

Further Excavations of the Submerged City of Dwarka

S.R. RAO

Since 1983 the Marine Archaeology Unit of the National Institute of Oceanography is engaged in the offshore exploration and excavation of the legendary city of Dvaraka in the coastal waters of Dwarka in Gujarat. Brief accounts of the findings of the underwater search for the lost city have appeared in *Progress and Prospects of Marine Archaeology in India, 1987*, *Marine Archaeology of Indian Ocean Countries, 1988*, *40 years of Research - A CSIR Overview, 1988* and *Journal of Marine Archaeology, 1990*. The present paper deals with the more significant results of further excavations in 1988 and 1989 and discusses archaeological and literary evidence for the identification of the port city of Dvaraka of the protohistoric period. It also draws attention to the scientific data available from the underwater excavations in the Arabian Sea and the Gulf of Kutch.

A brief account of the discovery of the submerged city of Dvaraka of *Mahābhārata* fame and the salient features of the structures exposed as a result of underwater excavation conducted at Dwarka and Bet Dwarka by the Marine Archaeology Unit of the National Institute of Oceanography under the direction of the author from 1983 to 1987 appeared in 1988 (Rao, S.R. 1988, 47-53). Offshore exploration of the legendary city at Dwarka was resumed in 1988 and continued through 1990, further seaward of the Temple of Samudranārāyana (Sea God) at Dwarka with a view to trace the plan and extent of the port-city and the purpose of the massive stone walls built on the banks of ancient Gomati. It was also necessary to ascertain whether its architectural features were in conformity with the description of the city of Dvārāka given in the epic *Mahābhārata*. A second object was to obtain more corroborative evidence for reclamation referred to in the epic. Thirdly, the nick point where the ancient Gomati river joined the sea had to be determined. Lastly, the cause of submergence of the city was another problem that needed further investigation.

Onshore and offshore excavation in the island of Bet Dwarka which, according to tradition, was the resort of Śrī Krishna was resumed in November, 1987 and continued through 1988. The main objective was to trace the landward extension of the submerged protohistoric township near Balapur Bay where, in the intertidal zone a submerged wall had been traced in the earlier expedition (Rao, S.R. 1988, 49).

VI MARINE ARCHAEOLOGICAL EXPEDITION AT BET DWARKA

The trenches dug by the Public Works Department in the 'Talao' area near Balapur village for building an earthen embankment were examined, but no remains of any protohistoric settlement came to light confirming thereby that there was no landward extension of the ancient town. Most part of the ancient township was swallowed by the sea and the mud flats of Balapur extending over 1 km seaward had buried the ancient relics. One Trench (A) to the south of the Old Custom House, and the other Trench (A1) in the intertidal zone at the foot of the Custom House mound were sunk to establish the sequential relationship between the two sectors of habitation. (Fig.1) The short duration of 3 or 4 hours at low tide when land was exposed near the shore, rendered excavation in clayey deposit very difficult. Even so, a rubble foundation, 35

cm broad, and a few sherds of a large storage jar lying on the floor of the house were exposed in Trench A1. Several worked columella of conch shell found lying in a line suggested that the house belonged to a shell-worker. Excavation had to be abandoned after digging to a depth of 20 cm because of high water table in lowest tide also. Trench A1 was however extended on the west and the extension was marked XA1, but no structure came to light. Layer 1 of trench A1 is surface humus, layer 2 consists of fine grained silty sand mixed with shingle and layer 2A, where shells and pottery are found, is darkish clay. No pottery was found in layers 2 and 2A of XA1.

A trench 2 × 2 m was laid above the rain gully in the Custom House mound to ascertain the cultural sequence. In all, 10 layers were distinguished. Layers 1 to 4 upto 1m depth yielded Muslim glazed ware and red ware of early medieval period. In Layers 5 and 6 in 1-1.3m depth the Red Polished Ware assignable to the first five centuries of the Christian era was found. One sherd inscribed with the letter *syā* meaning 'of' in Brahmi characters of the 1st-2nd century A.D. was recovered. Layers 8-10 yielded a few sherds of the Lustrous Red Ware and coarse red ware of the post-Harappan phase. Natural soil could not be reached. A large number of shell bangles and a couple of worked columella were found in the medieval and early historic deposits. A bead of fish bone is the only find from the post-Harappan deposit. It was decided to postpone to a later date the excavation of the intertidal zone and the mound further north of the earthen embankment of the Talao where Late Harappan pottery has been found.

