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HISTORY OF MARINE ARCHAEOLOGICAL RESEARCH IN INDIA

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Marine Archaeology is the interdisciplinary scientific study of the past seafaring from the material remains of the activity, seeking the cooperation of archaeologists, historians, oceanographers, engineers, geologists, biologists, physicists and other academicians. Marine Archaeology is also known variously as Nautical Archaeology, Submarine Archaeology, Undersea Archaeology and Shipwreck Archaeology.

Marine Archaeological studies include

- a. Reconstruction of maritime history of submerged port remains
- b. Exploration and excavation of shipwrecks
- c. Ancient Ship building technology
- d. Conservation of antiquities
- e. Corrosion of metals
- f. Coastal erosion
- g. Eustatic changes

Marine archaeology involves nearshore and intertidal zone explorations before undertaking underwater explorations. Surface Demand Diving Equipment (SDDE) and Self-contained Underwater Breathing Apparatus (SCUBA) system of diving play a vital role in the offshore exploration. In recent past underwater scooter (Aquazepp) is being used for marine archaeological operations, which helps to explore the seabed thoroughly and saves time. Marine acoustic instruments like sidescan sonar, echo sounder, magnetometer, ORE mud

profiler are used for narrowing down the labour at the survey site. Underwater TV recording, underwater photography as well as underwater measuring and drawings are carried out for documentation.

Sources

The *Arthasastra*, the Buddhist *Jatakas*, Jain Texts and various Puranas furnish some particulars of sea voyages and occasionally of shipwrecks also. But the bearings of the wreck site are hardly mentioned. From Ajanta paintings, relief sculptures of Barhut, Kanheri, Aurangabad and Sanchi a faint idea of the type of boats used on rivers and of ships on the sea can be had. The Coins of the Satavahans, the terracotta sealings of Chandraka-tugarh, the Sangam texts of Tamil Nadu, the inscriptions of Chalukyas of Badami and Copperplate and other inscriptions of Silaharas, Kadambas of Goa, Pandyas, Pallavas and Cholas of Tamil Nadu, and the accounts of the Greek, Chinese and Arab travellers give a glimpse of sea trade, but no technical details of ship buildings, sea route and cargo are available. The Marine Records of the Portuguese, Dutch, French and the English in various archives of India and Europe and the Peshwa Daftar Records at Pune are useful in reconstructing the history of maritime activity of India during the last 350 years, prior to which written accounts are utterly lacking. It is only through marine archaeological research which involves exploration and excavation

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of submerged ports and sunken ships that the maritime history can be reconstructed and scientific data useful for a study of sea level changes during the last 5000 years can be generated. The earliest reliable reference on the ports of ancient India is contained in the *Periplus of the Erythraean Sea*. Indian culture spread to the west, in the Persian Gulf, Red Sea and Mediterranean ports from the ports in Gujarat and to the east upto Malaysia, Indonesia, Thailand and China from the ports in Bengal, Andhra, Orissa and Tamil Nadu. The earliest reference to naval administration comes from the *Arthashastra* a work of the 3rd century B.C. on political economy. Later texts such as the *Yutikalpataru* of Bhoja, the *Rajavalliya* and *Brihatkatha-kalpasutra* also throw light on boat-building technology, ports, sea voyages etc. Unless however the submerged ports and sunken ships are excavated the rich *Underwater Cultural Heritage of India* cannot be assessed and preserved. For undertaking this arduous task involving collection of data leading to location of wrecks and sites, trained manpower, modern scientific tools for search and documentation, adequate budget, planning and management are necessary on national scale:

Birth of Marine Archaeology in India

Though Underwater Heritage in the form of submerged Cities and sunken ships is lying buried in the coastal waters and exclusive economic zone of India for the last 4000 years, it is only in 1981 that the importance of the Preservation of Underwater Cultural Heritage of India was brought to the notice of the public. It was Dr. S.R. Rao who initiated steps to introduce marine archaeology as a scientific discipline by leading the First

Marine Archaeological Expedition to Dwarka in 1981 with financial assistance of the Indian National Science Academy and later by the Department of Science and Technology and Archaeological Survey of India and Council of Scientific and Industrial Research. Now the Marine Archaeology Centre is an integral part of National Institute of Oceanography. In a span of more than one decade marine archaeological explorations and excavations have been carried out in Dwarka, Bet Dwarka, Tranquebar, Poompuhar, Somnath, Lakshadweep Islands and Goa waters.

