

UNDERSEA ARCHEOLOGY

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Undersea archaeology is an interdisciplinary study seeking the cooperation of archaeologists, historians, oceanographers, engineers, geologists, biologists, physicists and other academics. Its primary objective is to explore and preserve the underwater cultural heritage of the world which is no less important than the heritage on land. With the introduction of aqualung and sophisticated Geophysical and seismic survey instruments for underwater search, it is now comparatively easy to probe the sea bed for archaeological remains, namely sunken ships and submerged cities, which constitute the bulk of our underwater cultural heritage. Boats and ships are in themselves microcosms of technologies that created them and of the societies that used them. The crew of the ship is a self-contained society. The merchants and sailors exchanged ideas and transmitted technology to other countries. India, being a pioneer in this field, has made significant contribution to the progress of man. For instance, the Harappans in their search for new markets and sources of raw material, went by sea to Bahrain and Sumer (Iraq) as well as to African coast and in the process, gave their simplified alphabetic system of writing to the Semitics in 1600 BC. Earlier, in Bahrain, the Indus weight system and Indus writing were introduced by 2300 BC. The Harappans built the first tidal dock of the world at Lothal in 2300 BC and its lockgate system ensured enough draft in low tide and automatic desiltation of the basin in high tide. Panikkar (Panikkar N.K. and Srinivasan T.M., 1971 IJMS 6.1) says that "this is the earliest example of putting to practical use one's knowledge of tides, waves and currents". The Harappans built three types of boats and used two types of stone anchors (Konishi 1985). The 'pure copper' referred to in the Dilmun clay tablets of Sumer must have come from Lothal because it is only here that a copper ingot of 99.84% purity without any arsenic content has been found. The copper ingots of Oman, Mohenjo-daro, Susa and Sumerian cities contain arsenic as an impurity. The trade in copper was extensive in the 3rd and 2nd millennia BC. A Bronze Age wreck off Cape Gelidonya off Turkish coast contained not only copper ingots but also tools and moulds of an itinerant smith who could fabricate different types

of tools according to the requirements of various countries visited by the ship.

Despite the major role played by India in the Indian Ocean trade because of its strategic position and the adventurous spirit of its navigators and merchants, we have no recorded history of navigation, ship-building technique and port-installations. Thousands of ships of India and other nations have sunk in Indian waters. Besides wrecks, many ports of yore, for instance, the legendary city of Dvaraka, of the Mahabharata on Gujarat coast, the Chola Capital at Poompuhar on Tamil Nadu coast, the Mauryan Emporium Sopara near Bombay referred in Buddhist Jatakas, Kalinganagara on Andhra coast and several others from where Indian culture spread to South Asia and China, are all swallowed by the sea. The excavation of even a few shipwrecks and cities will not only fill scores of maritime museums with invaluable antiquities such as the famous Bharhut sculptures of 2nd century BC, but also add several chapters to Indian history. The wrecks and submerged towns act as a time-scale on the sea bed for ascertaining the rate and nature of sedimentation. The eroded Danish Fort and Chola temple at Tranquebar provide an index to the rate of transgression of the sea and threat to several ports. The fluvial and marine deposits in the submerged valleys, containing prehistoric stone tools and fossil, supply data for the study of Palaeoclimate.

A small Unit of Marine Archaeology (MAU) was started in 1981. It was initially funded by the Indian National Science Academy and later by the Department of Science and Technology. Within the constraints of budget and manpower, this unit has made some important discoveries and also trained a few archaeologists and technicians in diving, underwater excavation and photography without any foreign help. Till recently, for want of geophysical survey instruments, underwater search was done visually and optically. The ancient structures of the submerged city of Dvaraka were discovered in the second expedition in 1983. Earlier however geophysical and magnetic survey for marine archaeological purpose was done by NIO scientists (Subbaraju LV and Vora KH 1987 339-343) off Kaveripatnam in collaboration with the Tamil Nadu Archaeological Department. The echograms have recorded here "strange conspicuous features as peaks having broad bases in water depths of 18-19 m". Some have twin peaks and others only one. The single peaks have one side sloping and the other straight. "Sonograms have revealed linear, rectangular, oval and irregular-shaped features with a diameter of

20 m and even more. These features associated with shadow zones in the sonograms have considerable height and appear three-dimensional". In 1989-90 the Marine Archaeology Unit and the Regional Centre of NIO carried out visual and geophysical survey of Tranquebar-Poompuhar zone. The archaeological divers physically examined the circular features off Tranquebar in 7 m water depth in March 1990. It is in all likelihood a cairn-burial having at least two circles of rolled boulders and covered by small pebbles. Dr. T.C.S. Rao observes that the sonar has recorded several circular and semi-circular features and rectangular ones between 9 and 11 m water depth off Chinnavanagiri. They are in a fairly systematic pattern over one km length. The absence of any outcrops on the coastline and the regular arrangements of the objects at these depth suggest possible existence of structures. Off Sinnarpete, the sonographs revealed large isolated objects which are suspected to be shipwrecks.