MASSIVE STONE PROTECTION WALL-CUM-PIER IN BDK VIII

In the course of exploration of the near shore and intertidal zones south of Balapur Bay on 4th January, 1988 Mr Rajan, diver-archaeologist and Mr Sirsath, photographer discovered a massive rubble wall exposed in lowest low tide and the site has been designated as BDK VIII (Pl. 18-19). The wall remains submerged at high tide under a column of 2 m water above its top. Excavation was conducted on both the sides of the eastern arm of this structure on the 9th and 10th January in order to expose to full extent the height of the structure and determine the nature and purpose of constructing such a large enclosure which is 558 m in its peripheral length. (Fig.2)

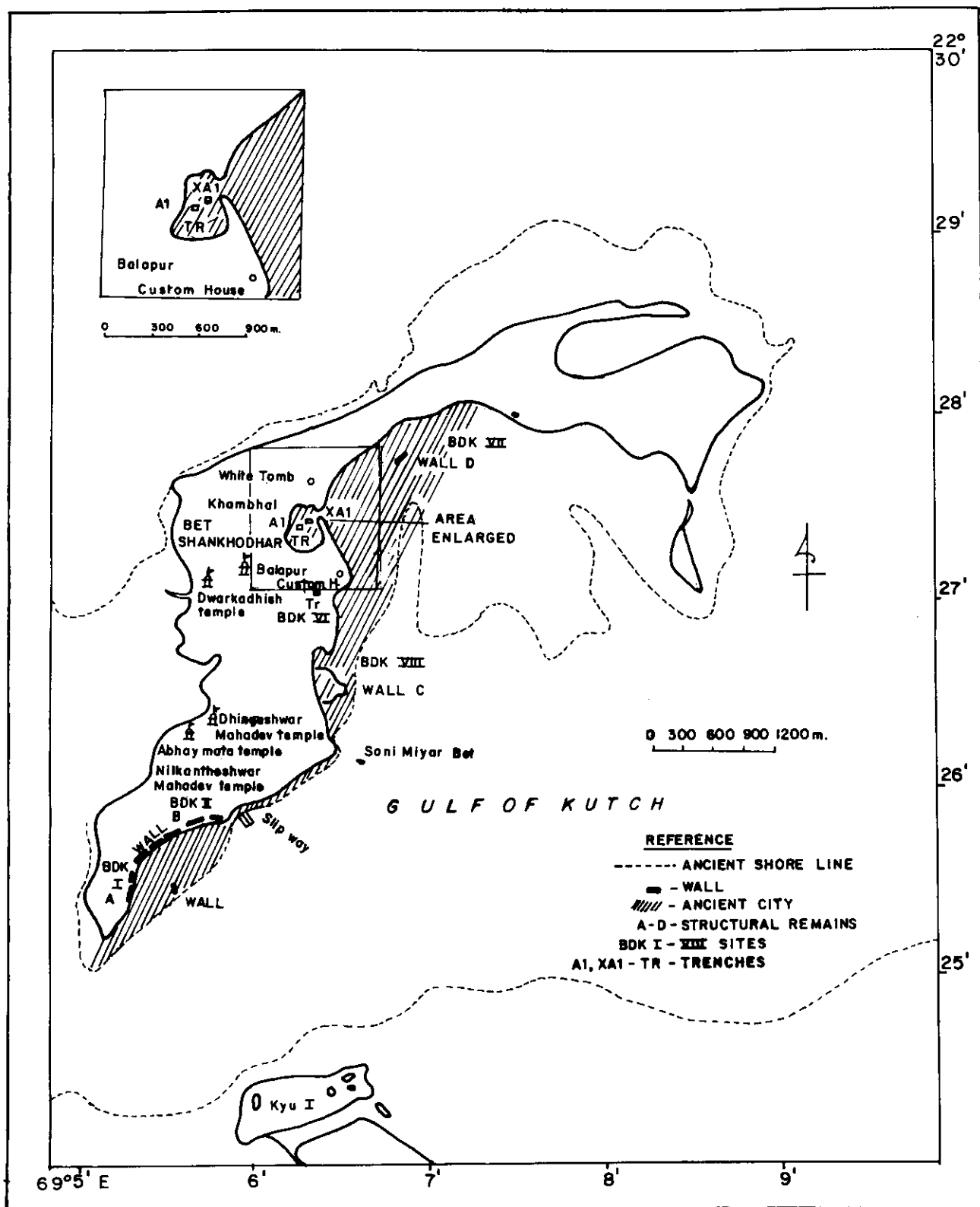


Fig. 1

Trenches measuring 1×1.2 m were laid on its southern and northern faces. In all, 9 courses of dressed and undressed stones, of which 4 courses are covered by silty clay deposit were traced. The wall was constructed on the bed rock. The stone masonry is heavily incrustated with barnacles and other sea organisms. It is very difficult to remove the incrustation without chiselling it. Originally the wall must have been atleast 2.5 to 3 m high. Presently it is only 1.5 m in height. The enclosure wall is an irregular hexagon on plan. An interesting feature of construction is the use of wedge-shaped blocks of stone for the shell, while the core is made up of rubble-filling. That the structure is man-made becomes apparent from the use of dressed stones closely laid and also from the box technique of construction. The thickness of the wall at the base is 2.5m while the extant tapering top is 1.5 to 2m thick. The pottery found in the trench is coarse grey ware but heavily rolled resulting in the disappearance of the slip and decoration if any. Only one sherd of the sturdy red ware of the post-Harappan phase was found in the extremely small trench. Provisionally the structure is datable to 15th century B.C. on the basis of the sturdy red ware. Within the enclosure there must have been very important public buildings – may be warehouses and other structures relating to shipping, for, not far from here are two rock-cut slipways for launching boats. The massive protection wall could have also served as a pier.

