equipment of the Center, ac-

commodations, and last—but certainly not least—the exceptional knowledge and experience that she and her talented team possess. The project is now in the fund-raising stages. If the campaign is successful, this will be the first shipwreck in the Black Sea excavated to modern archaeological standards, as well as the first INA project in the waters of this promising region. To the best of my knowledge, no other foreign archaeological institute has ever worked here, so INA will be breaking new ground and exploring new waters.

Acknowledgments. Our hosts, Dr. Ivanov and Mrs. Angelova, could not have been more helpful. They went far beyond the call of common courtesy due to colleagues. Without Dr. Ivanov's organizational abilities and dedication, the project could not have achieved as much as it did. Mrs. Angelova generously provided sleeping accommodations for the team and shared the exceptional database that she had accumulated. Her associates were good and patient guides. The staff of the Varna Museum of Archaeology again, as in 1992, went out of their way to assist with everything. To all of them goes my deepest gratitude.

I would like to thank Dr. Kevin Crisman for his support and encouragement for this project.

I will particularly take this opportunity to thank the excellent team that I had the honor to lead. Dr. Hocker has always been a deeply respected professor and a dear friend. The friendships of Dr. McManamon and Troy Nowak are very dear to me. Without the three of them, the project would have been impossible. I can only hope that the same group will be in Bulgaria again next summer. ☞

An Ancient Boat from the Sea of Galilee

In keeping with the maritime heritage theme of the World Stamp Exhibition—Australia 99, a souvenir sheet was issued recently showing the boat excavated by Dr. Shelley Wachsmann near Tiberias, Israel, in 1986. The subject of numerous articles and two books by Shelley Wachsmann, the vessel still draws much attention. William Charlton, Jr., constructed a model of the vessel with financial support from the Meadows Professorship of Biblical Archaeology. Dr. Jerome Hall, INA's Executive Director, is currently responsible for the final documentation of the first-century CE fishing boat. ☞



The souvenir stamp issued in honor of the World Stamp Exhibition—Australia 99.

The model of the "Sea of Galilee" boat built by Texas A&M nautical archaeology student William Charlton Jr., which is currently on display at the Yigal Allon Museum, Israel.

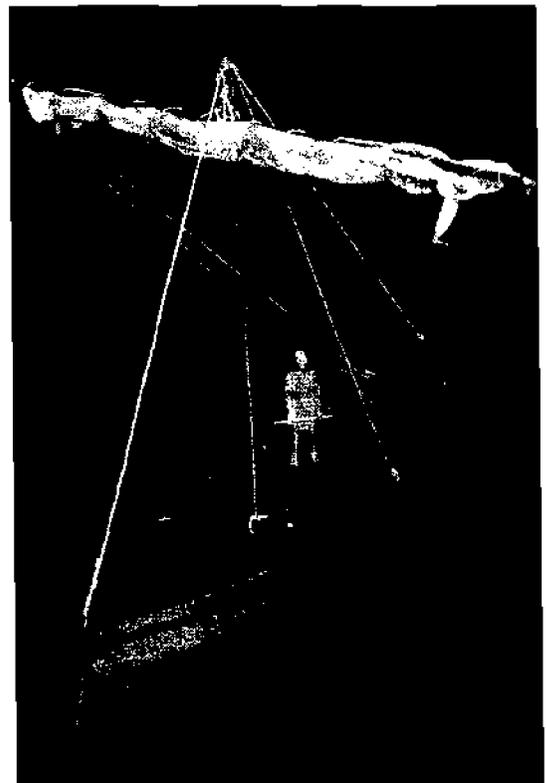


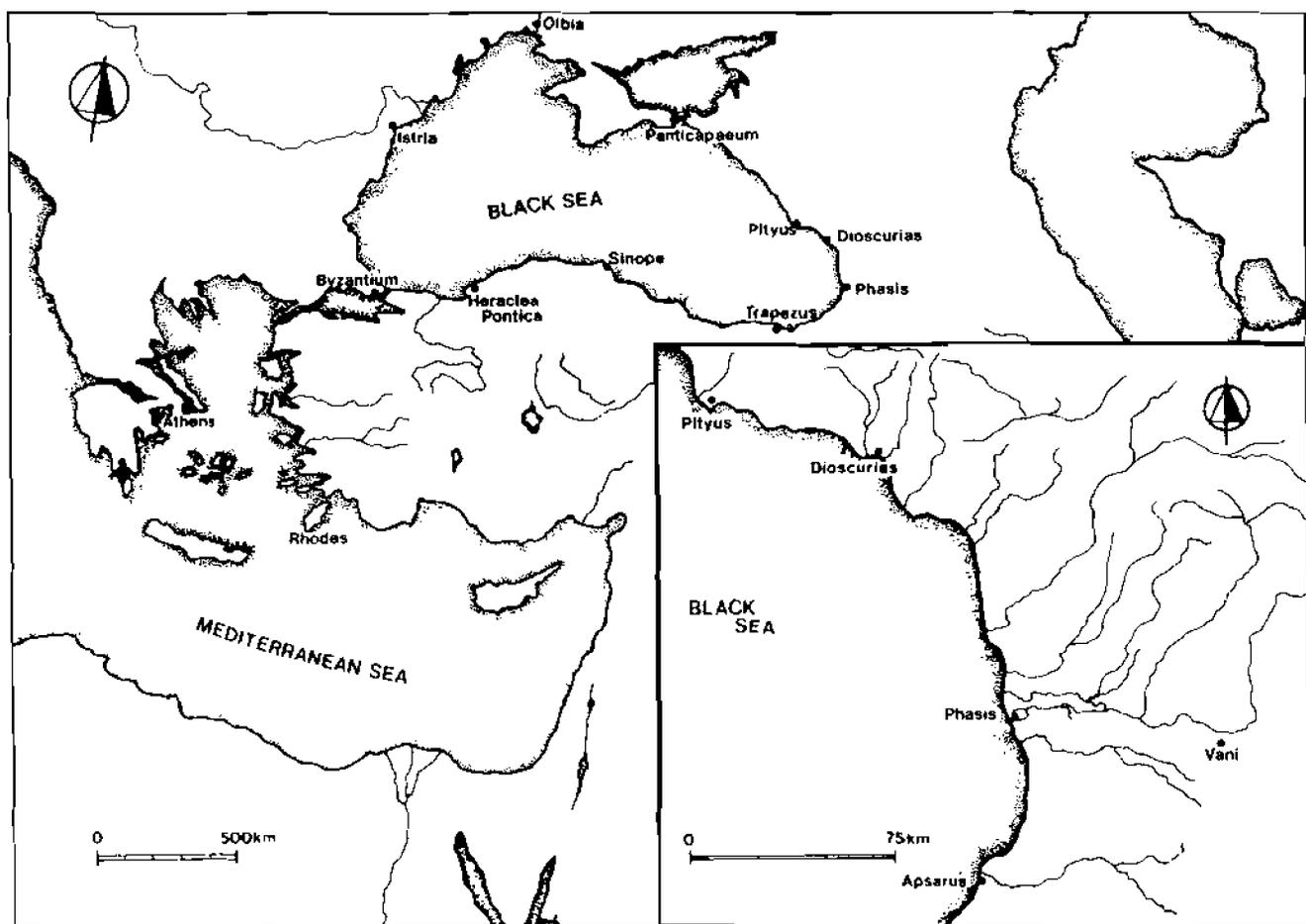
Photo: J. Lyle

In the Wake of the *Argo*: The 1999 Expedition to the Georgian Black Sea Coast

Dan Davis, INA Research Associate

The eastern end of the Black Sea has enticed nautical travelers since time immemorial (fig. 1). In antiquity, Greek tradition told of Jason and the Argonauts, who came to the remote region of Colchis to retrieve the Golden Fleece. As legendary as the tale may seem, historians and archaeologists generally agree that it may have been rooted in reality. During their expansion into the Black Sea during the eighth–fifth centuries BCE, Greek colonists followed in *Argo*'s fabled wake and established permanent cities around its shores. According to Aristotle, it was the citizens of the Aegean city Miletus who undertook the “farthest voyage” to Colchis. As early as the sixth century BCE, they established a sizeable trading center on the banks of the river Phasis (today known as the Rioni River)—the very river that the *Argo* sailed up to reach the fabled kingdom of Aëtes (fig. 2). That settlement, also named Phasis, became a popular destination for Greek, Roman, and Phoenician merchant ships.

Indeed, contemporary writers describe a city making its livelihood through seaborne trade well into the Late Roman and Byzantine periods. Ships from the Mediterranean arrived bearing their cargoes of wines, olives and olive oil, and finely made ceramics in exchange for metals, wood, Colchian wines, fine linens, and exotic, high-value goods. The latter commodity was especially important to Phasis's economic development, for the city lay along the northern arm of the Silk Road that linked Rome and Byzantium with China during the first few centuries of the first millennium. The demand for another product, pheasant, the city's namesake, also grew during the Roman period. Following their wars with Parthian kings in the first and second centuries CE, Rome's armies constructed forts at Phasis, near modern Poti, and to the south at Apsarus, near modern Batumi. Later, Byzantine, Genoese, Ottoman, and Turkish ships, merchants and war fleets both, frequented the eastern Black Sea.



Map: D. Davis

Fig. 1. Mediterranean and Black Seas, indicating sites mentioned in the text.

Given the level of nautical activity along the Georgian coastline, there is good reason to believe in the great potential of underwater archaeology. In February of 1999, the non-profit institute *Pipeline Archaeology for the Recovery of Knowledge* (PARK) and the *Center for Archaeological Studies* (CAS) of the Georgian Academy of Sciences invited the Institute of Nautical Archaeology to conduct an underwater survey near the modern port city of Poti on the Black Sea coast. For many years Georgian archaeologists have searched in vain here for ancient Phasis. According to ancient sources, the city had all the accouterments of a Greek city: a harbor, a marketplace, temples, a theater, and gymnasia. The Hippocratic text *Airs, Waters, and Places* (fifth century BCE) states that the Phasians "walk very little in the city and harbor, but sail up and down in *monoxyla* (craft made from a single log), for there are many canals." This accords well with the situation today, for the region's marshy environment has prevented widespread surface survey, and only recently have the remains of the Roman fort come to light.

The near absence of physical evidence led some to suspect that the city may have subsided into the sea. Indeed there is geological support for this view. About 6,000 years ago, the Black Sea finally slowed its steady rise, fixing the Georgian coastline some 50 kilometers west (seaward) of where it is today. Over the millennia, strong, longshore currents continuously ate away at the prehistoric coastline, steadily dumping their burden into the many deep canyons carved by several rivers, including the largest, the Rioni. The shoreline continues to recede today; in the last thirty years Georgia has surrendered more than 1,500 hectares to the sea. The modern port city of Poti essentially rests on a large sandbar separating the Black Sea from a boggy hinterland, much as the city of Phasis must have done 2,500 years ago. However, the inability to measure past rates of coastal erosion prevents us from extrapolating exactly how far offshore a 2,500 year-old city would lie. Besides, ancient Phasis may have been situated a distance upstream, away from the coast.

