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An ancient harbour at Dwarka: Study based on the recent underwater explorations

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Dwarka, an ancient harbour and an important religious centre of the Hindus, has played an important role in the history of maritime activities of Okhamnadal region since the early historical period. Gomati creek, located at the eastern side of Dwarka, served as a safe harbour till the 19th century AD. Offshore explorations have brought to light a large number of stone structures which appear to be the remains of an ancient jetty. This hypothesis is supported also by the discovery of a large number of stone anchors of various types in Dwarka waters. The typology of anchors has indicated that Dwarka was an important port since historical period. Maritime activities increased many folds during the medieval period. This flourishing port and religious capital is believed to have submerged under the sea after the death of Lord Krishna. This paper highlights the results of the offshore explorations carried out during the last two decades in the Dwarka waters.

THE ancient city of Dwarka, situated on the extreme West Coast of Indian territory, occupies an important place in the cultural and religious history of India. The fabulous architectural planning of the Dwarka temple has attracted tourists from all over the world. The town has association with Lord Krishna, who is believed to have founded this town by reclaiming 12 *yojana* land from the Sea. During its glorious past, Dwarka was a city of beautiful gardens, deep moats, several ponds and palaces¹, but it is believed to have submerged just after the death of Lord Krishna². Due to its historical importance and association with the great Indian epic *Mahabharata*, Dwarka continues to attract archaeologists and historians besides scientists.

Ancient Sanskrit words like *pattana* and *Dronimukha* have been generally used to describe coastal port cities where national and international ships and boats were harbor³. The oldest reference to the Agade harbour comes from the Mesopotamian text which mentions that boats from *Meluhha* used to be anchored in Agade harbour, datable to the mid-3rd millennium BC⁴. Archaeological excavations brought to light a jetty at Kuntasi in Gujarat dating back to Harappan period⁵. Similarly, excavations have revealed a dockyard and a few stone anchors at Lothal,

another Harappan site⁶. There are several literary references mentioning ports at many coastal sites during the early historical period (2500 to 1500 yrs BP), but archaeological remains of these ports are scanty. Most of the settlements were situated either on the river banks or on the banks of backwaters, which would have served as an excellent natural harbour. These locations being highly vulnerable to floods and other natural disasters, it is not surprising that only scanty evidence for their existence remain. Excavations at Poompuhar brought to light, a wharf⁷ situated on the bank of the old course of the river Kaveri. Similarly, onshore excavation at Elephanta Island yielded a wharf dating back to early centuries of the Christian Era⁸. There is evidence to suggest that the present Bet Dwarka jetty has been used as a harbour since the early historic period⁹.

Historicity of Dwarka

The city of Dwarka has been under investigation by the historians since the beginning of the 20th century. Although a very famous religious and maritime centre, the exact location of this port city was under debate since long. Several literary references, especially from the *Mahabharata* have been used to suggest its exact location. Pargiter¹⁰ was the first to suggest that Dwarka was located near the Raivataka mountain; he also mentioned that it was constructed on the remains of Kusasthali¹¹. Pusalkar¹² suggested that Dwarka of the modern times is the original Dwarka mentioned in the *Mahabharata*. Sankalia¹³ has also strongly argued that the modern-day Dwarka is in fact the same as the one that existed during the *Mahabharata* period. The earliest epigraphical reference to Dwarka comes from the Palitana copper plate of Garulaka Simhaditya dated to 574 AD. **The unknown Greek writer of the Periplus of Erythraean Sea makes a mention of *Baraca*, which has been identified as modern Dwarka¹⁴. In Ptolemy's Geography, *Barake* is the name of an island in the Gulf of Kanthi¹⁵, and the reference is most likely being made to Dwarka.**

We report here the results of marine archaeological explorations undertaken by the Marine Archaeology Centre of the National Institute of Oceanography, Goa between 1997 and 2001. The primary objective of this study was to appraise the earlier observations and to assess the nature of structures. We also discuss various issues raised¹⁶ on

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the observations from our earlier exploration, particularly on the interpretation of structures and their dates.