DWARKA

The Research Vessel *Vedhavati* arrived on 31st December at Dwarka duly equipped with diving gear, echosounder, heavy compressor, airlift etc. For the next three days Sri. Srinivasa Bandodkar, Chief-diver-photographer and other divers and diver trainees searched for and cleared the submerged structures of the ancient city exposed in the earlier expeditions. They were found partly disturbed and partly covered by sediments and vegetation. Swells and currents had disturbed a few blocks of the top courses of walls. They were photographed and marked by fresh buoys. New areas beyond 500 m seaward of the Samudranārāyaṇa temple were explored and the thick growth of vegetation on ancient buildings were removed. On 3rd January a small stone structure was found 200 m north of buoy 35, and the overburden of 2–3 m thickness was airlifted before exposing the topmost course of dressed stones. Lying nearby is a partly damaged bastion which is semi-circular in plan (Pl. 20). The dressed stones used in its construction are 1–2 m long 0.3 m thick. A lunate-shaped dressed block appears to be the *chandraśilā* (moonstone of a temple).

Two stone walls, one each near buoys 40 and 41, were laid bare (Pl. 21-24). The stones used in the construction are 1 to 2 m long, 0.5 to 0.7 m wide and 0.3 m thick. All structures near here are gridded and their position is fixed by sextant. Excavation in layer 3 yielded a sherd of a miniature bowl with everted rim in Lustrous Red Ware of Rangpur III type. The slip has however completely disappeared and the core of the fabric has a pitted surface due to wave action. The sea became choppy

and the currents strong from 15th to 21st January and the boats were heavily rolling. In an attempt to reach the shore the crew of the dingy was thrown out by heavy breakers but there was no serious injury to anyone. Underwater exploration was suspended for 3 days and limited search was undertaken next 3 days. In the solstice (14th January) orbital movements seem to be responsible for the abnormal roughness of the sea with waves breaking 3m high near buoy 19 and causing considerable damage to ancient structures in the sea bed. Taking advantage of the lowest tide – 0.12 (Okha) on 21st January the sea bed of nearshore zone from Samudranārāyaṇa Temple to the Light House was surveyed. Some well dressed architectural members including a semicircular moonstone (*chandraśilā*) of a public building were exposed 30m seaward of Samudranārāyaṇa indicating the existence of an earlier temple. Two rock-cut channels were also exposed to the north of Samudranārāyaṇa. A few iron rings fixed in the wavecut bench at the foot of Samudranārāyaṇa indicated that small boats could be ferried through the rock-cut channels from the sea and river channel and secured to mooring rings in the early centuries of the Christian era.

A pier-like structure was exposed on the left bank of the channel opposite buoy 35 and the construction suggests that it could be used as a jetty or quay on the river bank, for several triangular and prismatic stone anchors were found lying nearby. Further seaward a large area was searched manually and buoys 41 to 54 were placed to indicate the location of structures or anchors. On the left bank 3 anchors were found near buoy 53, one each near buoys 50 and 51 and three more near buoy 55. Trench 15 was laid near buoy 53. Airlifting was done near buoy 54 for collecting samples. Layer 1 consisted of fine sand; layer 2 was slightly coarse sand, and layer 3 consisted of coral and shingle covering bed rock. The total thickness of sediment is 1 m. A sherd of a large sturdy jar and stem of a dish-on-stand were recovered from layer 3. Two bastions were exposed near buoy 59 on the right bank and Trench 12 was sunk here for obtaining stratigraphic evidence and pottery for determining the age of the structures. Stone anchors found near buoys 45, 46, 47, 48 and 51 have been documented. A large single-holed semispherical stone base of a flag post (Fig. 3) was found *in situ* near buoy 48. It is 53 cm in diameter at the base and the height is 30 cm.

The larger triangular 3-holed anchors are 63 to 95 cm in length, 43 to 50 cm broad at the base and 25 to 29 cm at the top (Fig. 4). The prismatic anchors are 1.2 to 2.3 m long, 33 cm broad at the base and are tapering at the top.

Excavation near buoy 35 yielded a copper *lota* and a white marble statue with broken legs, but the rest of the body is missing. A pedestal of black stone with 4 pointed feet for embedding in the earth may be an altar and it is doubtful if it was used as quern because there is no depression caused by rubbing. Farther away near buoy 55 on the left bank a trench (15) was sunk and the sediments were removed through fanning action. It is here that a copper bell and brass parts of what looks like a miniature chariot (Pl. 26) were recovered. The perforated arches might have supported a canopy of a

