

In this issue

Underwater cultural heritage

Curiosity to explore the past through artifacts, stories and legends, passed over generations, is the essence of archaeology. Every object uncovered from an ancient site represents a moment frozen in time and each of them opens new windows to the past. This curiosity to explore the past and open up time capsules that help to solve the archaeological jigsaw, is what has driven many archaeologists to the sites of ancient civilizations, shipwrecks and the like. Our own rich heritage has left us with a glorious past, the Indus Valley, Deccan chalcolithic, Megalithic and many more cultures across the country. Trade and maritime activity in the Indian Ocean had transformed this region to an active centre where civilizations thrived. Today, we explore the remains of these civilizations to pick up the threads and weave stories of the people who lived hundreds and thousands of years ago. Many of the archaeological sites that we wish to explore are not currently on the land; morphological, climatic and sea level changes having destroyed some of them. Nevertheless, fascinating stories of shipwrecks and sunken treasures have often driven many archaeologists underwater. Underwater diving, a hobby, sports or adventure till late sixties, ultimately led to the emergence of a full-fledged science of underwater archaeology.

Underwater archaeology is concerned with the identification and interpretation of physical traces from the past. An interdisciplinary study that uses inputs from archaeology, epigraphy, archives, geology, marine geology and oceanography (specifically sea level and shoreline changes); marine archeology is all about reconstructing the history of past civilizations. The history of shipbuilding and the nature of transoceanic trade and commerce are some of the specific activities that marine archeologists have been able to reconstruct, based on their excavations in various parts of the world.

The special section on marine archaeology includes nine papers on archival records, underwater investigation of ancient cities, harbours and shipwrecks and their protection. Prehistoric archaeology from the continental shelf, ancient settle-

ments, stone anchors, shipwrecks, *in situ* protection of shipwrecks and the study of ancient manuscripts, etc. form the themes of the papers.

Ancient settlements

N. C. Flemming (page 1225) deals with the scope of prehistoric archaeology from the continental shelf of India, with special reference to ancient settlements. He emphasizes that the spread of humanity throughout the globe has been influenced by the exploitation of the continental shelf during glacial phases, by the use of coastal food resources, and by the effect of changed migration routes, connected land masses, or channels which were easier to cross. Marine archaeological explorations along the Indian coast can provide data on the migration and diffusion of prehistoric man. Clearly, this paper opens a new horizon in the marine archaeological studies in India.

Sundaresh and others (page 1231) report on underwater investigations off Mahabalipuram, the famous centre of Pallava art and architecture. Local traditions and foreign accounts make vivid references to the submerged ancient city and its temples. The authors discuss results of recent underwater explorations by NIO. They report of a large number of man-made structures including walls, square structures, steps, etc. at a depth of 5 to 8 m about 500 m off the Shore temple. The possible date for construction of the remains off Mahabalipuram has been suggested to be 6th century AD. The severe coastal erosion and minor sea level fluctuations are reported to be responsible for the submergence of these structures.

Shipwrecks

The main component of marine archaeology is the study of ancient shipwrecks. The study of shipwrecks helps to reconstruct the history of boat building, trade and commerce and trade routes, etc. There are two papers on shipwrecks at Goa and in Lakshadweep. Sila Tripathi and others (page 1238) throw light on the two shipwrecks discovered off Goa. Shipwreck at Sunchi reef dating back to the 17th century, obviously belongs to the Por-

tuguese period and the paper reports of iron cannon, hippopotamus teeth, elephant tusk, granite blocks, porcelain ware. The second wreck from the late 19th century discovered near St George's Reef was of a ship that belonged to the Bassel Mission Company. A large number of artifacts such as bricks, tiles, drum, capital, etc. intended for house construction, were found from this wreck.

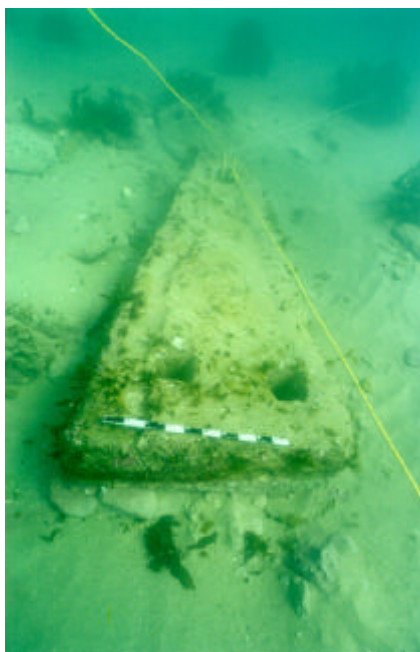
Recent underwater explorations by the Archaeological Survey of India and the Indian Navy brought to light a shipwreck near the Bangaram Island of Lakshadweep, which has been identified as *Princes Royal* dating back to the 18th century. Alok Tripathi (page 1246) discusses the important findings from this wreck, which include four cannons, glass bottles, brown glazed jars, porcelain ware and bricks. This ship has been identified as *Princes Royal-1792*, the name engraved on a bronze bell found from the wreck. It has been suggested that this ship got wrecked in 1795–96 during her return voyage from China and the findings shed light on the maritime history and trade in the Indian Ocean.