Methodology

The primary data were collected by the underwater visual survey mainly through SCUBA diving system. The artifacts like stone structures and anchors were located and a marker buoy was tied to each finding for detailed measurements and recording. Thereafter important structures were manually cleaned. At a few places airlift operations were undertaken to expose the buried artifacts. The objects were plotted underwater with the help of a compass. Similarly, Global Positioning System of each object was obtained from the surface. Findings were also documented through underwater still and video camera and drawings.

Results

Explorations have been undertaken from onshore to a water depth of 20 m about 1 km offshore (Figure 1) from the Samudranarayana temple. In the north–south direction, the exploration was extended between lighthouse and opposite to the Panchtirtha temple. The findings are described area-wise.

Inter-tidal zone exploration

A large number of scattered blocks of a wall constructed by the Gaikwad ruler (late 19th century AD) are noticed south of the Gomati creek during low tide. Two huge circular structures (Figure 2) were noticed adjacent to the

Gomati channel, which have a diameter of 2 m and height about 1 m. Besides these structures, eight stone anchors of different types namely composite, grapnel and ring-stone were noticed from inter-tidal zone area.

Offshore explorations

The underwater topography of shallow water consists of beach rock formation, covered with dense vegetation. Thick deposition of sand, in the small channels, is occasionally noticed. Topography beyond 10 m water depth is sandy and rock boulders without vegetation were rarely noticed. A number of artifacts were discovered during offshore explorations between 3 and 16 m water depths. Broadly, these artifacts can be divided into the following two categories.

(A) *Structures:* Underwater visual explorations at about 200 m westward from the Samudranarayana temple and opposite to the Gomati creek yielded a large number of stone structures. These structures are found at 3 to 6 m water depth and mainly consist of semicircular structures and fallen walls.

A few semicircular structures are partially intact and some have jointed with hard binding material. Structures with 2–3 courses have been noticed at least at 10 locations. The semicircular structures were constructed by using L-shaped blocks (Figure 3) with provision for dowels. The average size of a block of semicircular structure is 95 × 55 × 25 cm. The sizes and shapes of the blocks are similar to those found during onshore explorations.

Besides semicircular blocks, a large number of rectangular blocks have been noticed in this area. They are scattered over a vast area and do not follow any regular plan (Figure 4). However, at a few places 2–3 courses of blocks appear to be the remains of fallen structures. These blocks are found close to the semicircular structures, which indicate that these may have been part of some larger structure. The rectangular blocks have various sizes and important ones are 120 × 60 × 16 cm, 115 × 50 × 17 cm, 110 × 50 × 18 cm and 45 × 30 × 14 cm. Most of the

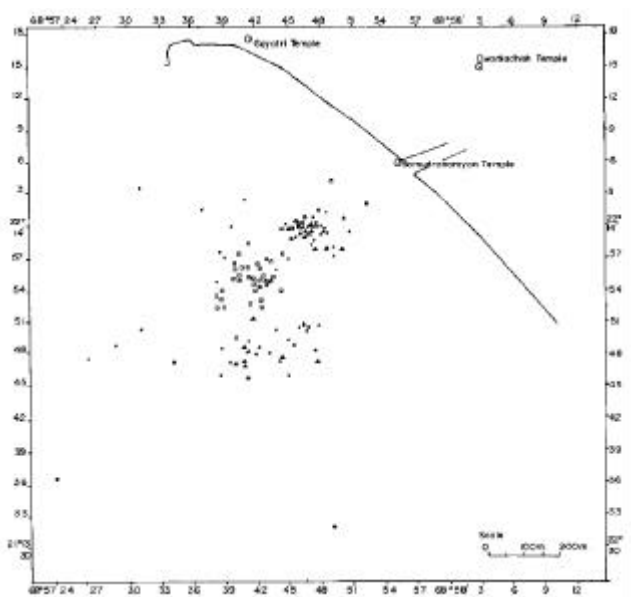


Figure 1. Map showing archaeological findings off Dwarka.