Underwater Explorations of Dwarka

The excavations at Dwarka carried out by Deccan college, Pune, in 1963 was limited to an area of 8 x 6m, later reduced to 2 x 2 m, below 6 m depth; medieval and early historic occupation layers were dug through and the earliest layer was dated to 1st cent. AD. Sankalia came to the conclusion that the earliest settlement of Dwarka is not earlier than 1st cent. BC and AD (Ansari and Mate : 1966). But the onshore excavations in the forecourt of Dwarkadhish temple in 1979-80 had yielded reliable evidence of submergence of the first protohistoric town in the 14th century BC. Furthermore, it was observed that temples I and II of the 1st cent. BC and 2nd cent. AD and temple III of 9th cent. AD were destroyed and submergence may be due to sea level fluctuations or due to subsidence, or some other natural causes, (Rao and Nayak : 1984-85).

The Marine Archaeological expeditions commenced systematic search for submerged structures 200 m seaward, off Samudranarayana temple in 1985. The subsequent expeditions till 1994 covered

an extensive area of more than 1200 x 500 m in seabed search and discovered many significant buildings of the protohistoric period and a few of the early historical period also. At a number of locations submerged structures namely fort walls, bastions, remains of jetty, perforated stone anchors, timber of the wrecked ship and artefacts such as brass bell, a fragmentary statue of marble and iron anchor were laid bare along the right bank of the submerged channel of the river Gomati at a water depth of 3 to 10 m. The antiquities found in excavation are useful in ascertaining the cultural level of the people. A late Indus seal of conch shell with a three headed animal motif representing a short horned bull, a unicorn and goat is engraved on it. The seal and motif suggest Indus origin but art style bespeaks of Bahrain art. Three headed animal figures are engraved on Indus seal of Maohenjo-daro but Late Harappan pottery from the intertidal zone of the island suggests a mid second millennium BC date (Rao : 1987a). This evidence is corroborated by an inscription in Post Indus characters on a votive jar from Bet Dwarka. The votive jar occurring in the intertidal zone is inscribed in the Late Harappan script which is in the transitional phase (Rao : 1987 b).

The outer and inner gateways of the fortification, flanked by circular or semicircular bastions have been traced. A flight of steps from the inner gateway led to the Gomati river. The smaller three holed triangular anchors of stone found near the bank weigh about 57kg. Perhaps small boats using these anchors sailed up the Gomati river, while larger ones, prismatic in shape and weighing 168kg, lying near the outer fortification and jetty

must have been used by the sea going vessels of larger dimensions. In this connection it may be noted that three holed and one holed stone anchors were used at Kition in Cyprus and in Syria, during the 12th-14th cent. BC (Rao : 1990 a). Dwarka anchors are more or less of the same age as judged from ceramic wares associated with three hold triangular anchors. From the size and number of anchors, it can be said that Dwarka was the largest port of the protohistoric period, so far known on Indian coast and deserved the name Dvara (gateway) given to it in ancient texts (Rao : 1988). The overseas trade of Dwarka is attested by the anchors and by the influence of Bharainian art on the Bet Dwarka seal. The high level of civilization extolled in the epic is true to a large extent. The fortified city and its plan are symbols of economic prosperity, while the seal and inscription indicate literary advancement. Metallurgy had made great progress. The prosperity of Dwarka and its satellite towns was due to shell working, boat building and overseas trade.

Underwater Exploration of Poempuhar

The Sangam text *Silappadi-karam* mentions that Poempuhar (Kaveripatnam) covered an area of 4 kavatham approximating to 30sq. miles. *Silappadi-karam* adds that the boundaries of Poempuhar extended upto Karivendan-athapuram and Kadarankondan on the west, Thirukadavur on the south, Kalikamur on the north and the sea on the east. It is thus obvious that ancient Poempuhar was not confined to the present Kaveripatnam and Vanagiri but extended inland upto Manigramam, Pallavanesvaram and southward upto

Tarangambadi (Tranquebar). The city of Poompuhar is said to have been swallowed by the sea owing to the wrath of Indra whose festival was not performed by the Pandyan king.