Recently, local fishermen began to report ancient paving stones and "walls" offshore in waters 10 to 15 meters deep. Dredge operators reported raising large amphoras to the surface during the construction of the offshore pipeline terminal at Supsa, just to the south of Poti. In Lake Palaeostomi, which is also near Poti, Georgian and Russian divers discovered ceramics dating as early as the fifth century BCE. It became clear that settlements and shipwrecks exist along this coast.

In April of 1999, two Nautical Archaeology Program students, Kristin Romey and Ayşe Atauz, traveled to Tbilisi, the country's capital, to introduce the Georgian archaeological community to the Institute's work in Turkey. After their warm reception, they visited several archaeological sites, then proceeded to Poti, where they made living arrangements for the expedition team that was to follow.

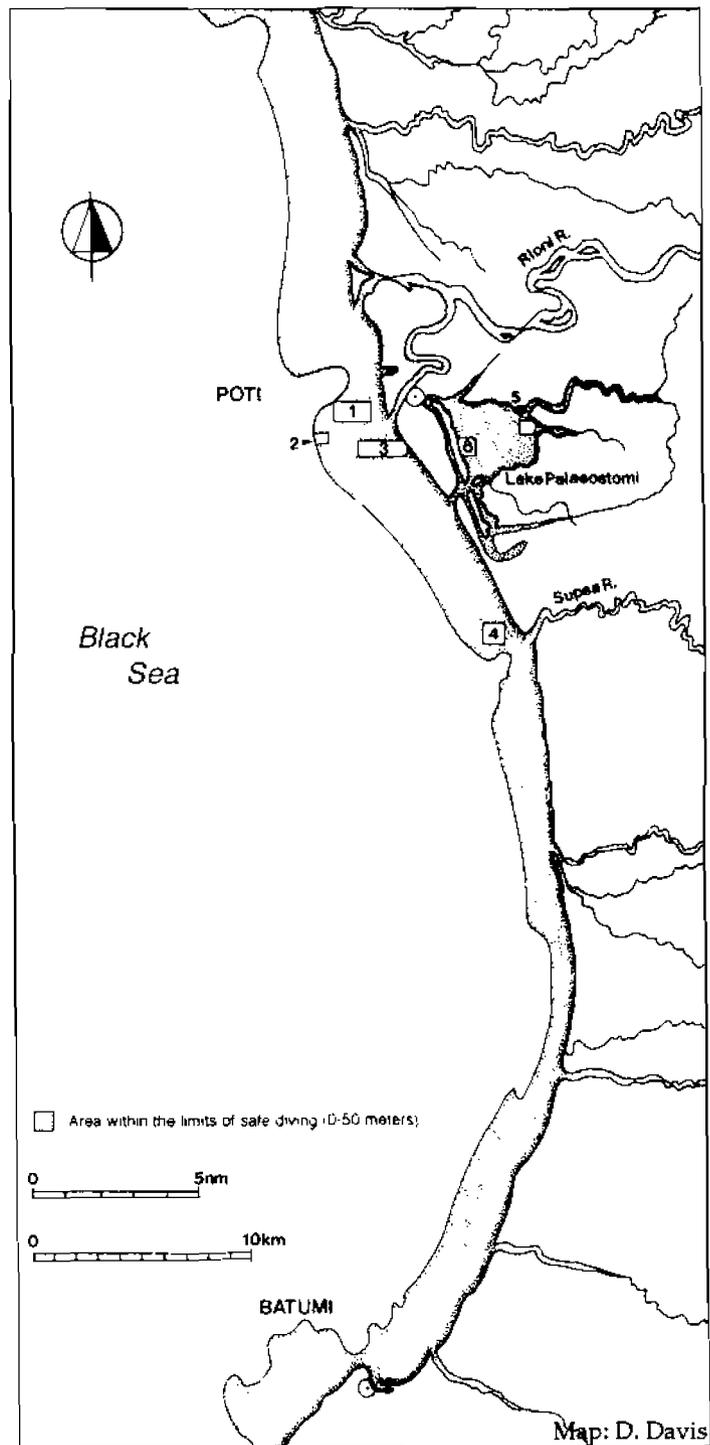


Fig. 2. The eastern shore of the Black Sea and the areas explored during the 1999 season.

By June we had assembled a team and were on our way to Georgia. Bjørn Lovén of Denmark and Charles Pochin of the U.K., both veterans of INA's excavation at Bozburun, eagerly joined us. Ayşe Atauz, however, had other commitments and could not participate in the actual survey.

After clearing customs at Tbilisi's airport with over 200 kilograms of dive gear, we joined up with Professor Licheili, Deputy Director of CAS, and Prince Haris von Sachsen-Altenburg, chairman of PARK. On the way to Poti, we made an overnight stop at the ancient site of Vani, located some 112 km from the Black Sea coast. Excavations here have revealed architectural and material remains that reflect heavy Greek influence during the fifth and fourth centuries BCE. The site's director, Professor Otar Lordkipanidze, who is also the director of CAS, toasted our team and held a dinner in our honor. Upon arriving at the coast the next day, we met with the authorities at the nearby Supsa Pipeline terminal to obtain permission to dive near their offshore buoy. In addition to the necessary permissions, they graciously extended to us the use of their state-of-the-art hyperbaric chamber aboard the seagoing tug *Tinatini*, as well as their nearby medical clinic. Their presence gave us the confidence to survey the deeper areas of the coastal shelf, visibility permitting.

We also interviewed several Poti fishermen working the large trawlers, for they have perhaps the best impression of the local sea bottom. They eagerly brought forward a number of barnacle-encrusted amphoras and amphora fragments, one of which was from third-century Sinope and bore the graffito "M." Indeed one fisherman took us to his house where he produced a large Colchian *pithos* dating to the early third century BCE (fig. 3). He and other fishermen, he said, often brought up ancient ceramic jars near the southernmost mouth of the Rioni in waters 50 to 70 meters deep.

As fig. 2 makes clear, Poti and its environs are part of the Rioni River delta. This wide, meandering stream courses westward from the Caucasus and slows to a crawl when it reaches the marshy Colchian plain. Just to the south of the river's mouth lies Poti, and south of there, separated from the Black Sea by a narrow tongue of land, lies Lake Palaeostomi. Its name is derived from ancient Greek, meaning "Old Mouth," clearly an indication that the waters of the River Phasis at one time drained first into the lake before reaching the sea. Today it is essentially a freshwater lake, connected to the Black Sea only by a very narrow channel at its southwest corner. We were later to

discover that the lake was likely a harbor, or perhaps a lagoon, more intimately connected with the Black Sea than today. Many of the ceramics that we found there, one meter below the lake's bottom, were heavily encrusted with barnacles, crustaceans that live only in saltwater.

The river's mouth has shifted through time. Thousands of years ago it was evidently located more to the south, corresponding to the modern harbor, for here the river cut a deep channel when the Black Sea's level was lower; the steep gradient of the sea bed here is evident from hydrographic charts (fig. 2). Only two kilometers offshore, the depths are thousands of meters. If any diving search was to be carried out here, it had to be done along the narrow stretch of bottom within diving depths (0-50 meters). This is where we began.

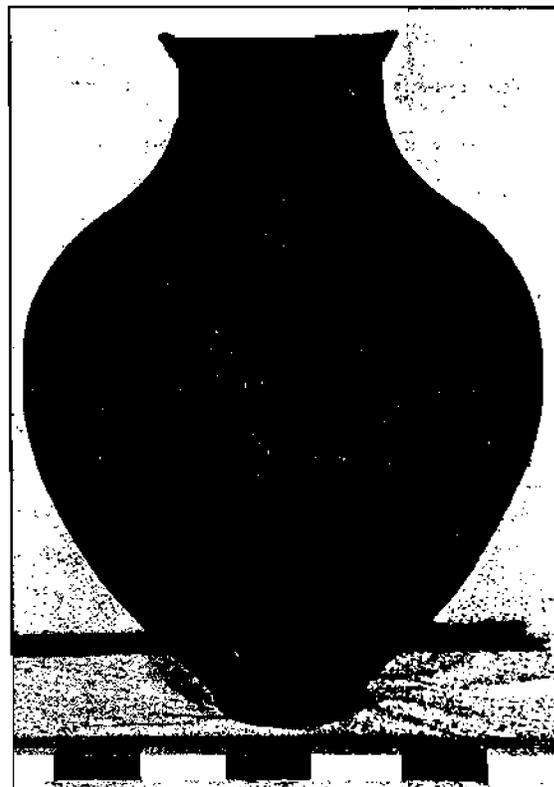


Photo: D. Davis

Fig. 3. Colchian *pithos* fished up from a depth of 50 meters off Poti.

Black Sea Reconnaissance

From June 13-20, aboard the 9 meter steel-hulled boat *Irena*, we dived at various locations along the coast. We began near the southernmost mouth of the Rioni, where fishermen had reported raising ancient ceramics. The Admiralty chart listed an anomaly nearby, a circular rise (see Area 1 in fig. 2) situated on the 20 meter curve and extending upwards to 9 meters below the surface. Its surrounding topography was interesting, for here was the edge of the ancient riverbed that dropped steeply to 300 meters before plummeting to the abyssal plain of the eastern Black Sea. We attempted to swim compass courses as we moved along the depth contours. Beginning in the deep areas at first, we swam along the 30-meter curve, then moved up slope at the end of each leg. The presence of a strong and erratic current, however, made us switch from compass dives to drift dives. Consequently, we were able to cover more area

on the bottom with less expenditure of energy. We used buddy-lines to maintain contact. In the end, the rise proved elusive. But from this series of dives we learned that visibility deteriorated quickly past 15 meters due to suspended particles and the resultant loss of sunlight—no surprise given the proximity of the river's mouth.

Area 2, farther offshore, also lay on the bank of the ancient river bed. A day-long search here for an obstruction turned up nothing but a flat, silty bottom. So we moved closer inshore to Area 3, where local fishermen indicated the presence

of ancient paving stones and possibly even submerged walls. In the end, despite covering several hectares of bottom, our searches turned up only deep trawl scars and lots of angry crabs.

With our hopes still high, we turned our attention to Area 4, ten kilometers south of Poti. The Georgia Pipeline Company (GPC) maintains an oil storage and pumping facility here, along with a buoyed terminal for oil tankers. During the burial of the pipeline beneath the seabed, dredge operators reported carving through a mound of amphoras lying along the intended route. After several dozen passes over the pipeline, it became clear to us that better search equipment was needed, with limited visibility being the single most frustrating factor. Although an excavation of a submerged land site, or even a shipwreck, under these conditions is certainly feasible, finding them with scuba equipment is not.