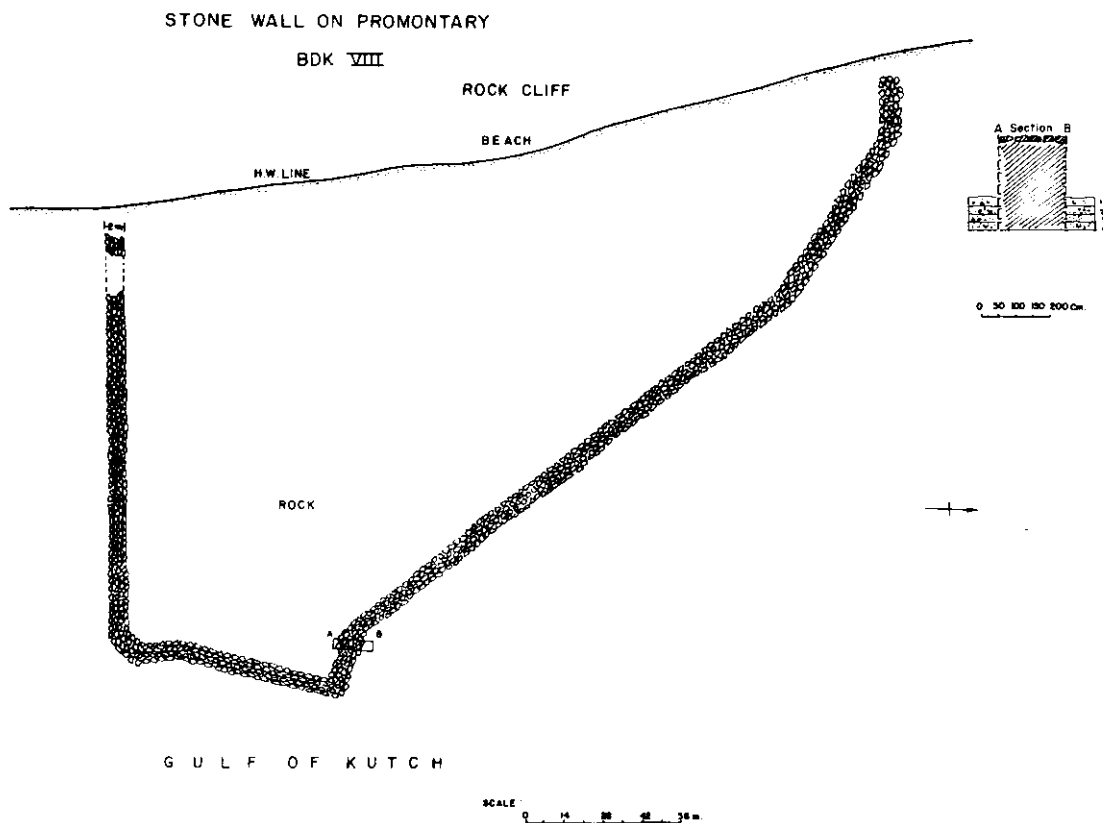
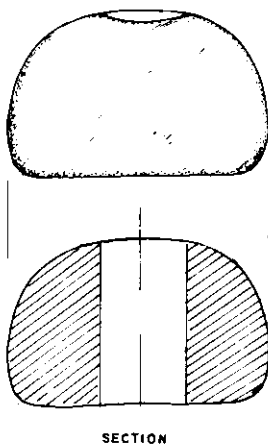


Fig. 2

STONE ANCHORS IN DWARKA WATERS:

STONE BASE OF
FLAG POST DWARKA



Scale: 0 10 20 30 40 cm.

Fig. 3

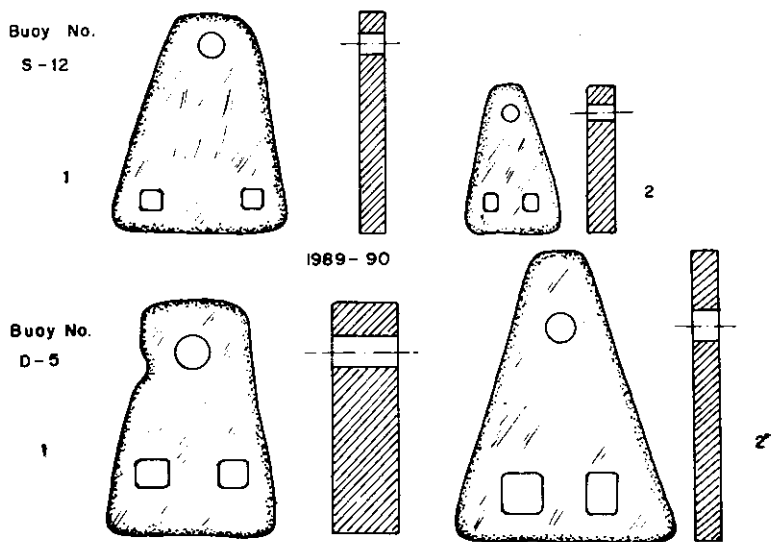


Fig. 4

wagon type chariot. As revetting was known to the Harappans it is no wonder if the metalsmith of protohistoric Dwarka could also re-vent the bars and drive holes in the brass-like metal. The metal objects of the Dwarka chariot are found to be made of brass. Unfortunately very little information is available on the antiquity of brass before 300 B.C. at Taxila and at Prakash in the late phase of NBP. The brass from Prakash is either copper-Zinc alloy (17.75% Zinc, remainder copper) or leaded brass (25.86% Zn, 8.34% Pb and remainder copper). Lead was used in Lothal in 2000 B.C. as can be seen from two lead pieces one containing 91.42% and the other 99.54% pure. The sleeved axe of Lothal contains 96.27 copper, and 2.51% lead, while the grooved rod contains 57.75 copper, 9.02% tin and 3.31%. The advanced metal technology can be inferred from the use of iron stakes in Bet Dwarka to which reference is made in the *Mahābhārata*. Ancient Indian steel dates back to 600 B.C. at Rajghat (Bharadwaj 1984, 143), but iron technology was developed by 1500 B.C. at Dwarka in Gujarat and at Gufkrol in Kashmir (A.K. Sharma in this volume).