For the first time joint offshore exploration of Poompuhar was carried out by the Department of Archaeology, Tamil Nadu and the National Institute of Oceanography in 1981 and revealed some conspicuous objects near the shore at a waterdepth of 7 to 8 m. Objects of similar nature were noticed in deeper waters (Vora : 1987) but could not be identified as no diving was undertaken.

The results of previous land excavations by Archaeological Survey of India and offshore explorations of Poompuhar in 1981 attracted the Department of Archaeology, Government of Tamil Nadu which came forward to carry out marine archaeological researches in Poompuhar waters in collaboration with the Marine Archaeology Centre of the National Institute of Oceanography, Goa.

Nearshore Exploration

A brick structure exposed in the intertidal zone about 200 m south of Kannagi statue was excavated to obtain a cross section by laying a trench up to a depth of 120 cm. There are 11 courses of bricks in this structure measuring 4 m long and 1.20 m wide. The bricks used here are 36 x 18 x 6 cm. Compact sticky clay was used as binding material. The structure is parallel to the shore, so that the wave action comes in perpendicular direction causing less damage to the structure.

Besides this structure, terracotta ringwells were also noticed at Vanagiri,

Chinnavanagiri and Poompuhar. During low tide a trench was laid about 300 m south of Vanagiri temple measuring 2.5 square metre to excavate three terracotta ring wells. In one ring well three courses of 15 cm height, 6cm thick and 75 cm of diameter rings were noticed. The two other ring wells megalithic black and red ware was found. Similar ring wells were also noticed at north of Kannagi statue of Poompuhar.

Offshore Exploration

The encouraging results of nearshore explorations justified carrying out the offshore explorations. Fifteen courses of a brick structure was found on the northern side of the present river mouth of Kaveri at a water depth of 1m and visible during low tide. It was 40 m interior from lowest water mark. Although it was impossible to anchor the boat near this structure underwater search was carried out keeping the equipment on shore. This structure lies in north-south direction and is parallel to the seashore. The main structure is of 6.20, and rest of 3 to 4m. All are separated from the main structure and tilted. The total length of the structure was 25 m and binding material used was lime mortar. The size of bricks were 22 x 13 x 6 cm.

Offshore exploration involved both geophysical and archaeological surveys. Geophysical exploration carried out with the help of Echo sounder and Sidescan Sonar revealed a couple of zones of diving interest in shallow as well as in deeper waters. Underwater explorations and diving operations were carried out at 6 strategic zones at different water depths. Diving was extended to the adjoining areas also followed by airlift operation to

expose objects buried in sediments. Buoys were dropped to know the alignment of the structures.

Geophysical survey conducted off Vanagiri and Kadaikkadu showed some indications of structures at zone. 1 and 3. Diving was resumed here to confirm the geophysical survey. Diving in zone 1 revealed a number of sand stone blocks which was marked later by four buoys to give the shape of structure as rectangular. The structure is highly disturbed and partly buried in the sediment. Airlifting brought to light some dressed stone blocks with 3 courses and of 45 cm in height. Rectangular and square blocks were used for construction of the structure. Binding medium is totally washed out and blocks are highly eroded. Besides dressed stone blocks, brick bats were also encountered. Probably both stone and bricks were used for the construction. Red ware, black and red ware and an amphora piece was also collected from the adjoining area. Scattered dressed stone blocks of a structure were noticed at zone. 3. The sizes being 65 x 40 x 10 cm, 60 x 35 x 10 cm and 30 x 20 x 10 cm. Pottery and shells were also encountered in the nearby area of the structure.

It is now fairly clear that ancient Poompuhar was prosperous from 3rd century B.C. to 5th century A.D. It extended over 5 km (Kadaikkadu to

Chinnavanagiri) along the present coast line about 2 km seaward and about 1 km landward. Further nearshore and offshore explorations and excavations may bring to light some more structures which may help to reconstruct the unknown history of Poompuhar (Technical Report, Poompuhar : 1994).

Shipwreck in Poompuhar

A highly significant achievement of the Poompuhar underwater exploration of 1991-95 is the discovery of a large shipwreck which carried three types of lead ingots. Details of the ingots are Shown in table 1.

W : BLACKETT : On obverse only W:BLACKET and on reverse S S. 1791 and on some 1792 4, E, F, X.

RECTANGULAR PLAIN : On obverse only H H, but on reverse 4, IB and H.

D : On obverse Crown D, and on reverse XXX, X, D, V, 4.