The "Old Mouth:" Lake Palaeostomi

Therefore, with limited luck offshore, we decided to spend the rest of our short stay exploring Lake Palaeostomi, where Dr. Gela Gamkrelidze of CAS had previously surveyed. Based on his early discovery of ancient ceramics around the margins of the lake, he suspected that we might find additional evidence of settlement, and perhaps even the city itself. With a large inflatable boat and motor on loan from the Georgian Coastguard, we explored the lake's perimeter and took several soundings. Accompanied by Dr. Gamkrelidze, we investigated the mouth of one small stream, the Pichora (Area 5). The shallows here had produced a number of ceramics, mostly medieval, scattered in the mud layer. However, the arrival of a herd of water buffalo unnerved us, and so we moved on to Area 6, an area lightly explored in the 1980s. In the shallows along the shoreline of Natechebi, a small island in the western part of the lake, we discovered

virtually thousands of artifacts: amphora sherds, pot sherds, broken glass from finely made vessels, roof tiles, and brick fragments. Here were the signs of settlement for which we were searching.

Realizing the significance of the find, we immediately set up a system of measurement and began digging a trench perpendicular to shore. The sheer volume of sherds, however, made us rethink our approach. Instead, we switched to digging test pits at three-meter intervals along each datum (201–204), which in turn were spaced approximately five meters apart (fig. 4). At the end of four days, working under the fierce sun one day and intense thundershowers the next, we registered over 1700 artifacts, including a fourth-century CE Roman coin. Some of the more diagnostic artifacts are described on page 17.

Preliminary analysis has shown that import wares comprise about thirteen percent of the total. Amphoras from Hellenistic Rhodes turn up in significant numbers, along with Sinopean and Crimean transport amphoras. The rest are of local (Colchian) manufacture in all shapes and sizes; amphoras and *pithoi* are the most common shapes.

Perhaps more significant, however, is the span of time represented by these artifacts. The earliest sherd, from a Greek import, dates to the fourth century BCE. The latest artifacts, on the other hand, date to the Byzantine (Early Medieval) period—the time when Phasis disappears from historical accounts. Could this be Phasis, or perhaps the outskirts of the ancient city? Georgian archaeologists believe so. Based on our findings and the survival and proximity of the second-century CE Roman fort north of Natechebi, we tentatively agree. If it is, however, what happened to the city and its seaport? Is it possible that the physical remains of the city—the walls, the municipal buildings, harbor works—lie submerged in a deeper part of the lake, or perhaps even offshore?

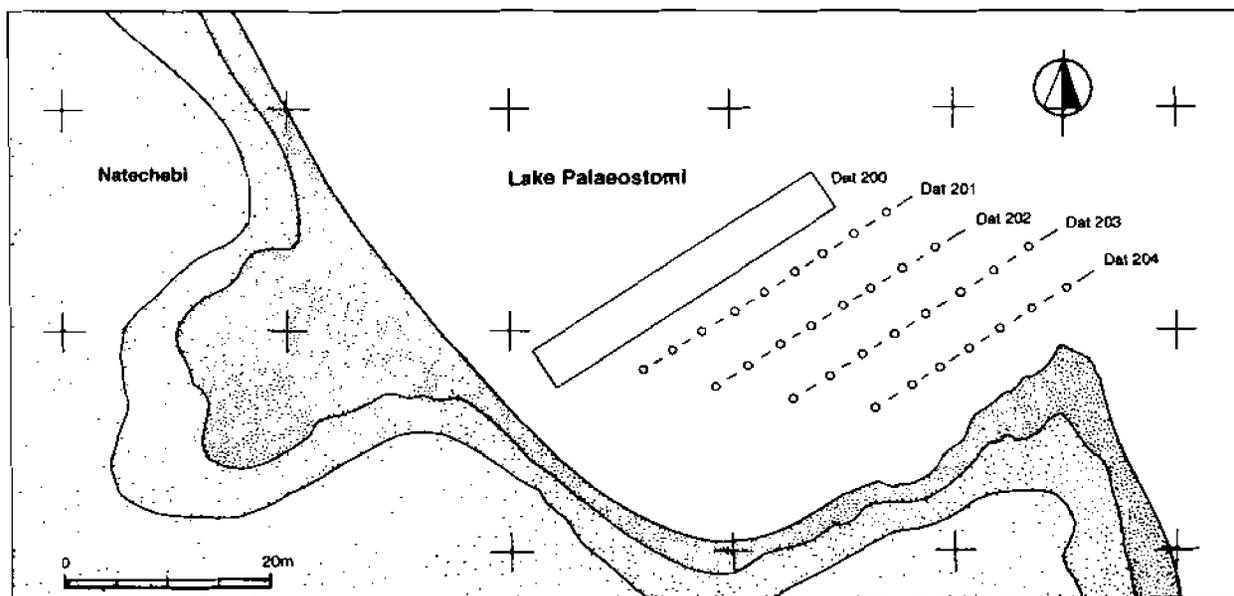


Fig. 4. The island of Natechebi (Area 6) on the western shore of Lake Palaeostomi.

Map: D. Davis

Where do we go from here?

The key to finding definitive proof of Phasis's location, we believe, lies in a comprehensive understanding of sea-level changes in the Black Sea in antiquity as well as the geological history of the wandering mouth of the Rioni. Once the path of the ancient riverbed is scientifically charted, and coastal-erosion processes are taken into account, a search of its ancient inland banks should reveal clues of the location of the Archaic and Classical city center. Given the poor visibility and silty bottom, a remote-sensing survey in the lake and offshore will reveal far more useful information than a limited diver survey.

More pertinent for INA would be the discovery of an ancient shipwreck along the Georgian coast. The excavation of a Bronze or Iron Age ship would, in the opinion of several Georgian archaeologists, help fill gaps not only in the region's history, but also in the history of the Black Sea. Unlike northern Europe or the Mediterranean, there is no known tradition of shipbuilding in this region, and yet there must have been. For we know that dugouts (*monoxyla*) were used specifically in Phasis. Tacitus, a first-century Roman historian who detailed events in the eastern Black Sea, describes another ship type, the *camarae*. These seagoing vessels had "narrow sides and broad bottoms" and were "constructed without any bronze or iron fixings.

Acknowledgments. I would like to thank the following people for their help in making the 1999 expedition possible: Dr. George F. Bass, for his trust, inspiration, and financial support. Professor Vakhtang Licheli for his vision, professionalism, and generous nature. Prince Hans von Sachsen-Altenburg of PARK, for his organizational and diplomatic abilities, as well as for his contribution of time and resources; without him, this project would not have been possible. Professor Otar Lordkipanidze of Georgia's Center for Archaeological Studies (CAS), for the tour of Vani and the festivities held there in our honor. Dr. Gela Gamkrelidze of CAS, for his enthusiasm and unfathomable knowledge of ancient ceramics. Irakli Chkonia, Senior Assistant to the Chairman of Parliament, for paving the way. Alexander Gvasalea, the museum director in Poti, whose affability and good humor gave us a good introduction to Georgian culture and tradition. The good citizens of Poti, who turned out to watch us work. The Georgian Pipeline Company (GPC) at Supsa, who graciously fulfilled our needs for a hyperbaric chamber and emergency oxygen. The Georgian Coast Guard, for loaning us boats and boat motors. Nancy Donnelly at National Geographic Television, for the underwater video camera. In addition to the above mentioned, I cannot find words enough to thank those Georgians involved in housing, feeding, and entertaining us during our brief stay. We are truly in your debt. ❧

Suggested Reading

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1991 *The Greeks in the Black Sea, from the Bronze Age to the Early Twentieth Century*. Athens.

Please visit our webpage at INA's Virtual Museum: <http://nautarch.tamu.edu>

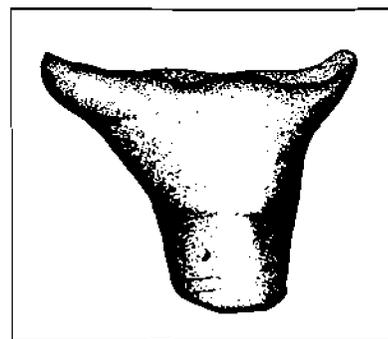
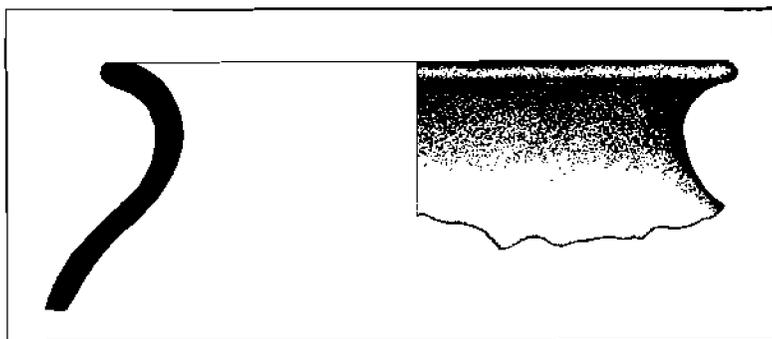
And when the sea swells, as the waves rise, so they build up the sides of the vessels with planks, until they are shut in as if under a roof" (Tac. *Hist.* 3.47). So far, owing to a lack of searching, these ships have escaped discovery.

With this in mind, we have begun plans for an expedition in summer 2001. Returning with remote-sensing and diving equipment, we will search the narrow shelf off Poti for shipwrecks and other cultural remains; then we will follow up by diving on the acquired targets. We also intend to survey along the coastline 50 kilometers south of Poti near the harbor town of Bahumi, ancient *Bathys Limen* or "Deep Harbor" (fig. 2). Aside from only a few references in Roman sources, we know only that this ancient harbor served nearby Ap-sarus (modern Gonio), where the Romans established a fort in the first or second century CE. This fort is currently under excavation by CAS archaeologists and may provide a conservation and storage area for submerged artifacts.

The Republic of Georgia holds great promise for nautical archaeology. With an energetic relationship already established with Georgian archaeologists, there is no better time than the present to begin a full-fledged search for wrecks and other historical evidence along these shores. We believe that this little-known and even lesser-understood corner of the ancient world is ripe for exploration and study.