The presence of several structural remains between buoys 51 and 55 and also between 51 and 53 necessitated gridding the entire area for purposes of preparing the site plan of the township. Further west near buoy 59 a stone pillar with a square base and cylindrical shaft was found in the seabed. It is indicative of the fact that a public building of religious or secular importance existed here. Two triangular anchors were found near buoy 58 and a single-holed anchor was traced near buoy 53.

In the absence of Mini Ranger III needed for very accurate fixing of positions, the sextant was used and checked with the distances between structures measured manually. For instance, buoy 53 is about 1200 m from Samudranārāyaṇa and the bastion of inner gateway (str.1) at buoy 35 is 200 m seaward of buoy 8 which itself is 200 m seaward of Samudranārāyaṇa. The bastion of the outer gateway is near buoy 59. The position of buoys especially those marking bastions, gateways and protection walls had to be rechecked subsequently with the help of Mini Ranger III.

Two coils of steel wire lost by a boat in comparatively recent times were found near buoy 35. As they were heavily damaged their retrieval was not attempted. A large prismatic anchor 137 cm long was recovered from the station marked by buoy 46. Rajan took soundings at 50 m intervals along the banks of the Gomati channel and across it also for studying the gradient and width of the channel, but these had to be further checked with the echosounder readings at closer intervals.

EXPEDITION 1989-90:

The main purpose of the expedition was to determine the limits of the submerged city and the nick point where the Gomati joined the sea 3500 years ago when Dwarka was built. This could be achieved by echo-sounding, side scan sonar and shallow seismic profiling surveys which could indicate

anomalies and provide the bathymetric data. Simultaneously through optical and manual surveys the anomalies could be examined to distinguish man-made constructions from natural formations. It was also felt necessary to fix precisely the position of structures already discovered and determine the course of the ancient channel of Gomati river. The profiles would help to establish the shifting of the flow channel, if any. The area covered in the course of the survey is 5 × 6 km upto 25 m depth so as to include a 'spit' referred to by Pathak (Pathak *et al* 1988, 58-62).

The MFV *Sea Master* and *Sharda Devi* were engaged for exploration and survey. A dingy with outboard engine ferried between the main boats and shore. At three locations namely A4, A5 and A3 along the right bank of submerged channel of Gomati anchors were found. Southward of A5 a stone pillar and bastion were located at the station P which is gridded. At 60° southwest of Dwarkādhis-Samudranārāyaṇa transit line a bastion in situ (S4), a fallen bastion (S3) (Pl. 24), a disturbed wall (Pl. 25) and a large stone slab (S4) were found. Further south of S4 is another bastion (S2). These structures are in 7 m depth. Towards the west several anchors were discovered at stations A2, A8 and A11, in 8m depth. Heavy growth of vegetation on the bastions and walls had to be cleared carefully before photographing and plotting them. A very interesting feature of the masonry is the L-shaped joints in setting heavy dressed blocks of stone for constructing bastions in high energy zone (Pl. 28). Even so a couple of bastions have collapsed, but others in deeper waters namely low energy zone are in situ. Three groups of structures at S2 were gridded. A spherical anchor with 2 holes is recorded at A12, about 70° NW of the grid. The following is the resume of anchors and structural remains found in the course of the present expedition:

- A1 fragmentary anchor
- A2, A3, A8, A9, A10, A11, A13 prismatic anchors
- A7 and A12 triangular anchors
- S1, S3 wall
- S2 bastion (fallen), S9 bastion in situ

Others S4 to S8 and S10 to 13 are dislodged architectural members, mainly large dressed blocks. Two iron anchors were found near A13. One of them is 1.5m long and has 5 arms.

Geophysical Survey – a summary of the results of Geophysical survey carried out by Vora's team has been received. The salient points of observation and recommendations of the team are mentioned briefly below (Fig. 5).

High resolution Marine Geological and Geophysical Surveys carried out off Dwarka for marine archaeological purpose was aimed at finding direct or indirect evidences of the existence of relics of sunken ships and submerged ports beyond the area already surveyed by MAU. Another objective was to suggest places for diving based on the data collected.

The surveys were carried out in December 1989 in 2 to 22 m water depth over an area of 5 × 2 km by echosounding, side