Shipwreck protection

M. R. Mandars and others (page 1251) report on the *in situ* protection of shipwreck. The protection of shipwrecks that are lying underwater is of serious concern and challenge for the marine archaeologists all over the world. This is of greater concern in tropical regions where woodborers cause severe destruction to underwater remains, especially the wooden hulled ship. Mandar focuses on this subject very methodically and effectively with the example of a shipwreck in Sri Lanka. The ideas discussed could provide many useful tips for marine archaeologists working on *in situ* preservation of the underwater heritage in the Indian coast.

Jetties and anchors

Dwarka, one of the best-studied underwater sites in India, has commanded much attention, also because the site is considered as one of the four *Dhamas* of Hindu religion. According to ancient Sanskrit literature, the Lord Krishna founded Dwarka. Gaur *et al.* (page 1256) report on



the underwater explorations near Dwarka. The findings suggest that this was one of the most important and busy ports during historical and medieval periods. Boats from different parts of the world used to visit this port. The explorations have revealed the occurrence of more than 120 stone anchors of various types at Dwarka. A large number of stone structures consisting of semicircular, rectangular and square shapes were noticed between water depth of 3 and 7 m.

Stone anchors are important elements in marine archaeological studies because they are suggestive of the route of movement of ships. These anchors are useful to infer the relative sizes of the ships. Stone anchors are found in many parts of the Indian coast; Athiyaman and Jayakumar (page 1261) report on the stone anchors off Tamil Nadu coast. The authors have developed a method to calculate the tonnage of ships, using these anchors. This study provides a new approach for assessing the characteristics of ships that floated on Indian waters.

Other aspects

M. McCarthy (page 1268) deals with the management of submerged and terrestrial maritime heritage on the Australian shores. He also refers to two important elements of the Australian maritime heritage in the Atlantic—HM Ship *Roebuck* and an adjacent land camp in the Falkland Islands. He reveals clues on how the information of ancient navigators could be useful for the explorations of shipwrecks underwater.

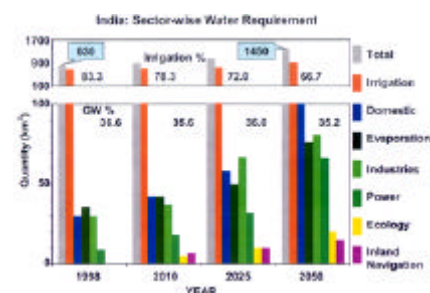
Joe Flatman (page 1276) deals with the analysis of maritime scenes in medieval illuminated manuscripts. Manuscript illuminations have been generally used to analyse specific details such as shipping and sea life; they also bear imprints of the broader picture of the maritime world. Flatman explores this broader perspective, by highlighting common themes and exploring the origins of artists and their inspiration. In particular, he addresses the issue of iconographic accuracy, in terms of distances and perspective. He presents a rich bibliography and a variety of information on the various aspects of ancient and medieval period maritime activities.

We thank P. Balaram for inviting us to be guest editors of the marine archaeology section. Perhaps this is the first serious attempt to bring together a broad spectrum of researchers working on various aspects of marine archaeology to a common scientific forum and we are happy that *Current Science* provided that opportunity. We are also grateful to Dr Kusala Rajendran for her proactive role in bringing out this special section. We thank all the authors for contributing to this special section. We hope that the papers in this special section will help to communicate the excitement of underwater explorations that continue to open windows to our past.

A. S. Gaur and K. H. Vora

Water in 2050

Starting with a review of the emerging water scenario in India, Gupta and Deshpande (page 1216) make an assessment of the potential for additional water from (i) rainwater harvesting and artificial groundwater recharge and (ii) reuse and recycle of wastewater to examine if these strategies can provide the required quantity of water to meet the anticipated deficit in the target year of 2050.



It is shown that in normal year, water conservation, recycling and reuse can significantly enhance the water availability to meet the anticipated demand. This does not mean that inter-basin transfer of water is not required as such a view ignores regional imbalance. In water-scarce parts of the country it is not possible to increase the availability of water without bringing water from other basins. This is true even after estimated utilisable surface water and replenishable groundwater sources have been fully developed and measures for conservation, recycling and reuse of water have been put in place.

It is argued that considering gestation period and capital requirements, rainwater harvesting and water conservation measures must receive the highest priority followed by renovation and recycling measures to be followed by inter-basin transfers in the last phase. But, investigations and planning process for all three options must begin immediately.