Area 6

Lake Palaeostomi may hold the key to unlocking the location of Phasis. The lake has already produced a number of interesting discoveries, among them amphoras identical to those found on the Yassiada fourth-century shipwreck, as well as a Byzantine-era burial. In the shallows along the eastern shore of Natechebi Island we discovered a voluminous deposit of ancient material (fig. 4). In place of excavating the large site layer by layer, we chose instead to focus on a small cove where we dug several dozen pits at regular intervals into the silty bottom. This gave us a large sample size of artifacts while saving considerable time in the process. Each pit revealed some degree of stratigraphy, both geological and artifactual, despite only a few centimeters of visibility. A 10 cm layer of fine black sand rested atop a thicker, organic layer of soft clay with the consistency of peat; it averaged approximately 16 cm thick. The bottom layer, which continued deeper than our test pits, contained somewhat coarser sand. All three strata produced artifacts, with frequency falling off with depth; the very bottoms of our 60 cm pits rarely produced sherds. After collecting and registering over 1,700 sherds we conducted a preliminary analysis of the pottery assemblage. Several shapes are represented: of the closed shapes, amphoras made up a clear majority, followed by *pithoi* and *amphoriskoi* (small amphoras); open shapes in the form of bowls, cups, and plates are overwhelmingly of local manufacture (fig. 5). The ratio of local wares to import wares is approximately 8:1 (1,590/179), or 13%, statistics very similar to those found at the Archaic site of Eshera, up the coast from Poti. The foreign finds are mostly from Sinope and the Crimea, although a significant number of Hellenistic Rhodian (fig. 6) and late Roman amphora sherds were recorded (figs. 7 and 8). Indeed the earliest sherd discovered at this site is a foreign one, a fourth-century BCE black-glaze base fragment from Athens (fig. 9). It probably belonged to a *kylix*, a cup usually used for wine-drinking. Every century thereafter, between the fourth century BCE and the ninth century CE, is represented by both local and foreign ceramics. This uninterrupted span of time suggests that the site was either an emporium or sat very near to one. Historical Phasis appears to fulfill that description. ☞



Drawings: Bjørn Lovén

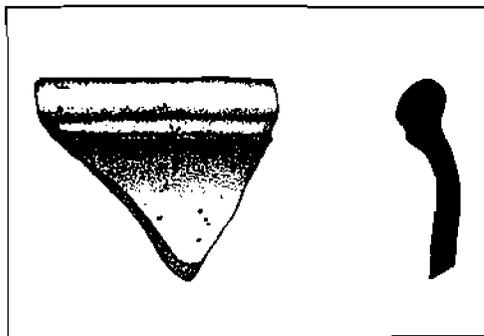
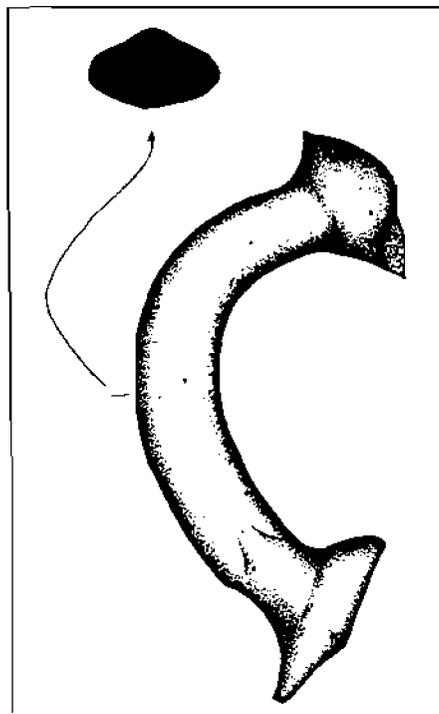


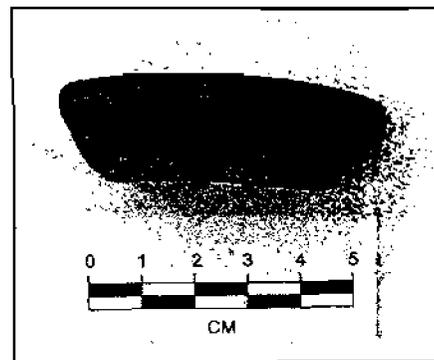
Fig. 5 (above left). Medieval Colchian cooking bowl found in Area 6.

Fig. 6 (above right). Toe of a Rhodian amphora, third/second century BCE.

Fig. 7 (above). Rim fragment from a Late Roman amphora.

Fig. 8 (left). Handle from a Late Roman amphora.

Fig. 9 (right). Base fragment of a fifth century BCE Attic black-glaze cup, probably a *kylix*. Photo: Dan Davis.



From Ganos to Serçe Limanı: Social and economic activities in the Propontis during Medieval Times illuminated by recent archaeological and historical discoveries

Nergis Günsenin, Associate Professor, University of Istanbul

In the summer of 1989, an archaeological team including the author discovered a major amphora production center at Gaziköy, on the Northwest shore of the Sea of Marmara, in the modern administrative district of Tekirdağ, Turkey. This confirmed museum research that revealed the existence of such production sites on the Anatolian coast during the Middle and Late Byzantine periods. The discovery at Gaziköy led to an ongoing project studying the medieval amphora workshops and shipwrecks in the region of the Propontis. This project has included three major elements: surveys of the Gaziköy area, the waters around the Marmara Islands, and the land area of the islands. The next phase will include the excavation of a Late Byzantine shipwreck and further investigation of the monastic economy in the Sea of Marmara region.

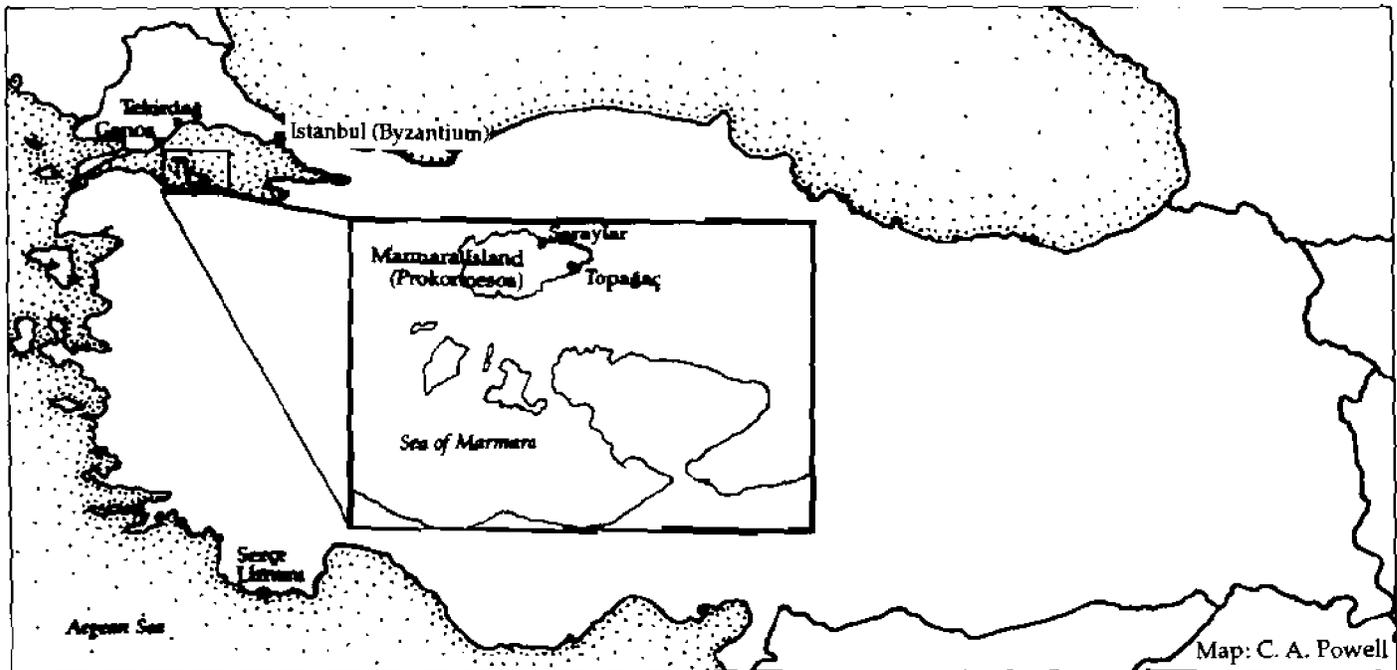


Fig. 1. The research area and the archaeological sites where the amphora samples were obtained for chemical analyses.

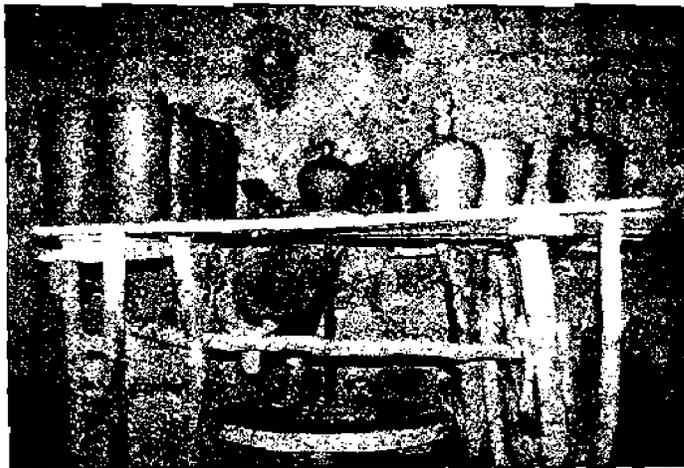


Photo: N. Günsenin

Fig. 2. The last potter of a "thousand years of tradition."

Preliminary Surveys

Gaziköy was known in ancient and medieval times as Ganos (fig. 1). Strabo describes it as a Greek colony established during the first century BCE. From the tenth century CE onward, it was a thriving monastic center. The mountains of this region were a major pilgrimage site, comparable with Bithynian Olympus and Athos. Therefore, the Ganos amphora factory was a small part of a major medieval monastic settlement. According to Ottoman sources, the region had a reputation for wine production. This suggests that amphora production was a component of an important monastic economic activity. Production continued well into the Ottoman period when wooden barrels became the typical transport container in the Mediterranean. Even today, wine production and ceramic manufacture continue in the area (fig. 2).

Several surveys of the Ganos region were conducted in 1991–1993. Albert Hesse and his assistant, Florence Tixier, used magnetic prospecting techniques to pinpoint kilns. This writer, together with colleagues from the Tekirdağ museum, carried out a rescue excavation of a kiln at Ganos. With the help of Pamela Armstrong of the Oxford Byzantine Ceramics Project, we investigated glazed pottery production in the region.

These studies have shown the existence of many amphora kilns stretching for several kilometers along the coast. High quality clay deposits provide a nearby source of material for ceramic production. When these production sites were in operation, the area formed a part of the monastic estates of Ganos. Clearly the monastery functioned as a vertically integrated economic unit producing both a bulk commodity and the containers necessary to transport it.

Amphoras of the type produced at Ganos (author's Type I) are found all over the Byzantine Empire (fig. 3). This suggests that Ganos was part of a large scale trading network. Produce, particularly wine, from the monastery may have been used to obtain supplies that the monks could not produce locally. The monasteries at Athos still function this way.