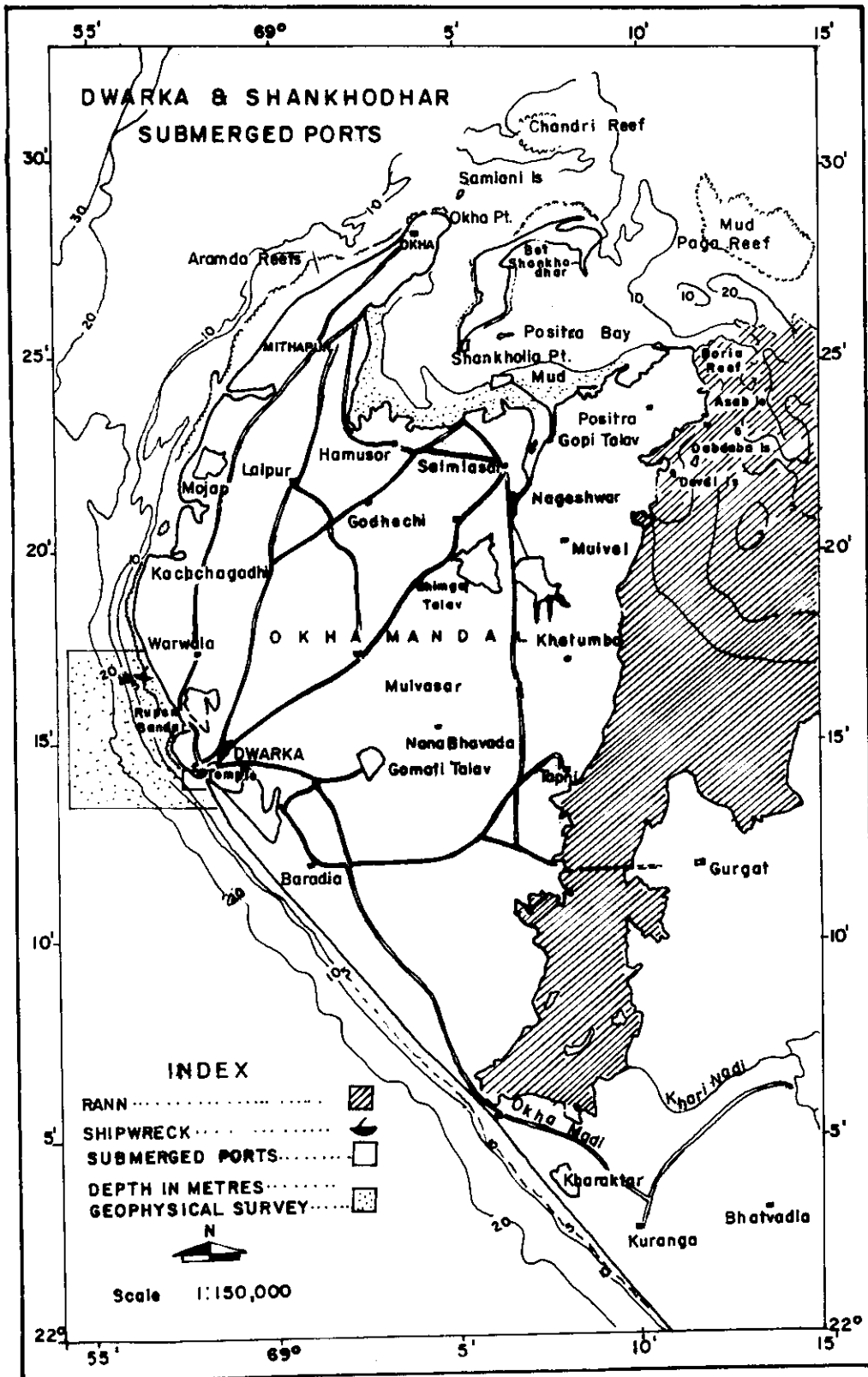


Fig. 5

scan sonar and shallow seismic profiling (Fig. 5); scale adopted was 1:5000. The survey area was divided into two parts, north and south for convenience. In the northern part from Rupen port to Dwarka Light House, 45 lines perpendicular to the shore were surveyed while south of Dwarka Light House 22 lines parallel to shore were surveyed. The results of the survey indicated extension of Gomati for about 1.5 km in NE-SW direction and its channel is about 400 m wide. Apart from this channel, other submerged drainage systems were also noticed. Other Geomorphic features present in the area include scarps, terraces and pinnacles. Sonographs collected from the area show large tonal variations throughout the area which includes furrows of various sizes and directions, and at times ripples, boulders etc. The channels of Gomati as revealed by echograms are highly significant. The present channel along the Gomati Ghat was not the original course of the river 4000 years ago. It was to the south of temple of Samudranārāyaṇa and the channel was wider. The river seems to have joined the sea through more than one channel and the structures so far traced lie along the central channel. Nearshore, the submerged Gomati bed shows a deep wide symmetrical V-shaped channel, either side of which is at the same elevation. A small channel formation is seen to the south. Bending of contours in the area in more than 13 m water depth towards shore in southwest direction indicates a depositional phase, while in lesser contours there is a strong erosional activity. The result is that many structures built of smaller fractional blocks are destroyed in shallower waters, while those built of heavier blocks to serve as piers, wharf, protection walls and jetty are only partly destroyed and buried under 1 to 2 m thick sediment especially beyond 12 m water depth.

Though there are some anomalies present on the sea floor, nothing more could be said about them until divers verified whether they were natural phenomena or man-made objects. Shallow seismic profiles showed no penetration in the area. However five locations were given to the diving team of MAU for direct inspection. At one such point a large iron anchor was found by diver-archaeologists. Accurate position fixing of the five points with miniranger had to be postponed to the next season as the sea became rough, but the position of some of the marker buoys, where structures were discovered by MAU was fixed with sextant. The map obtained from Dwarka Municipality did not show accurately the present shore line and it is to be surveyed and redrawn for position fixing. On the left bank of Gomati the divers uncovered three arms of a large rectangular structure (Str. 5-6) and a corner bastion (Str 7) at buoys 68-69 and 70. Opposite the inner gateway on the right bank, the width of one of the submerged channels of Gomati is 170 m. Further westward of structure 7, four 3-holed anchors were exposed.

