

Black Sea Shipping in Late Antiquity

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The Institute for Exploration (IFE) recently conducted a series of surveys in the Black Sea as part of a long-term project in cooperation with several institutions and archaeologists. In 2000, maritime exploration resulted in the discovery of one of the best preserved seagoing ships from antiquity. At a depth of 320m, this ship dates to the late 5th or 6th centuries. Three other shipwreck sites marked by mounds of shipping jars were located between depths of 85 and 101m and date from the 4th to 6th centuries AD. These four ships are all located slightly west of Sinop in northern Turkey, along the southern shores of the Black Sea.

Maritime surveys of the Mediterranean coastline have provided data about a significant number of shipwrecks from the period of Late Antiquity, but only very scant remains of a single, small, ancient Black Sea ship have been previously reported. Residents of the Sinop region engaged in long-distance exchange as early as 4,500 BC, and analyses of ceramics here and on the Crimean peninsula suggest that seaborne traffic in the region was most intense during Late Antiquity. Direct evidence for Black Sea maritime trade, so well attested by artefacts in terrestrial sites, is now directly accessible as a result of the survey efforts.

Survey methods

Using both traditional and innovative remote-sensing methods in search of deep-water archaeological shipwrecks allows nondestructive evaluation of sites in a marine environment more hostile than most, while

maintaining standard archaeological approaches to site survey. Because much of the Black Sea is anoxic (oxygen-depleted), it is hostile to the biological organisms that usually destroy exposed wood in oxygenated waters. Willard Bascom recognised in 1976 that the deeper waters of the Black Sea might preserve a treasure trove of ships from antiquity, because at depths greater than 150m insufficient oxygen exists to support most familiar biological life forms. A suboxic zone in the next 20 to 50m has both low oxygen and low sulfides, and in the anoxic layer below 200m water chemistry studies consistently document relatively high concentrations of sulfides and low oxygen.

Collaborative efforts of the Institute for Exploration, the government of Turkey, the University of Pennsylvania, University of Rhode Island Graduate School of Oceanography, the Massachusetts Institute of Technology, Florida State University and the Institute of Nautical Archaeology (INA)

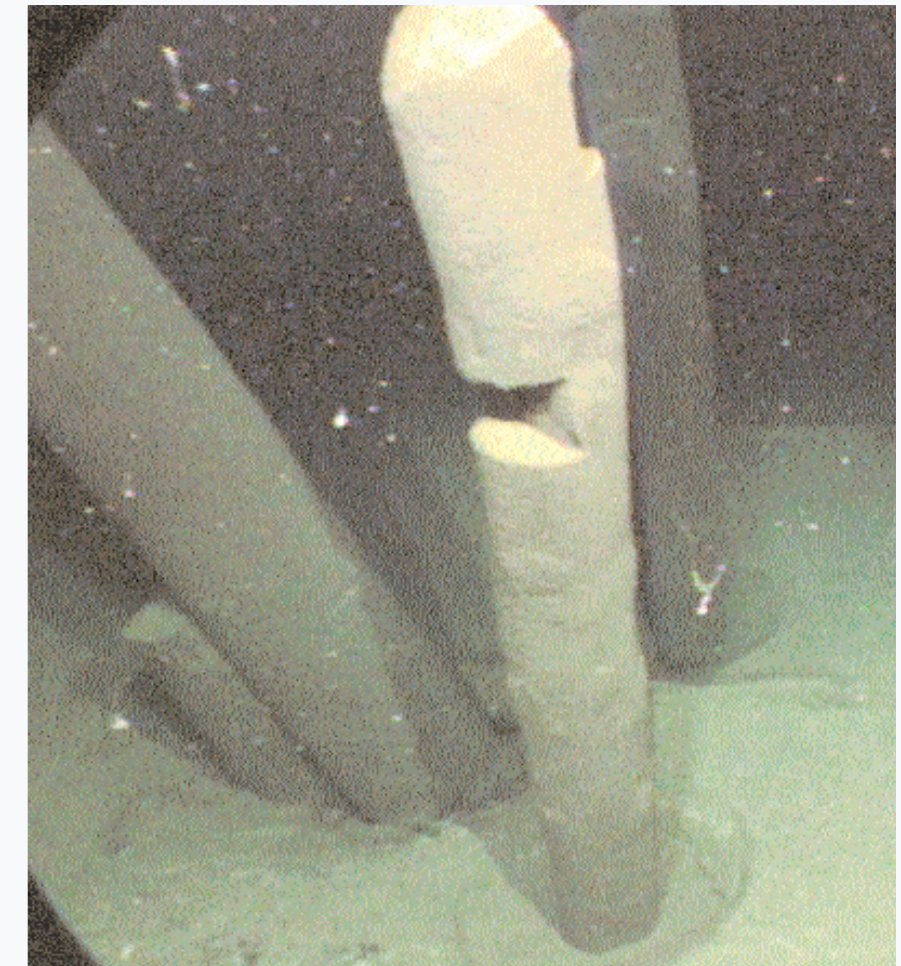
resulted in a programme of terrestrial and marine survey focused on Sinop, Turkey. The potential for wood preservation in the deep waters of the Black Sea (up to 2,210m deep), and the long occupation and central role Sinop played in regional trade, including extensive exchange with settlements on the Crimean peninsula, made this region attractive for testing several hypotheses.