All this provided indirect evidence of trade centered on Ganos. To obtain direct evidence, it was necessary to conduct an underwater survey. The focus of research therefore shifted from the shoreline to the most likely routes between Ganos and Constantinople. The Marmara Islands (ancient Prokonnesos) have provided an obstacle to navigation for many centuries. During the 1993–94 and 1995 survey seasons, eleven Byzantine shipwrecks were identified (fig. 4). Seven of these

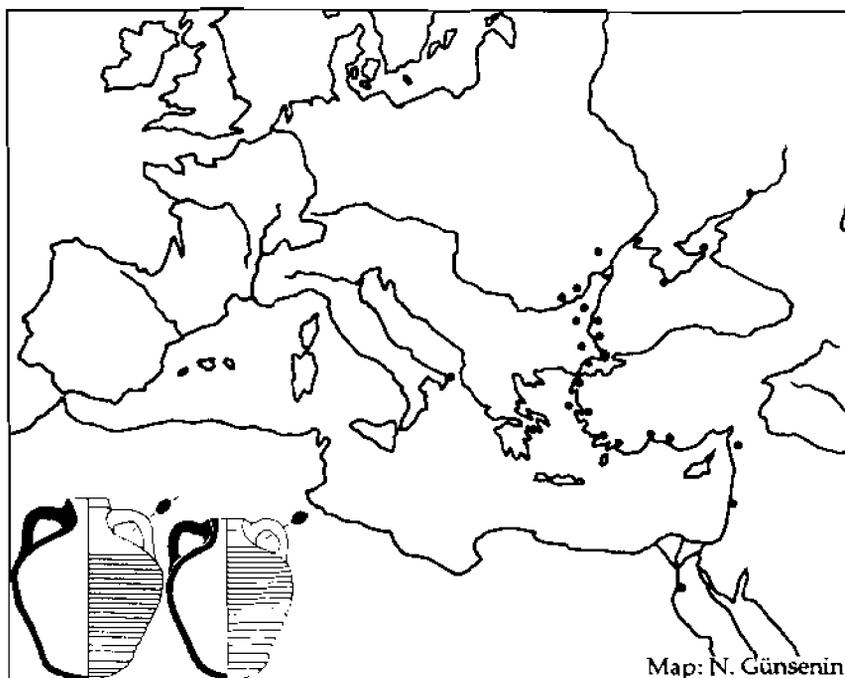


Fig. 3. The diffusion of Type I amphoras.

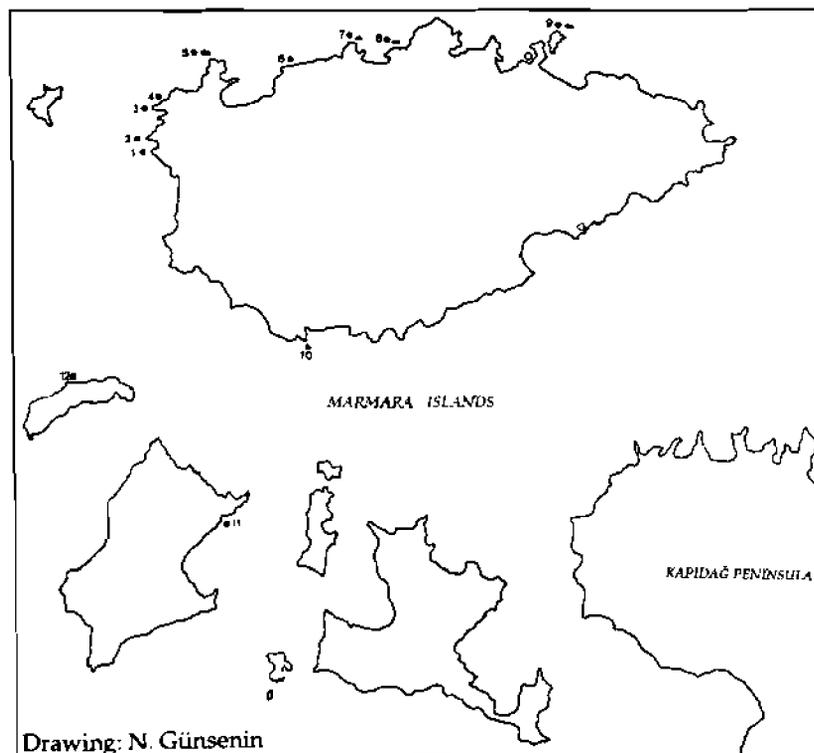


Fig. 4. Discoveries to date around the Marmara Islands.

1. Ocaklar Burnu wreck (11th century CE)
2. Çamaltı Burnu wreck (13th century CE)
3. Tekmezar I - Tekmezar II wrecks (11th century CE)
4. Kocayemişlik wreck (11th century CE)
5. Anataş adacık (11th century CE)
6. Kuyu Burnu tile wreck (7th century CE)
7. Küçük Ada water pipe wreck (7th century CE)
8. Taşada (Virankoy) wreck (11th century CE)
9. Eşek adaları wreck (11th century CE)
10. Çıhlı Burnu wreck (7th century CE)
11. Türkeli (Avşa) adası mound (3200–1100 BCE)
12. Ekinlik adası marble wreck (6th (?) century CE)

O Kiln areas



Photo: E. Omur



Photo: E. Erk'akan

Fig. 5 (left). *The tile wreck.*

Fig. 6 (above). *The water pipe wreck.*

carried Ganos type amphoras. Another was laden with a cargo of roof tiles (fig. 5), while another carried water pipes (fig. 6). A seventh-century wreck carried globular amphoras of a form familiar from the contemporary Yassiada wreck. Finally, one carried amphoras of the last form used in maritime commerce. A twelfth wreck was found in 1997, this one containing architectural marbles, possibly from the sixth century CE (figs. 7).

The wrecks of Tekmezar Burnu

Two wrecks carrying Ganos-style amphoras were found approximately fifty meters southwest of the Cape of Tekmezar. The larger of the two shipwrecks, Tekmezar I, was one of the most substantial vessels of the Byzantine period. The 800 square meter amphora mound measures 40 by 20 m, and there are three visible layers of amphoras (fig. 8). Without counting the amphoras that are buried and

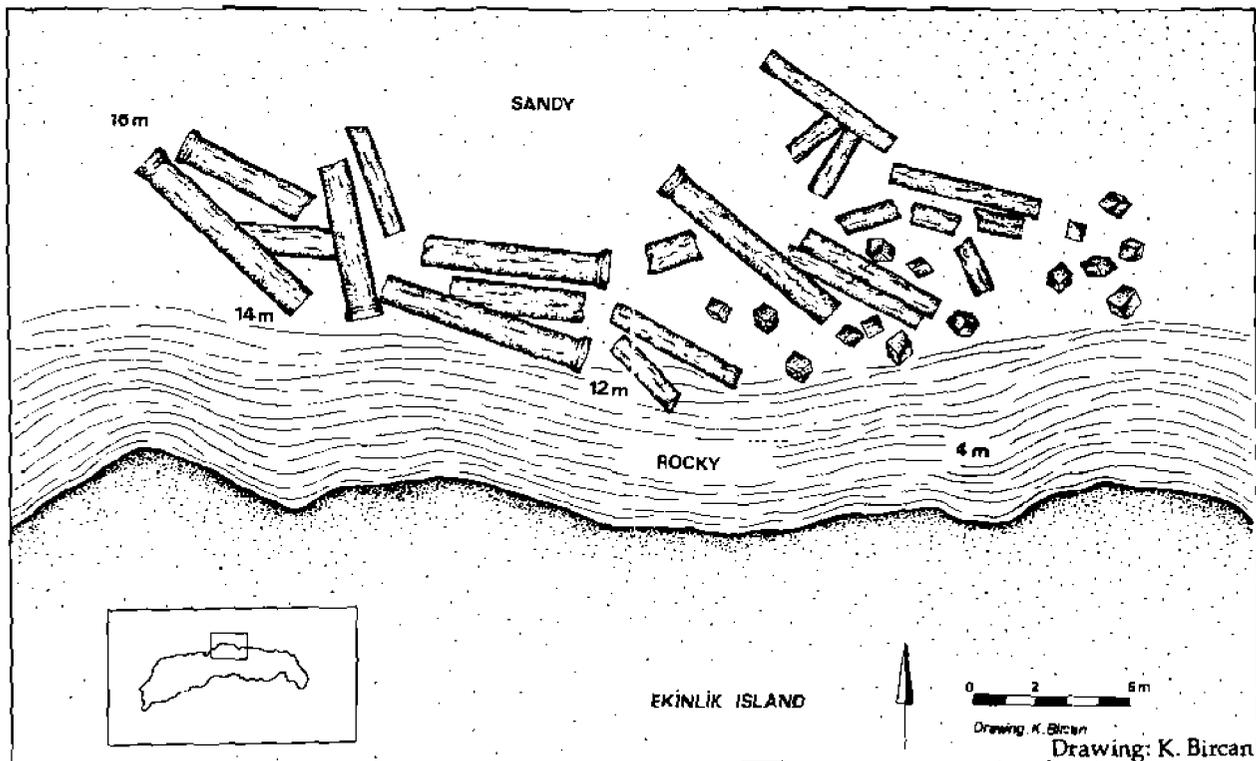


Fig. 7. *A sketch of the Ekinlik Island wreck on the sea floor.*

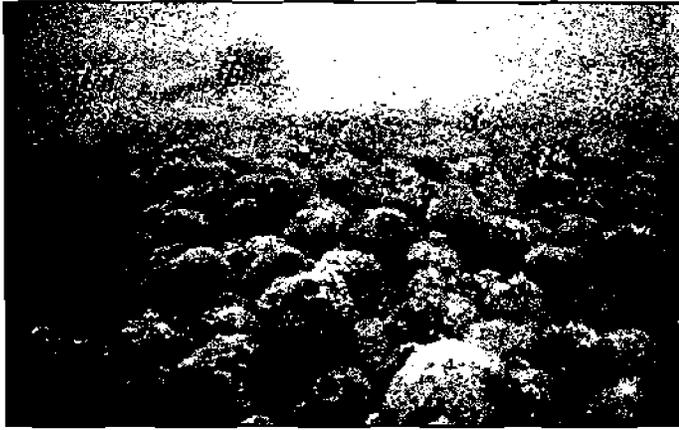


Fig. 8. *Tekmezar I* wreck.

Photo: E. Omur

out of sight, the visible cargo can be estimated at well over twenty thousand units. Such ships were called *muriophoros*, or "thousand-carriers." If they were common, it is hardly surprising that Ganos-type amphoras had wider circulation than any other medieval type. Since a full amphora (40 cm high with a circumference of 90 cm) weighed about 12 kg, the total weight of the *Tekmezar I* cargo must have exceeded 200 tonnes. In contrast, the *Serçe Limanı* ship carried 103 amphoras, along with its other cargo, in a hull 15.36 m long.