On January 14, 1989 the wave-cut bench and iron rings fixed in it were exposed a few metres seaward of SN at lowest low tide. A mooring pillar and a fragmentary deity in black stone were recovered from the rocky bed near the Light house.

On January 21, two rock-cut channels meant for sluicing small boats were exposed to view between SN and Light House. The Iron rings and rock-cut channels belong to period II, while the protection walls, and enclosures on either bank at buoy 35 and extending 500 m seaward belong to period I. The farthest point of structural activity so far traced is about 1.2 km seaward of SN, but a plan of the city can be made out upto 800 m. A pier - like structure on the left bank where a platform which could be used for loading and unloading exists might have been the jetty for smaller boats. The terraced top of an escarpment nearly 1.5 km seaward of SN was the main anchorage for the ocean going vessels. That there existed a port-installation here is indicated by the collapsed building blocks lying scattered at the foot of the scarp but further examination of this scarp and another rock standing high further northwest will have to be made by divers for preparing the ancient limit of the port-town.

DISCUSSION

Dwarka was a city-state extending upto Bet Dwarka (Śankhodhara) in the north and Okhamadhi in the south. Eastward it extended upto Piṇḍāra. The 30 to 40 meter-high hill on the eastern flank of Śankhodhara may be the Raivatata referred to in the *Mahābhārata*². The general lay-out of the city of Dvārakā described in ancient texts agrees with that of the submerged city discovered by MAU. Four enclosures are laid bare; each one had one or two gateways (Fig. 6). The port Aramda (*Ārambhadvāra*) on way to Bet Dwarka was the first gateway in the outer fortifications. The bastions flanking gateways of submerged Dvārakā resemble those of Kuśinagara and Śrāvastī carved on the Gateways of Sanchi Stupa. The *prāsāda* referred to in the epic must be the high fort walls of Dvārakā a part of which is extant. The epic says that flags were flying in the city of Dvārakā. This can be corroborated by the stone bases of flag posts found in the sea bed excavation. Umashankar Joshi is of the view that *antardvīpa* in the region of Kuśasthalī referred to in the *Mahābhārata* must be Bet Dwarka (Śankhodhara). The *Bhāgavata Purāṇa* says that before leaving his mortal frame Śrī Kṛṣṇa put the ladies and children in boats and sent them to Śankhodhara. Hirananda Sastry also identified the *antardvīpa* of *Mahābhārata* with Bet Dwarka.

The buildings built of smaller fraction stone blocks are razed to the ground leaving only small portions of the thick fort walls, bastions and protection walls (built with massive stones) which are too heavy to be moved by tides and currents. From the structural remains in Dwarka and Bet Dwarka waters, it is possible to visualise that the city-ports were large and well planned.

A very significant antiquity that corroborates a statement of the *Harivamśa* is the seal bearing the motif of a 3-headed animal representing the bull, unicorn and goat. The *Harivamśa* says that every citizen of Dvārakā had to carry a *mudrā* as a mark of identification.² The seal (*mudra*) found in the excavation belongs to 15th-16th century B.C.