W: BLACKETT must be an English firm since the Dutch and Danish authorities are not aware of any such company. Whether the ship which carried ingots was going to a foreign country or coming to an Indian port is not clear. India was known for exporting lead from Jawar Mines in Udaipur district of Rajasthan. It is necessary to identify the source of lead manufacturing or dealing company,

	Length	Width	Height	Weight
W : BLACKETT	88 cm	15.5 cm	7 cm	68.700 kg
D	87 cm	14 cm	7 cm	63.600 kg
Rectangular Plain	88 cm	14.5 cm	5 cm	65.800 kg

Table -1

and the ship which carried it, besides ascertaining the men and other cargo lost. Seven ingots were retrieved in the expedition. The wooden hull of the ship was partly excavated and a cannon has been exposed.

Tranquebar

Marine Geophysical survey of the offshore region of Tranquebar-Poompuhar region carried out by NIO followed by examination of certain features by Marine Archaeologists has been of considerable interest for archaeological and eustatic studies. The geophysical surveys in March 1990 covering an area between 5 and 15 m water depth revealed that in addition to several isolated objects, a continuous belt of small objects extending parallel to the coast in 8 m water depth is recorded for a distance of more than 3 km. From the diving operations it is confirmed that they correspond to heaps of shells (Gastropods) with their relief varying from a few centimetres to half a metre. Gastropods require shallow warm water of less salinity and hard substratum - preferably estuarine environment. At 11 to 13 m water depth several isolated objects of strong reflectivity are recorded off Poompuhar and Tranquebar. Many of the objects recorded at 7 to 8 m and 11 to 13 m depth off Tranquebar and Poompuhar appear to correspond to manmade structure. Fairly large size objects were recorded in 6 to 7 m and 11 to 12 m depth seaward of Masilamani Temple at Tranquebar (Rao : 1991). One of the circular features in 7 m depth was examined and excavated by diver-archaeologists. It turned out to be a cairn circle type of burial measuring 10.5 m along the longer axis and 6 m along the

shorter axis (Rao : 1991). The pottery from the circle consists of coarse Red Ware and Grey Ware. Two courses of boulder used in outer circle could be traced. Elsewhere in Manigramam, a suburb of Poompuhar Roulletted Ware and Megalithic Black-and -Red Ware were found in the onshore excavation in 1962. Below the Tranquebar offshore cairn circles there is beach rock of intertidal zone.

Submerged Somnath

Onshore explorations carried out in and around the excavated area and on the bank of river Hiran by Marine Archaeology Centre yielded pottery of different periods including the Late Harappan pottery and Red Polished ware. The nick point of the Hiran river where it used to join the sea is now buried under sand bars.

Nearshore and intertidal zone exploration were carried out from Veraval jetty to the sand bars near the mouth of river Saraswati. Six lingas came to light near Veraval during ebb tide. A few of them are under worship. A shipwreck is also visible in ebb tide in 0.5 m to 2 m water depth. Local inquiries revealed that wreck is hardly 15 years old.

Offshore explorations were carried out west of the Somnath temple and opposite river Hiran. Diving was carried out in shallow waters and extended up to 9 m off Somnath. The underwater explorations off Somnath revealed triangular and Prismatic type of stone anchors which are the prototype of Dwarka anchors. Dressed sand stone blocks and single holed circular stone artifacts of different types and rock-cut channels are also noticed. The large

spheroid stone measuring 75 x 37 x 25 cm and 88 x 61 x 28 cm, having a hole appears to be the flagpost used on the boat or on the shore. The age of these objects is yet to be ascertained. Intensive survey in deeper waters is necessary to come to a conclusion regarding the cause of submergence (Rao, Sila and Gaur : 1992).

Shipwrecks in Lakshadweep Island

The Marine Archaeology Centre undertook onshore and offshore exploration of Kavaratti, Androth, Agatti and Amini islands of the Lakshadweep group of islands in February, 1994 with a view to locate early human settlements on land and their role in developing overseas trade, boat-building and promoting cultural interaction with other Indian Ocean countries.

The *National shipwreck register* of the Marine Archaeology Centre shows that there were 7 shipwrecks in the Lakshadweep group of islands but most of them are confined to the Byramgore and Cherbiniani Reefs. The expedition was able to discover 3 shipwrecks in the sea and a few archaeological sites on land.