Only twelve meters to the west, the *Tekmezar II* wreck carried about three thousand Ganos-type amphoras, now dispersed over 180 square meters. Each of the vessels was equipped with at least five "Y" shaped anchors (fig. 9). However, *Tekmezar I* probably required additional anchors that have not yet been found. The wrecks lie at a depth of thirty-five to forty-five meters, and their huge cargoes would make excavation difficult. However, an exploration of at least the *Tekmezar I* shipwreck might help reveal the techniques that ancient and medieval shipwrights used to build such enormous ships.

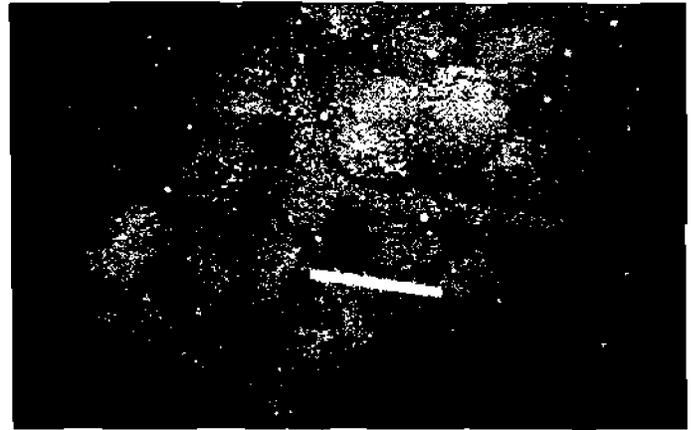


Fig. 9. An anchor of the *Tekmezar I* wreck.

Photo: E. Omur

The Çamaltı Burnu wreck

Another tempting shipwreck is located just over thirty meters south of the rocky cape of Çamaltı Burnu. The amphoras on this wreck have been dated to the thirteenth century CE, placing them among the last amphoras in large-scale commercial use. The ship's cargo has settled in three pockets at depths between twenty and thirty-two meters. The smallest amphoras (fig. 10) are in the top deposit, and the largest in the bottom deposit with the medium sized amphoras in the middle. Any hull remains are probably beneath the lowest deposit on the slope (fig. 11). Many anchors have been found associated with this wreck. About two hundred amphoras are currently visible, although the wide distribution of the cargo makes it difficult to assess its size and tonnage.

The Çamaltı Burnu wreck was chosen for further study because it is small and shallow enough to excavate economically, and it represents a period that has not previously been explored. It is hoped that it will provide valuable information from the thirteenth century about shipbuilding and commerce. The production site of the late amphoras is not currently known, so information from this wreck may help to identify the ship's route and the amphora production sites. The author hopes to establish the infrastructure necessary for a full-scale excavation of the Çamaltı Burnu wreck as the first step towards a long-term project studying the Anatolian underwater heritage. We hope to follow the example provided by the collaboration between INA and the Bodrum Museum of Underwater Archaeology.

The Marmara Production Sites

While surveying the offshore areas, the team also surveyed Marmara Island for additional amphora production sites. Two kiln areas were found, at Saraylar in the north and at Topağaç in the south (fig. 1). As both sites produced Ganos-type amphoras, the hypothesis that all such amphoras actually came from Ganos as wine-filled or empty containers must now be revised.



Fig. 10 (left). Type IV amphoras of the Çamaltı Burnu wreck.

Photo: E. Omur

However, no clay sources were found on the island. It is therefore possible that Ganos clay was transported to Marmara for amphora fabrication and filling. It would have been substantially easier to transport raw materials, rather than finished amphoras. That both kiln areas are located on exposed beaches supports this. The Topağaç site was close to a small monastery, and the Saraylar site was associated with domestic buildings of as yet unidentified use. It is possible that both kilns were operated by monastic communities associated with or subject to Ganos.

To investigate this possibility, analyses were carried out by Helen Hatcher, an analytical chemist, then associated with the Research Laboratory for Archaeology and the History of Art in the University of Oxford. She used inductively-coupled plasma emission spectroscopy, a technique for analyzing the chemical composition of a sample, to check the concentrations of twenty-nine elements. The study included amphora sherd samples from Ganos, Saraylar, and Topağaç. Sherds of the Ganos-type amphoras found by INA investigators on the Glass Wreck were also compared to the other samples.

The analysis suggests that Ganos clay was used to make most, if not all, of the amphoras found on the Glass Wreck. However, Ganos clay is different from the Saraylar and Topağaç samples. Although these clays are similar, the common geology of the Sea of Marmara region makes the identification of a specific origin difficult.

The Ganos-Serçe Limanı Connection

Nonetheless, Dr. Frederick Van Doorninck agrees that most of the Glass Wreck amphoras came from Ganos. This includes the group stowed separately in a stern compartment and marked with an "M," possibly for "Michael," who may have been the ship's captain. Since some of these were marked before firing, the ship's home port may have been very near where the amphoras were made, a proposition confirmed by the similar composition of the amphoras and the ship's storage and cooking ware. The Ganos area may have had strong Slavic (Bulgarian) influences, based on the potter's marks, tools, and weapons.

All this confirms the importance of Ganos in Byzantine trade relations. Vast quantities of wine-filled amphoras came from Ganos itself, or from closely associated sites in the Sea of Marmara region. This writer and Pamela Armstrong are researching whether the Marmara island monasteries operated independently or were subject to Ganos.

Acknowledgments. I would like to thank my permanent staff, Erkut Arcak, Korhan Bircan, Ayça Akin, Atila Kara, and the other members of the Middle East Technical University Underwater Research Team (ODİÜ-SAT). I would also like to express my appreciation to my colleagues who visited the sites and brought their valuable knowledge with them, Albert Hesse, Akif Işın (director of the Tekirdağ museum), F.H. Van Doorninck Jr., Yvon Carlan (who indicated the kiln at Topağaç), Nuşin Asgari (who

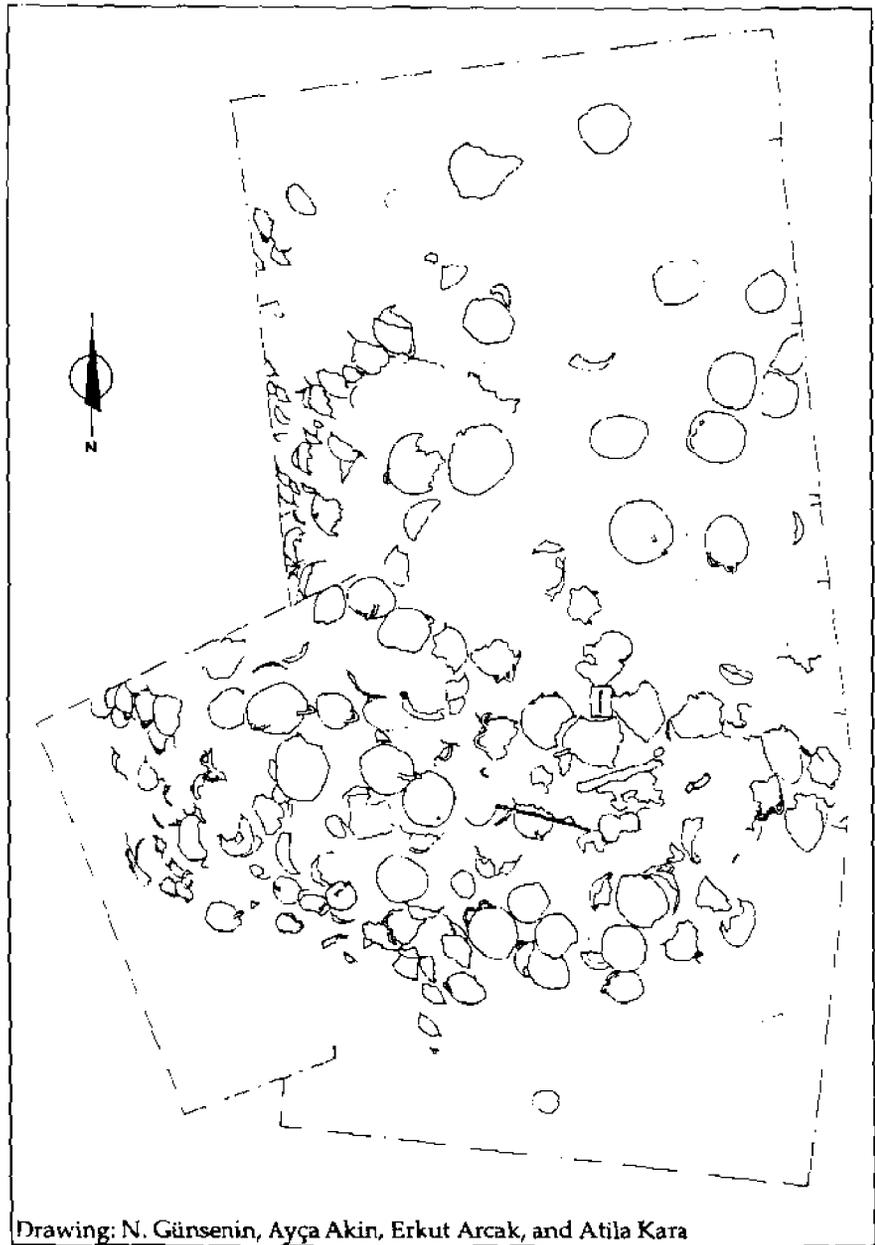


Fig. 11. Plan of Çamaltı Burnu third group amphoras.

drew attention to Saraylar), and Eric Rieth. I am also grateful to Pamela Armstrong, with whom I have collaborated for some years and who has been particularly helpful in improving my understanding of medieval ceramic production, social life, and economic activities. Helen Hatcher, whose analyses are invaluable for our comprehension of understanding the historical facts, also provided invaluable information. Each year's survey was made possible by the permanent financial assistance of the French Institute of Anatolian Studies in Istanbul (IFEA). Ömer Koç, Defne Akçağlılar, Togan Müftüoğlu-Padi-Aware Foundation and Emre Omur also brought their help, especially in underwater equipment and photography. I am also thankful to the Ministry of Culture, and the Director of Museums and Antiquities for their permission to work. My deepest thanks to the villagers, my friends, and the local authorities of Gaziköy-Hoşköy and the Marmara islands. As INA has also learned, most of the shipwrecks had already been found by the local fisherman and divers. I will never forget the good will and information of Mustafa, Erdoğan, Kadem, and Captain Ömer. ☞

Suggested Readings

Günsenin, Nergis

- 1990 *Les amphores byzantines (Xe-XIIe siècles): typologie, production, circulation d'après les collections turques*. Université Paris I (Panthéon-Sorbonne), Paris, doctoral thesis. Atelier national de reproduction des thèses de Lille III.
- 1992 "Ganos: Centre de Production d'Amphores à l'Époque Byzantine," *Anatolia Antiqua II*, Paris: 193-201.
- 1995a "Ganos: résultats des campagnes de 1992 et 1993," *Anatolia Antiqua III* Paris: 165-178.
- 1995b "Glazed pottery production at Ganos," *Anatolia Antiqua III*, (with Pamela Armstrong), Paris: 179-201.
- 1997 "Analyses chimiques comparative des amphores de Ganos, de l'île de Marmara et l'épave de Serçe Limanı (Glass Wreck)," *Anatolia Antiqua V* (with Helen Hatcher), Paris: 249-260.
- 1998 "Récentes découvertes sur l'île de Marmara (Proconnése) à l'époque byzantine: épaves et lieux de chargement," *Archaeonautica 14*, Paris: 309-316.
- 1999 "Les ateliers amphoriques de Ganos à l'époque byzantine," *Production et Commerce des Amphores Anciennes en Mer Noire*, l'Université de Provence: 125-128.