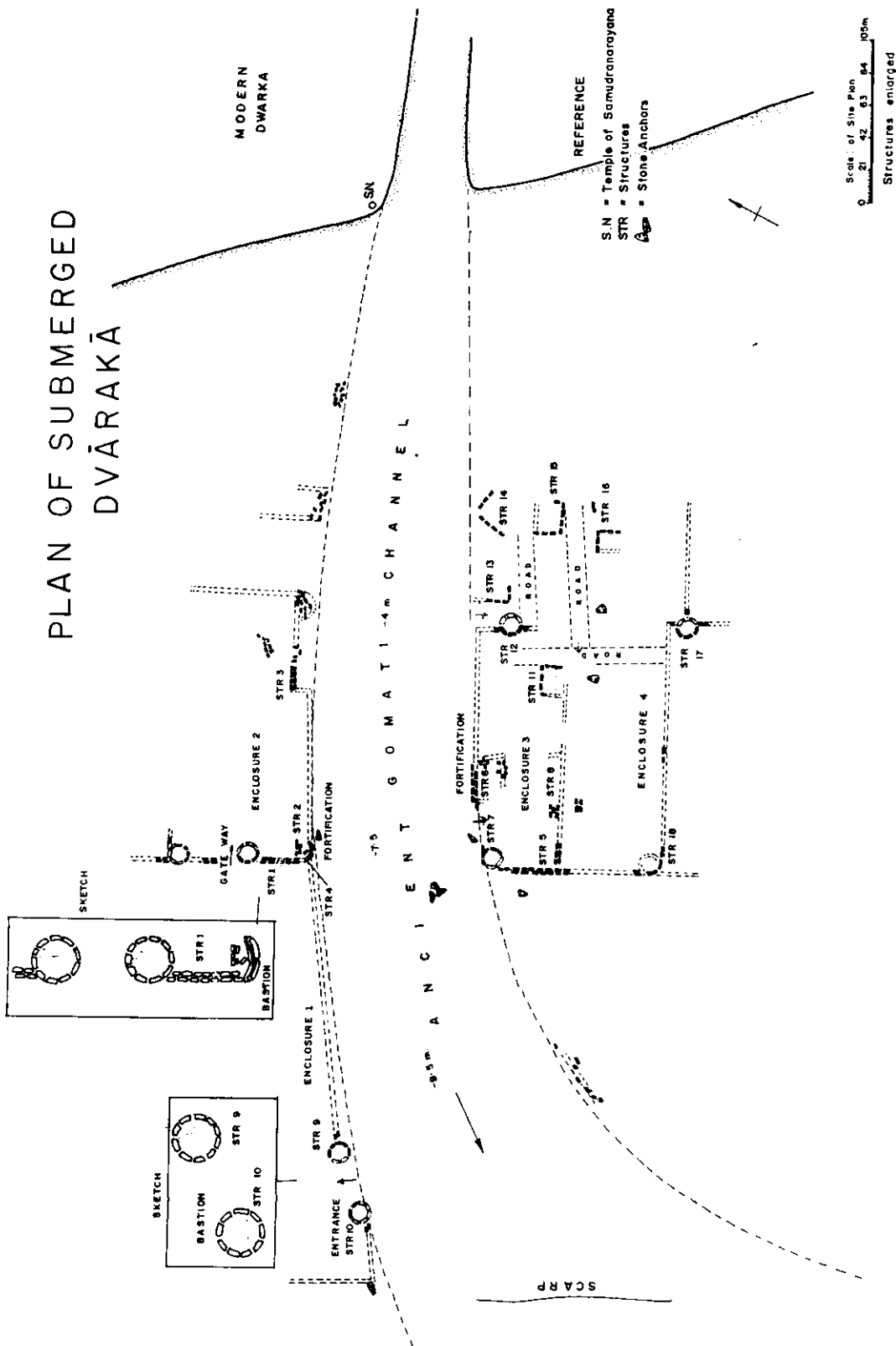


Fig. 6

The reference in the *Harivamśa* to the reclamation of twelve *yojanas* of land from the sea for building Dvārakā has an element of truth in it, for the bastion and protection walls of Dvārakā are found built on boulder foundation. Such a technique is adopted even now for reclaiming land. When Dvārakā was built the sea level was 10 m lower with several pockets of water where boulder foundation became necessary.

The description of Dvārakā as a *nagari* or *mahāpuri* is borne out by facts. All the features of urban planning and urban life are traceable in the sprawling fortified port-city unearthed in Dwārka waters. The prosperity of Dvārakā was due to pearl and shell-fishing as well as overseas trade. The residents were literate and used an Indo-Aryan (Sanskrit) language as can be made out from the inscription. They revered the Sea God, to which a reference is made in the inscribed jar.

The existence of a pre-Dvārakā settlement referred to as Kuśasthali in the *Mahābhārata* is indicated by the perforated jar and chert blades in the early levels of Bet Dwarka.

The use of iron stakes mentioned in the *Harivamśa* for preventing enemy attack on Dvārakā is also borne out by the recovery of an iron stake in Bet Dwarka.

CONCLUSION:

The available archaeological evidence from onshore and offshore excavations confirms the existence of a city-state with a couple of satellite towns in 1500 B.C. That they were submerged by the sea is also proved. The *Mahābhārata* and *Purānas* refer to the submergence of Dvārakā and no other city. It is therefore reasonable to conclude that the structural remains and antiquities found seaward of the area mentioned in the epic are of the city of Dvārakā of the Mahābhārata Age. This discovery has turned myth into history. The date 16th century B.C. for Mahābhārata war may be nearer the truth if we take into account the use of iron weapons in the Mahābhārata War. The introduction of iron technology in India is datable to 16th century B.C. at Gufkrol in Kashmir.

Participants in the Expeditions

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DISCUSSION

Q: You have not said anything about iron objects

A: RAO: We do get iron objects in the intertidal zone of Bet Dwarka. The site has been dated to 1500 B.C. by Thermoluminescence dating technique; the dated pottery comes from a section of the wall in Bet Dwarka. We get identical pottery in Prabhasa as well as Dwarka. This date is corroborated by other finds such as the seal and inscription.

The use of seal (*mudra*) referred to in the *Harivamśa* is also attested to by the late Indus type seal. The use of iron weapons in the Mahabharata war is of importance for dating the event. Iron nails and an iron stake were found in the excavation in the intertidal zone of BDK I-II at Bet Dwarka. It is necessary to note here that the *Harivamśa* refers to fixing of iron stakes in the moat to prevent the enemy from entering Dwarka city. The excavation at Gufkrol in Kashmir has given the date 1500 B.C. In the south the date of iron is Circa 1300 B.C. It appears that iron technology was known in India by 1500 B.C., perhaps not much earlier because there is no evidence of iron objects before 16th century B.C. Hence in the present state of our knowledge we may comment: Mr. Dobbs: I think that it is extremely encouraging that a decision is being taken to have a center of Marine Archaeology based in Goa and also to have other areas of India with their own centers. Prof. Rao ended with an appeal to ASI to help in this endeavour and I hope they are able to reply to that appeal by assisting these centres.