Figure 2. A circular stone structure exposed during low tide off Dwarka.

structures are lying exposed on the rocky sea-bed, however, a few of them are partially buried in the sand. The exposed portions of the structures are covered with thick vegetation. A rectangular stone block bearing an inscription in the Gujarati script is another important find worth mention here.



Figure 3. Stone blocks with L-shape cut.

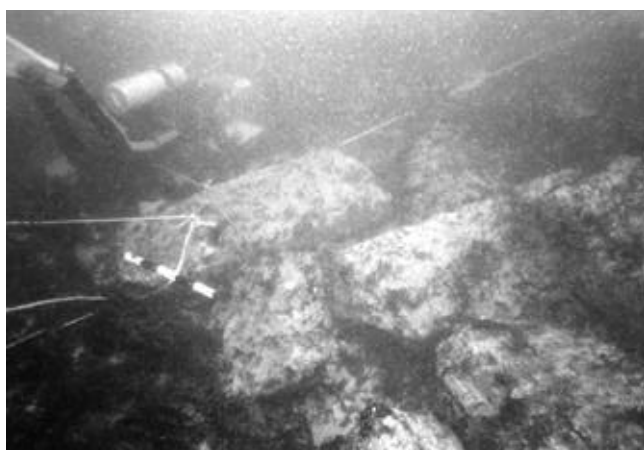


Figure 4. Scattered stone blocks.

Anchors: More than 120 stone anchors of different varieties were noticed in the Dwarka waters. These are lying between inter-tidal zone to water depth of 16 m. Broadly, these anchors can be divided into the following three groups.

(i) *Composite type:* Composite type anchors are often cut from a thin limestone block and are of triangular shape. One anchor cut out of laterite stone was also noticed. The anchors often have three holes, a circular upper hole and two lower ones which are either rectangular or square shaped. Anchors with more than 3 holes were also noticed in Dwarka. Similarly for some anchors all the holes are circular. The upper circular hole was used for tying rope and the two lower holes were used to have two wooden flukes with pointed ends. Total of 34 anchors of this group were found from Dwarka. The biggest anchor of this variety has a length of 1.8 m and maximum width 86 cm and the estimated weight is 496 kg (Figure 5). The smallest anchor is weighing 16 kg.

(ii) *Grapple type:* Several grapple-type of stone anchors were also found in the Dwarka waters. During our exploration we retrieved 63 of such anchors. Most of them are made of locally available limestone and a few are made of basalt rock. Often they have been cut from a long solid prismatic block (Figure 6). The anchor has an upper hole and two lower holes cut in square or rectangular shape.



Figure 5. One of the biggest composite stone anchors.

These anchors have also been termed as Indo-Arabian type as this type of anchor is believed to have been introduced by the Arab navigators and used in the Indian Ocean. The biggest anchor has a length of 2.37 m, width of 40 cm and an estimated weight of 668 kg while the smallest anchor with its shape fully preserved has an estimated weight of 82 kg.

(iii) *Ring-stone type*: Ring-stone type anchors are also found in the Dwarka waters. Twenty-five anchors of this type were found and these lie scattered from inter-tidal zone to 16 m water depth. An important characteristic of the ring-stone anchor is its circular shape, with an axial hole (Figure 7). Often, the base of ring-stone is flat and top is semi-circular rising to a certain height. Most of the ring-stone anchors remain exposed on the seabed; however, a few are partially buried in the sediments. Up to a depth of 8 m, the exposed portion of the ring-stones is covered with marine growth such as seaweeds. Beyond this depth they are covered with a thin layer of greyish marine growth. They are normally found lying in vertical position, tilted and flat positions are not uncommon. A



Figure 6. Grapnel or Indo-Arab type anchor.



Figure 7. Ringstone anchors.

few ring-stones also have the evidence of chisel marks on their surface, around the hole and on the flat bottom side.

Discussion

Sankalia¹³ had argued that the safe harbour in the back-water of the Gomati Creek was one of the main attractions for the early settlers in Dwarka. The offshore explorations at Dwarka have brought to light many interesting findings, that are suggestive of early settlements. Perhaps, the Dwarka waters have the largest number of anchors in the world and these come in a wide variety. However the purpose for which each of these anchors was used and their ages are debatable. The following different views have been presented below.