For further information about this project refer to the website www.nautarch.org

News & Notes

Book receives prize nomination

When Horses Walked on Water, the latest publication by Kevin Crisman, Nautical Archaeology Faculty Fellow, and Art Cohn, Executive Director of the Lake Champlain Maritime Museum at Basin Harbor, has been nominated for the Francis Parkman Prize. This annual award for the best non-fiction book on the history of the United States is presented by the Society of American Historians. The first half of Crisman and Cohn's book traces the history of animal powered vessels from Roman times to the last horse ferry in the 1920s. The second half

of the book discusses a particular vessel, the horse-powered ferry they located in 1989, and excavated during 1990-92, two kilometers northwest of the city of Burlington, Vermont. The book contains the first detailed description of a horse-propelled vessel that is based on scientific observation. For a more detailed description of the book, please see *INA Quarterly* 26.1:20-21.

Students receive 1999-2000 honors

The following students in the Nautical Archaeology Program at Texas A&M University have received non-teaching graduate assistantships

in the Program: Kroum Bachvarov, Felipe Castro, Adam Kane, Erika Laanela, Sam Lin, Mason Miller, and Asaf Oron. Erkut Arcak, Jonathan Faucher, Daniel Walker, and Amy Borgens all received LaSalle non-teaching graduate assistantships. An INA scholarship was awarded to Nancy DeBono while Ayşe Atauz has been awarded a TINA scholarship. Dan Davis will hold the Mr. and Mrs. Ray H. Siegfried III Graduate Fellowship while Sara Brigadier will hold the Marion M. Cook Graduate Fellowship. Erika Laanela will hold a Regents Fellowship. ☞

Getting into Deepwater

In *Deep Water, Ancient Ships*, Willard Bascomb delved into shipping records from the mid-nineteenth century, prior to the introduction of steam engines and iron hulls. He discovered that forty percent of all recorded ships sank within three hundred meters of a coastal obstruction. However, Bascomb also found that an additional ten—and perhaps as many as twenty—percent of ships sank in deep water. These statistics are probably conservative in regard to ancient times when sail systems allowed for less maneuverability.

Until recently, deepwater shipwrecks remained out of the reach of archaeologists. This situation is, however, starting to change. In 1997, the US Navy's nuclear research submarine *NR-1* discovered several shipwrecks in international waters nearly a half kilometer deep opposite the Israeli site of Ashkelon. The submarine was on a search mission to locate *Dakar*, an Israeli submarine lost in 1986. In 1999, Drs. Robert D. Ballard (President, Institute for Exploration [IFE]) and Lawrence E. Stager (Head, Harvard Semitic Museum) led an expedition to study these vessels. INA's Dr. Shelley Wachsmann, the Meadows Associate Professor of Biblical Archaeology at Texas A&M University, participated in the survey as a member of Dr. Stager's archaeological team.

Two of the shipwrecks examined are wine-carrying trading vessels that sank in the second half of the eighth century BCE—about the time that Homer is believed to have written the *Iliad* and the *Odyssey*. Personal items retrieved from the vessels identify them as Phoenician, the first such shipwrecks ever found. These are also the oldest ships ever discovered in deep water.

The survey was carried out aboard *Northern Horizon*, with staff and equipment from Woods Hole Oceanographic Institution's (WHOI) Deep Submergence Operational Group. IFE Adjunct Professors Drs. Dana Yoerger and Hanumant Singh from WHOI, David Mindell of the Massachusetts Institute of Technology (MIT), and Louis Whitcomb of Johns Hopkins University also participated in the search and recovery. The shipwrecks were examined by means of WHOI's remote operated vehicle (ROV) *Jason*.

Sponsors of the expedition included the National Geographic Society, the United States Office of Naval Research, and philanthropist Mr. Leon Levy. The story of the expedition will be told in a documentary film produced by National Geographic TV for its Israeli channel, and in an upcoming issue of *National Geographic Magazine*.



Fall 1999 saw the first-ever search for ancient shipwrecks located in depths beyond those of normal scuba diving capabilities carried out inside Israeli territorial waters. Wachsmann directed a survey opposite Tantura Lagoon sponsored by INA Director Mr. George Robb, Jr. who also provided his vessel *Robo*, with its crew and complement of remote sensing equipment. This project was an international endeavor, carried out in cooperation with Haifa University's Recanati Center for Maritime Studies (CMS).

The team surveyed to a depth of 110 meters and in doing so recorded a number of what appear to be non-geological targets that fall within the expected parameters of ancient shipwrecks (defined as 15-30 meters long and found away from reefs).



Photo: M. Baram

Members of the 1999 INA/*Robo* Remote-Sensing Expedition show the INA flag in Israel: From left to right: Amir Yurman, Bundy, Isabel Rivera, Stephen Breitstein, Arad Hagi, Shelley Wachsmann, Andy Wilson, Finn Swanson, Heather Swanson, Cristian Swanson. Missing: George E. Robb, Jr., Brett Phaneuf, Gordon Swanson, Meir Baram and Bill Broughton.

In antiquity, seafaring was primarily a summer occupation. In the eastern Mediterranean during the summer, the wind rose is predominantly from northeast to southwest. With the relatively primitive sails then in use, this made for easy sailing on an outbound journey from Europe to Egypt, but required a counterclockwise return trip along the entire Levantine coast. This made the sea lane along Israel's Mediterranean shores among the most traveled in antiquity. Thus, statistically we might expect a relatively large number of shipwrecks here. The abundance of shipwreck-like anomalies revealed in a relatively small search area during the *Robo* survey is exciting because it seems tentatively to support this conclusion.

Today, deep submergence archaeology is in its infancy, yet it promises immensely significant returns in knowledge gained about our human past. Shipwrecks in Israeli waters will add a distinctly biblical flavor to this unfolding intellectual adventure. ☞

The Reconstruction of *La Belle*

Opening the next chapter in the history of *La Belle*, guests at the Riverside Campus of Texas A&M University witnessed the dedication of a new conservation facility on November 12, 1999. A large vat will soon house the flagship of Robert Cavellier, Sieur de La Salle. Like the French explorer, scientists at the Conservation Research Laboratory (CRL) of the Nautical Archaeology Program are heading boldly into new territory. They are rebuilding the 316-year-old ship in the largest ship conservation facility in the Americas—the largest in the world designed for conservation by immersion. The European facilities that are preserving *Vasa* and *Mary Rose* use spraying techniques, rather than immersing the ships in conservation solution. The CRL has a new 60 x 20 x 12 foot concrete vat, large enough to hold the reconstructed *La Belle* under fresh water that will be replaced by increasing concentrations of polyethylene glycol (PEG) solution as conservation proceeds.

Readers of the *INA Quarterly* are undoubtedly familiar with the earlier chapters of this story. The 15.5 meter *barque longue* was constructed in the shipyards of Roucheford, France, in 1684 and sailed to America shortly thereafter as the flagship of La Salle's expedition to colonize the mouth of the Mississippi River as a French stronghold. Probably due to La Salle's reliance on bad maps, the expedition landed at Matagorda Bay, Texas, in February 1685. After a series of misadventures, *La Belle* was wrecked in the bay in January of the following year. La Salle was killed by his own men in March 1687 and the remnants of the colony were destroyed by a Native American attack in January 1688. This effectively ended the French claim to Texas, but the episode was the driving factor in the subsequent settlement of Texas by Spaniards seeking to provide a protective buffer for Mexico.

A team from the Texas Historical Commission led by J. Barto Arnold (now of INA) located *La Belle* in 1995. The ship lay under twelve feet of water and two feet of sediment about 14 miles from shore. Because visibility was not much better than zero, divers would have found it difficult to recover all of the artifacts in the wreck without damaging them. Therefore, the archaeologists decided to surround the shipwreck with a cofferdam and drain the site so the excavation could proceed on dry land. Nearly a million artifacts were recovered between September 1996 and April 1997. These were transported 160 kilometers to the CRL for conservation.

Dr. Donny Hamilton directs the lab, with Jim Jobling as *La Belle* Project Manager and Dr. Helen Dewolf as Conservator. The artifacts have been preserved by being waterlogged in a low-oxygen environment for the past three centuries. The water and sea salts must be removed slowly, thoroughly, and carefully if the irreplaceable historic items are to survive. For example,

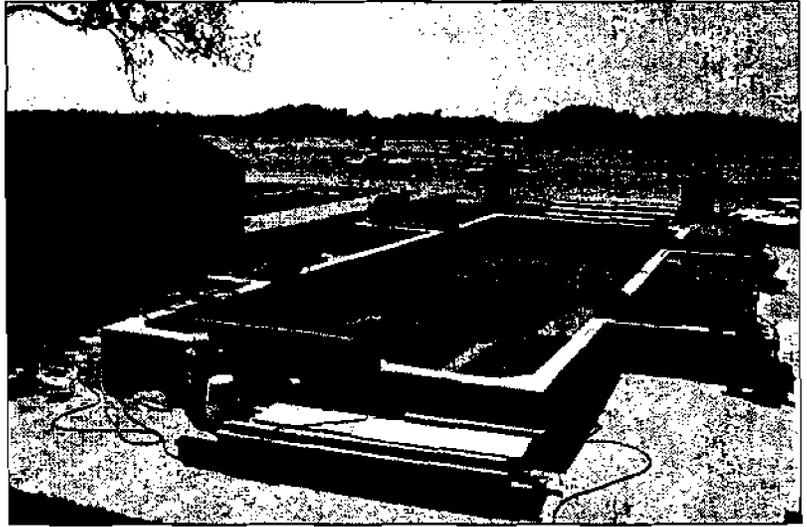


Photo: A. B. Cramer

This newly-dedicated vat is the largest conservation facility of its type in the world.

the 750,000 glass beads that La Salle brought to Texas as trade goods will each need to be rinsed in tap water, rainwater, diluted alcohol, pure alcohol, and finally acetone, before being dipped in a chemical to consolidate and protect them. The five hundred pieces of wood that represent the surviving forty percent of *La Belle*'s original hull will be reassembled on a 12-ton elevator platform in the vat. This can be hauled out of the conservation solution by four big gearboxes to allow conservators to work on the ship before it must be reimmersed to prevent drying.