Annually from 1998 to 2000, and in a final season in 2003, remote-sensing tools were used to investigate Sinop's anchorage, portions of the submerged coastline, and deeper waters along suspected trade routes between Sinop, the Crimea and towards Byzantium to the west. A side-scan sonar survey of waters near Sinop harbour in 1998 produced several dozen anomalies examined through images provided by camera-carrying remotely operated vehicles (ROVs) in 1999 that showed many of these low-relief anomalies to be colonies of large-shelled molluscs. A large, late 18th-century iron anchor, a storage jar at least one metre high, and the remains of a 19th-century steamship were also identified.

In 2000, the archaeological survey focused on the survey of deep waters east and north of the promontory and investigation of the seabed about 15–30km west of Sinop. The project had several goals. We sought to discover whether human habitation sites could be identified on the ancient submerged landscape, to examine the seabed for shipwrecks, to test the hypothesis that the anoxic waters below 200m would protect shipwrecks from the expected biological attacks on organic components, and to seek data about an ancient trade route between Sinop and the Crimea indicated by terrestrial archaeological remains.

Much of the two-week survey was devoted to side-scan surveys in search of relic stream beds in the submerged landscape and shipwrecks. Once anomalous targets were identified as potential shipwrecks or habitation areas, we examined images obtained by cameras on an ROV to determine site composition. Even relatively small acoustic anomalies were identified by the DSL-120 phased-array, 120kHz side-scan sonar developed by the Woods Hole Oceanographic Institution and towed at about 40–50m above the seabed, providing returns across a swath of seabed 600m wide.

IFE developed both the optical tow sled *Argus* and the ROV *Little Hercules*, and both were operated from *Northern Horizon*, a research vessel with direct positioning capability. *Argus* carries lights and a 3-chip video



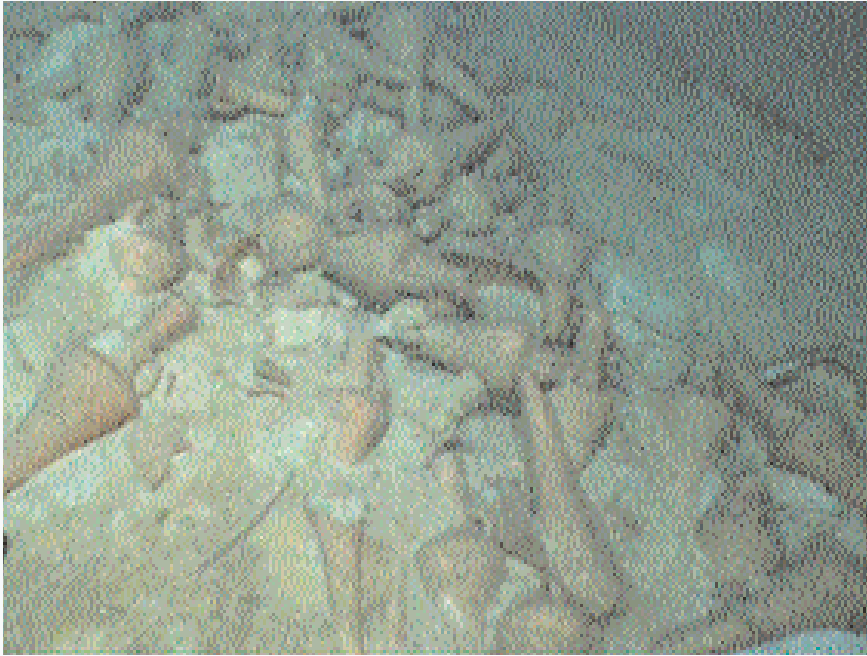
Preservation on Wreck D is extraordinarily good, and the mast (left) and stanchions here are unique examples from anywhere in the ancient world.