Harbour or habitational site?

Underwater structures particularly semicircular ones have been described as the remnant of bastions of the Fort wall¹⁷ as in the case of Harappan, historical and mediaeval period. However, the absence of any other artifact, like pottery, suggests that this may not be a habitational site. Underwater explorations in Bet Dwarka⁹ and Poompuhar¹⁸ yielded a large number of pottery from 5 to 8 m water depths, indicating that any submerged habitation should have at least pottery, which is absent in Dwarka. Therefore, it may be argued that the structures found off Dwarka might not be the part of any habitation. Findings of the large number of stone anchors along with these structures suggest that the boats were anchored here.

The structures recorded onshore and offshore, particularly the circular (Figure 2) and semicircular structures, are presumably the bases of pillars and perhaps represent the remnant of a jetty which was running from shore and continued till 300 m offshore. Sankalia¹³ has mentioned that 'Sayajirao Gaekwad of Baroda had built a dock along the Gomati creek and a *ghat* (landing place) on the opposite side, with huge stone pillars to facilitate tying the ships'. It is quite likely that the remains lying on the shore and offshore regions are remains of the same dock. Presence of anchors which are lying along these structures also support this hypothesis. Similar types of structures are also noticed in the Rupen Bundar (2 km north of Dwarka) during low tide. Information provided by local fishermen suggests that this was a 150-year-old jetty, used for loading of cement. However, the jetty was abandoned about 80 years ago. Interestingly, stone anchors have not been found from Rupen Bundar, which suggest that the remains of Dwarka jetty are older than the Rupen Bundar.

Date

Underwater stone structures of Dwarka have been suggested to be part of a habitational site dating back to the

protohistoric¹⁹ and the historical periods²⁰. Study of the structures of protohistoric and historical period in the nearby localities such as Okhamandal suggests that the blocks used for the construction are different from those found in Dwarka waters. Excavations at Nageswar, a protohistoric site, yielded several structures of small irregular blocks²¹. Similarly excavations at Bet Dwarka revealed that small irregular blocks dating back to the early historical period were used for construction. Structures from Dwarka waters are found to be uniformly dressed with provision for dowels. Explorations brought to light a rectangular stone block bearing Gujarati script, which suggest that these structures are of recent origin. The anchors belong to a wide time range, between historical period to 15th century AD^{22,23}. All of these evidence argue that the harbour at Dwarka was in use since the historical period and it must have been repaired and reused during the later period.

Causes for the destruction of the harbour

Coastal erosion is the primary reason for the destruction of underwater structures at Dwarka. A 19th century map of the area indicates that shoreline has advanced landward by 550 m during the last 130 years²⁴ with an average of 4 m/yr. The present offshore explorations have indicated that most of the structures are now within 500 m from shore, therefore, it is quite conceivable that the present underwater structures were within the inter-tidal zone during the 19th century. Geological studies suggest that due to lack of sediment discharge into the Gulf of Kachchh, the area is prone to severe erosion²⁵. Besides these natural factors, the development of many other ports and harbours along the Saurashtra coast must have also led to the decline of Dwarka as a harbour. Subsequently, a natural safe harbour came into existence about 2 km north of Dwarka at Rupen Bandar, where a jetty was built about 150 years earlier. Presently, local fishermen use Rupen Bandar as a sheltered harbour.

Conclusion

The underwater structures lying off Dwarka are the remains of a jetty. It is difficult to date these structures precisely, however the binding material suggests that it may be of the late medieval period. Discovery of a large number of stone anchors suggests that Dwarka was an important port since the historical period and continued till late medieval period. Existence of a wide variety of anchors may suggest that different types and sizes of boats from different regions used to visit Dwarka harbour. The available evidence suggests that natural factors like coastal erosion are primarily responsible for the destruction of the port of ancient Dwarka. The development of Rupen Bandar and later on, the Okha port may have also contri-

buted to challenge its prominence as a natural harbour. However, the contribution of Dwarka to the maritime development is as important as its existence as a religious capital of ancient India.

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