In March 1990, the cairn-circle located 500 m seaward of the fallen Danish fort wall, was only partly excavated as the visibility was nil and the sea extremely rough. Two successive courses of boulders were noticed and the monument measured 10 m on the longer axis. Pottery recovered from within the cairn-circle after recovering pebbly cover has been sent for TL dating. Such megalithic burials range from 300 AD to 1300 BC. Strangely enough the material used for construction is Anorthosite which is not found near Tranquebar but far way near Salem and Trichy. The cairn-circle are almost superimposed over the beach rock, analysis of which has been done by NIO scientists. The shells in the shelly limestone are aragonite in composition and have been cemented in a beach environment. Obviously the sea level must have been 7 m lower when the beach rock was formed. Subsequently builders of cairn circles must have settled down on or near beach-rocks. Still later came the builders of Terracotta ringwells noticed in the present intertidal zone at the foot of the 11th-12th century Chola temple and finally the Danish colony was established. A profile of all these features is sure to yield highly reliable data for sea level fluctuation during the last 5000 years or more. The presence of a large number of coins including pre-Chola and Chola coins suggests wrecks or commercial establishments destroyed by the sea. About 5 km seaward of Vanagiri a shipwreck has been discovered at 19 m depth. Onshore excavations in 1962-65 at Kaveripatnam revealed a brick wharf of 3rd century BC and a later Buddha Vihara. The ancient chola Emporium of Poompuhar must be lying buried in sea. Another important feature recorded by echosounder and sonar is

the submerged river valleys at the mouth of the Parayar and Nandalar rivers near Tranquebar.

In this connection a reference to Sangam literature is very essential. The *Tolkappiyam*, the earliest Grammar in Tamil literature is said to have been introduced for the first time into the Royal Court of Nilan Tharu Thiruvinnayan, who ruled immediately after the great deluge which had submerged Lemuria, an extensive land south of Cape Comorin stretching out far into the Indian Ocean. The date of this event, if true, is of historical, archaeological and Oceanographic interest, as much as the submergence of Dvaraka itself is. This takes us to the discovery of this famous city of the Mahabharata Age.

According to the epic, the Yadavas led by Krishna migrated to Dvaraka. The Rigveda mentions Yadava settlements in Anarta, that is north Gujarat, where some Late Harappan sites have been found in explorations. They went to the western coast and Kakudmin Raivata built Kusasthali which seems to have been destroyed by the sea. It is near, or on, the ruins of Kusasthali, Dvaraka was built, after reclaiming land from the sea. Subsequently, within 100 years, the flourishing city was submerged by the sea according to the epic and Puranas. The onshore excavation at Dvaraka in 1979-80 had brought to light temple remains dating from 1st century BC to 9th century AD. Deeper digging revealed a settlement of 1500 BC destroyed by the sea. This evidence induced me to explore seaward for the remains of the legendary Dvaraka of Mahabharata age. Underwater explorations from 1983 to 1990 have revealed four sectors enclosed by stone walls in the construction of which massive stone blocks are used. They are not easily moved by waves and currents. The Gateways flanked by bastions approximating to the description in the epic are also traced. The three-holed triangular stone anchors, similar to those used in Cyprus and Syria in the 14th century BC, are found in large numbers. They weigh 75 to 250 kg, suggesting that large ships were anchored here. Dvaraka must have been a great emporium. It was also the administrative centre while Bet Dvaraka, which is now an island but was anciently joined to mainland when the sea level was lower, was also a port where fortification walls have been found on shore and in shallow waters. Sea has played havoc here but the antiquities found, namely the Indus type seal, Lustrous Red Ware pottery, jar inscribed in evolved Indus script, are of great significance. The TL date of pottery is 3520 years BP. Hence the founding of Dvaraka may be assigned to 1500 BC. There is evidence of an earlier (Late Harappan)

settlement which may be Kusasthali of the pre-epic days. The seal reminds us of the reference in the *Harivamsa* to the use of *mudra* (seal) by the citizens of Dvaraka. Nageswar and Pindara near Positra Bay must have been other satellite towns of the city state of Dvaraka. The undersea archaeological evidence confirms that the Mahabharata is not a myth. The submergence of Dvaraka is proved. A lot more information about town planning and port-installations made after reclaiming land when the sea level was 10 to 11 m lower than at present, is now available (Rao 1990). The cause of submergence may be partly due to a rise in sea level around 1450 BC as in Bahrain and partly to subsidence or tectonic movement. In that case was Prabhas (Somnath) port also submerged? This will be investigated soon. Now we are planning dig to in deeper sea to know the outer limit of ancient Dvaraka, which was built on both the banks of the Gomati river. The submerged channel of the river has been traced upto 1.5 km. The ancient shoreline upto which the city extended will be traced. Useful data on the effect of environment on wood and metals found in seabed are being analysed by wood preservation lab and the analysis of metal objects is also being made.

Shipwrecks

Two shipwrecks have been discovered, one each in Ameer shoal and Grandi island in Goa waters. The former wreck carried atleast three cannons and dressed granite blocks. From the size and shape of the cannons the ship appears to be about 300 years old. What cargo lies buried under the granite block remains to be seen. Excavation of this wreck will be taken up in the next field season.

The shipwreck 4 km seaward of Vanagiri on the east coast is covered by sea organisms and much effort is needed to uncover it and expose the vessel and cargo if any. The Indus which carried the famous Bharhut sculptures and sank in Sri Lankan waters needs to be excavated soon.