Photo: courtesy Institute for Exploration/Institute for Archaeological Oceanography-URI/GSO



The ROV *Little Hercules*, with video and cameras, used to find and record shipwrecks in the Black Sea.

Photo: courtesy Institute for Exploration/Institute for Archaeological Oceanography-URI/GSO



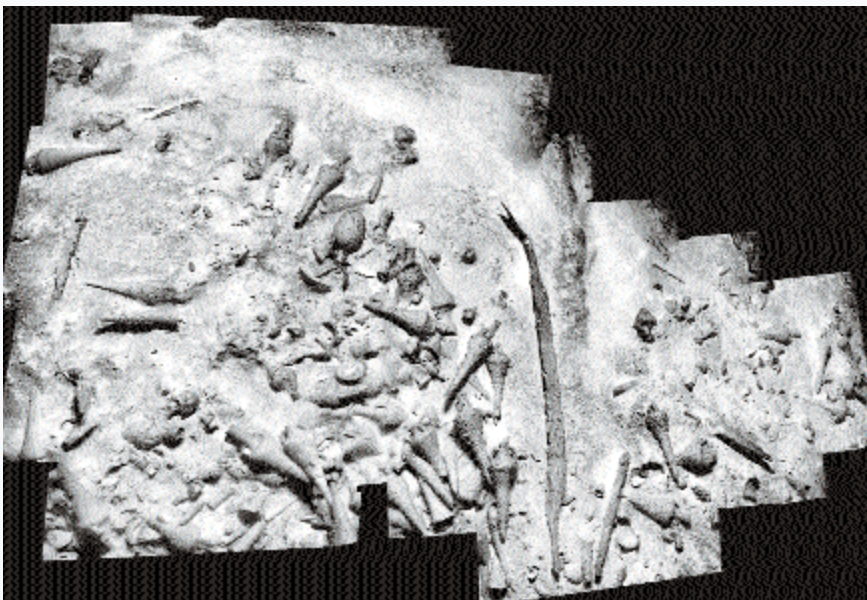
Examples of the Sinopean amphorae that covered wrecks A, B and C.

Photo: courtesy Institute for Exploration/Institute for Archaeological Oceanography-URI/GSO

opportunity to analyse them, we cannot date them more closely, nor can we predict what the ships might have been carrying to or from Sinop.

Wreck D provides a unique opportunity to examine a shipwreck from antiquity that seems to be almost entirely preserved due to the toxic nature of the deep Black Sea. Wood samples of both oak and fir were recovered from the site, and a radio-carbon date calibrated to AD 410–520 places the ship within the period of Late Antiquity. The presence of at least one ceramic jar visible at deck level suggests that we will have

ample opportunity to learn more about this ship and its crew through sub-surface testing.



A photomosaic of part of Shipwreck B made from electronic still camera images.

Photo: Courtesy of the Institute for Exploration/Institute for Archaeological Oceanography-URI/GSO

camera, an electronic still camera, and a 35mm colour still camera, all controlled by shipboard operators. A 675kHz fan-beam scanning sonar mounted directly on the tow sled *Argus* easily located acoustic targets originally identified by the DSL-120. *Little Hercules*, tethered directly to *Argus*, carries cameras capable of providing extremely high-quality images. Both vehicles worked well and provided outstanding visual images of the four shipwreck sites.

Results

Distinctive orange, carrot-shaped shipping jars from Sinop marked the location of shipwrecks A, B and C, and gave us a preliminary date of the 4th to 5th centuries for the sinking of these ships. Until we recover examples of the jars and have the

Discoveries by the Institute for Exploration's Black Sea expeditions are likely to provide new information about both technological change and trade in the Black Sea during a period of political, social and economic transition through the study of ship construction techniques and the remains of cargo. By relying on remote sensing with side-scan sonar in both shallow and deep water to detect possible archaeological sites, and investigating them with cameras mounted on ROVs, we were able to extend both our knowledge of the Black Sea and its past seafarers, and also to expand the expectations for archaeological survey in the deep sea.