The November 12 gathering celebrated the opening of the unique CRL ship conservation facility. However, it also provided an opportunity to thank the sponsors who made the La Salle Project possible. These included Fuji NDT, Dinacon Inc., Fibregate, Northrup Grumman, Huntsman Chemical, Dow Chemical, A&M officials and administrators, The Cullen Foundation, The Fondren Foundation, Houston Endowment Inc., The Meadows Foundation, Mobil Exploration and Producing U.S. Inc., Dennis O'Connor, Shell Oil Company Foundation, The Summerlee Foundation and Blue Bell Creameries, L.P., Diamond M Foundation, Inc., The Melbern G. and Susanne M. Glasscock Foundation, Gulf Coast Medical Foundation, Hillcrest Foundation, Carolyn Bennett Jackson, The Kathryn O'Connor Foundation, Strake Foundation, The Summerfield G. Roberts Foundation, The Trull Foundation, and the many others who have made this project possible.

What may be the last chapter in *La Belle*'s long story will follow after five or six years of conservation treatment at CRL. The reconstructed and preserved hull will be taken to its permanent home in a Texas museum. Generations of visitors will marvel at the ingenuity of both La Salle and the conservators who have made it possible to view his ship. ☞

Seventh Annual Tropis Conference

Athena Trakadas

During the week of August 26–30, 1999, current and former faculty and students of the Nautical Archaeology Program (NAP) and the Institute of Nautical Archaeology presented papers at Tropis: the Seventh International Symposium on Ship Construction in Antiquity. This conference was held in south-western Greece at the Sunrise Hotel in Petalidi and the Medieval Castle at Pylos under the auspices of Harry Tzalas of the Hellenic Institute for the Preservation of Nautical Tradition, the Ephorate of Underwater Antiquities, and the Prefecture of Messina.

At this conference, the diverse and promising finds from the first season of the new INA shipwreck excavation along the Turkish Aegean coast were presented. Dr. George Bass' paper, "The Fifth-Century B.C. Shipwreck at Tektaş Burnu, Turkey," revealed that aside from the recovery of some Mendeian and pseudo-Samian amphoras that provided the tentative date of the wreck, the ensuing discoveries of fine black glazeware *kylekes*, lamps, an *alabastron*, and what is possibly the ship's oculus, were also raised during this preliminary season.

On-going analyses of past INA shipwreck excavations were also presented at the conference. Dr. Cemal Pulak's paper, "Constructional Features and Tentative Reconstruction of the Uluburun Shipwreck," analyzed the three extant sections of the mortise-and-tenon constructed Late Bronze Age hull, a fragment of which is the keel-plank. Dr. Jerome Hall, in his paper, "The First-Century CE Boat from Lake Kinneret," discussed his work in Israel, where he has been recording the hull of the vessel, newly-emerged from a PEG treatment. Ph.D. candidate Matthew Harpster reported the tentative results of his recent research sojourn in Bodrum, Turkey, where he began to record the hull that will be the subject of his dissertation. His paper, entitled, "Preliminary Research on the Ninth-Century Hull Remains from Bozburun, Turkey," revealed that the Byzantine ship was unusually constructed of all oak planking, and some oak ceilings and frames at midships, while the other floors, futtocks, and ceilings were of pine. Anthropology Ph.D. candidate Dillon Gorham, in his paper, "The Palynological and Archaeobotanical Studies of Ninth Century A.D. Shipwrecks in Turkey and Israel: Two Projects from INA," proffered the data of fossil pollen and seeds excavated from one of the Tantura Lagoon, Israel, shipwrecks, and the Bozburun, Turkey, shipwreck, in order to provide further information regarding the ships' cargo origins.

NAP graduate and former NAP professor Dr. Fred Hocker and former visiting scholar Dr. John McManamon, SJ, co-authored a paper entitled, "Celebrity Shipwrights and the Educational Process: Social Aspects of the Early Italian Treatises on Shipbuilding," that re-assesses the earliest surviving written works on ship design and construction from northern Italy during the Renaissance Period. Instead of analyzing the technical details of these fifteenth-century documents, McManamon and Hocker instead present several early manuscripts as instruc-

tional texts that focus on basic design concepts for emerging shipwrights during Venice's rapid ascension to maritime dominance.

Deborah Carlson, a former NAP student and current Assistant Director of the Tektaş Burnu shipwreck excavation, presented a paper entitled, "Roman Fishing Boats and the Blunt Prow." Through iconographic examples derived from Italy, Sicily, and North Africa, as well as several textual references, Carlson was able to conclude that the blunt or transom prow was a distinctive but not exclusive feature of small Roman fishing boats in the first several centuries CE. NAP graduate student Athena Trakadas presented a paper entitled "The Khorsabad Timber Transport Relief," which re-evaluated the earlier assignment of the location of a nautical scene from the palace at Khorsabad, in ancient Mesopotamia. Her new identification of the scene helps to reconstruct a facet of the relationship between the Neo-Assyrian kingdom and the Phoenician seafarers in the ninth through seventh centuries BCE.

Interest in the prolific maritime history of ancient Egypt was also well-represented in several papers given by NAP and INA scholars. Dr. Cheryl Ward, a NAP graduate and current Assistant Professor in Nautical Archaeology at Texas A&M Galveston, presented the paper, "A Comparison of Mediterranean and Egyptian Nilotic Traditions of Hull Construction before 450 BCE." This paper dispelled the use of several accepted but inaccurate and misleading facets of information derived from Egyptian riverine vessels in the reconstruction attempts of seagoing ships. NAP graduate Edward Rogers followed the theme of atypical ancient Egyptian ship construction with his paper, "Boat Construction in Old Kingdom Egypt: Evidence from Tomb Reliefs," in which he presented building techniques deduced from iconography but unknown in the present archaeological sources. Further analysis of Egyptian iconography was also the subject of a paper given by Noreen Doyle, another recent NAP graduate. Her paper, "Sitting on Tholes, Dining on Anchors: Perils in the Interpretation of Ancient Egyptian Nautical Iconography," examined the dangers in interpreting and then reconstructing ships' features without taking into account the nuances of the respective images, such as artistic convention and production, and even modern publishing techniques. Dr. Shelley Wachsmann, experimenting with comparative cultural anthropology, presented a paper which documented an amalgamation between ancient and modern Egyptian history. Through his paper, "The *Moulad* of Abu el Haggag: A Modern-day Boat Festival in Egypt," Dr. Wachsmann documented the striking similarities between the modern birthday festival of the Moslem saint Abu el Haggag, with the pharaonic-period Opet boat procession between the temples at Karnak and Luxor.

In two years' time, the tradition of insightful and well-received papers documenting the research projects and excavations by students and faculty of the Nautical Archaeology Program and the Institute of Nautical Archaeology will be much anticipated at the Eighth Biannual Tropis Conference. ❧

Review

by Filipe Castro

El Astillero de Colindres (Cantabria) en la Época de los Austrias Menores, Arqueología y Construcción Naval

by Miguel Cisneros Cunchillos, Rafael Palacio Ramos, and Juan M. Castanedo Galán

Edition Universidad de Cantabria y Ayuntamiento de Colindres, 1997
ISBN: 84-8102-169-5, 206 pages, 30 color plates, 9 b/w plates, and 20 drawings and maps, references, bibliography, 5 appendices, index, hard cover.

The small village of Colindres, Spain, is situated inside the Bay of Santoña, on the Cantabrian coast, and is already mentioned at the time of the Roman conquest. Colindres de Abajo is also cited in the eleventh century as one of the possessions of the kingdom of Navarra. In the seventeenth century this small community of about 160 inhabitants saw intense activity in its shipyards, where twenty-one ships were built for Spain's *Armada del Mar Océano*. When shipbuilding was at progress more than four hundred carpenters and laborers would lodge in this small village, sometimes for several months or even years.

This book presents an interdisciplinary view of the shipyard of Colindres and its relation with the surrounding villages during the seventeenth century. Ships were also built in four other places around Colindres on the fortified Bay of Santoña. The region had good shipbuilding resources, for here iron was mined and worked, and oak timber was abundant.

Extensive archival research, as well as the study of the local cartography and its toponyms support the study presented in this book. Following an archaeological survey of a selected area of the waterfront, excavations were performed that allowed archaeologists to identify three distinct areas. The first area was protected by a dam that has been interpreted as a storage area for wet timber. The second area had a small slope paved with clay and pebbles, which may have been used for the construction of ships, and the third area was artificially leveled with the same pavement that is thought to have held the shipbuilding stocks. Very few archaeological materials were found, mostly pot sherds—dated to a period after the activity of the shipyards and found in layers above the original pavement—tiles (dated from the late sixteenth to the early seventeenth centuries), and iron objects, mostly nails, of undetermined date.

The book generally provides accurate information. However, in the prologue João Baptista Lavanha, the Portuguese writer, mathematician, and cosmographer who is also the author of the *Livro Primeiro da Arquitectura Naval*, is mistakenly identified as being Spanish. In the first chapter a comprehensive historical introduction is given, including useful information about the geological characteristics of the area, its human occupation and economic activities.

The second chapter looks at the origins of the shipbuilding activity in and around Colindres, its characteristics and development, and its decay and eventual extinction. Following is a short overview of the history of the Spanish navy during the sixteenth and seventeenth centuries, particularly in the north and northwest of the Iberian peninsula. The contribution of this zone to the construction of ships is also emphasized. Information is provided on the dimension and tonnage of the first four galleons built in Colindres for the *Armada del Mar Océano*, by Martín de Araña, the man who had built Carla Rahn Phillips' *Six Galleons for the King of Spain* (Johns Hopkins University Press, Baltimore and London, 1986).

The third chapter discusses the organization of sixteenth- and seventeenth-century shipyards, supported by iconography and a bibliography. It also follows the excavation of the selected areas in the presumed area of the seventeenth-century shipyard at Colindres. Chapter Four explains how the fortifications of Santoña Bay and its surroundings were conceived and built, destroyed in 1639 by the French, and rebuilt soon after. In Chapter Five a clear and short summary is presented, followed by five appendices with historical information supporting and completing the text.

El Astillero de Colindres is a complete monograph of a site that was once important, but that has completely vanished, despite its rich history. I believe that its basic interest resides in the restitution of an almost forgotten history to the place where it belongs. It is also an important contribution for understanding the shipbuilding industry of that time. ☞



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