Minicoy

This is the southernmost island of the Union Territory where several ships must have been lost. Two large shipwrecks (LSW2 and LSW3) were discovered in 4 m to 10 m water depth, 200 m seaward. Diving on the shipwreck marked LSW 2 for convenience revealed that the frame and beams of this steam ship are preserved but hull plates are corroded. Some parts of the engine in midship, such as flywheel and steam pipes are fairly well preserved. The diameter of the wheel is 4.5 m. The shaft

attached to it could be traced upto 27 m length and is found to be in good condition. In the aft it must have been attached to the propeller. The bearings at 3 attachments of the shaft itself could be seen. The total length of the ship is about 100 m. The anchor chain which is in a very good state of preservation was surveyed upto 150 m length. The rest of the chain upto propeller lying in deeper waters could not be traced. Some brass parts of the ship such as the port-hole lying scattered have been retrieved. The wreck lies in a North-South direction parallel to the shore. The wreck LSW 3 lying North of LSW2 has its hull plate in a fairly good state of preservation as the vessel lies tilted. There are two massive steam boilers. A portion of shaft attached to the engine is preserved but the condition of the rest of it in deeper water is not known. The approximate length of the ship is 100 m, if not more.

Shipwreck LSW 4 is being salvaged by a private licensed company known as "Salvage Corporation of India", which has destroyed all evidence of archaeological importance by removing two large boilers, winches etc. This ship of German origin namely Russett is said to have sunk about 65 years ago.

Suheli Par

During offshore exploration in the island a shipwreck (LSW1) some parts of which are on the reef, was noticed. As there are several rubber tyres and a tank, it may be a warship that sank here. The sea being very rough other parts of the wreck could not be located while diving upto 15 m depth. It is said there are 2 or 3 more wrecks in Suheli Par waters.

Androth

The site is known as "Kalikatta" in the island where a large quantity of Red

Ware was found. A local artist had discovered earlier two Buddha heads and a few other sculptures which are now kept in the High School. They belong to 6th - 7th century A.D.

Kavaratti

From the ancient mounds in the locality where the Masjid known as Ujira Habiwullah, pottery of the early historical period including the Red Polished Ware was recovered. In another site near the Hospital area Red Ware sherds were found.

Agatti

Exploration of 3 sites namely, Walullah Majar, Jama Masjid and another Majar revealed pottery of medieval period. It is however reported that some sculptures of earlier period were also found here.

Amini

An examination of the strata in a trench which was being excavated for the foundation of a public building brought to light Red Ware and Course Grey Ware of medieval and early historical periods (Technical Report, Lakshadweep : 1994).

Shipwrecks in Goa Waters

Hundreds of ships sank on Konkan coast during the 16th-19th centuries. Some were lost in the naval warfare but many more in cyclone and storm waves. The Portuguese records in the State Archives at Panjim and the Marine Records in the Archives at Bombay give a long list of ships lost in Goa waters. During a storm on 24th April 1648 12 Portuguese ships which were to go to Calcutta sank near Aguada and seven smaller ones were lost at Nerul river, the estimated loss being 1 million xerofins.

Another calamity befell 14 Portuguese ships in 1694. The Bagla Sallamuttee was wrecked at Mandovi on Goa coast in 1861. Brig *Champion* wrecked at the sand bar near the entrance to Goa waters on 15th September 1862. Hydrographic charts indicate a few wrecks in Goa waters. One such is in Grandi Island and another in Marmugao Head. A few are indicated in Ameer Shoals.

The Marine Archaeology Centre discovered a wreck at 2 m water depth on the west side of Ameer Shoal and another in Grandi island. In the Ameer shoal wreck, three guns and several dressed blocks of granite have been found (Rao : 1990b). It is a wooden hulled sailing vessel about 300 years old. the country to which it belonged and its destination can be ascertained after further excavation. The Grandi island wreck is a steel hulled vessel. A search for a wreck in Baga Bay was undertaken. Further explorations in Goa water is called for.

National Shipwreck Register

The marine records of the coastal states are available in the State Archives and National Archives, New Delhi which mentions several ships lost in Indian waters. Till now 250 references of shipwrecks have been collected from various archives of India. The records sometimes provide the details of the shipwrecks like name of the ship, owner of the ship, destination, cargo, place and year of the wreck as well as whether attempt was made to salvage it or not.

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