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Marine archaeological exploration and excavation of Vijaydurg—a naval base of the Maratha Period, Maharashtra, on the west coast of India

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Introduction

The Marine Archaeology Centre (MAC) of the National Institute of Oceanography (NIO) has been conducting nearshore sea bottom surveys since 1983 to locate excavation sites of ancient remains such as sunken settlements, anchors, shipwrecks and other evidence of ancient shipping.

The coastal waters of Maharashtra have remained a blank spot on the map of underwater investigations for a long time. The history of ancient shipping and maritime activities of this vast region is virtually unstudied and is poorly documented. Various studies on marine activities in the Maharashtra region have been mainly based on written documents, epigraphic and numismatic materials, or representations in art and architecture, but very rarely on underwater investigations. The importance of this port in the past was revealed for the first time in 1995 following an underwater reconnaissance survey by the NIO off Vijaydurg.

Historical background and naval battles

Vijaydurg is situated on the bank of the River Vaghotan on the southern Konkan coast of Maharashtra. It appears that Vijaydurg served as a minor port in the early historic period up to the 2nd century AD. Ptolemy and the Periplus referred to Vijaydurg as Byzantine in the 1st and 2nd centuries (Schoff, 1974). The early settlers of this region came by sea. Buddhist monks and merchants entered this area during the Asoka Period (273–36 BC). The Buddhist sites in the region are Panhale Kaji, Brahmapuri, Povale and Karad (Fig. 1) which date to the 3rd century AD (Deshpande, 1986). The excavation of Brahmapuri has yielded evidence of commercial contact with the Mediterranean world (Ghosh, 1989). It is probable that the trading community of Brahmapuri contributed towards the spread of Buddhism in the Konkan region. It appears that at the end of the Satavahana Period in Maharashtra in the 3rd century AD, the port towns became a bone of contention between rival political powers and minor ports like Vijaydurg lost their status until the rise of Maratha power.

In ancient times, Vijaydurg Fort was also known as Gheria Fort, deriving its name from a nearby village. It is believed that Vijaydurg Fort was built by Bhojaraja of the Silahara Dynasty between AD 1192 and 1205. Subsequently the region came under the control of Yadavas of the Devagiri and Vijayanagar kingdom. Later, in AD 1431, Adil Shah of Bijapur occupied the fort and made it one of the strongest in the Bijapur kingdom. After conquest and restoration, Shivaji named it Vijaydurg Fort in AD 1653. The fort is located on a convenient promontary at the mouth of the river, mainly made of solid rock and

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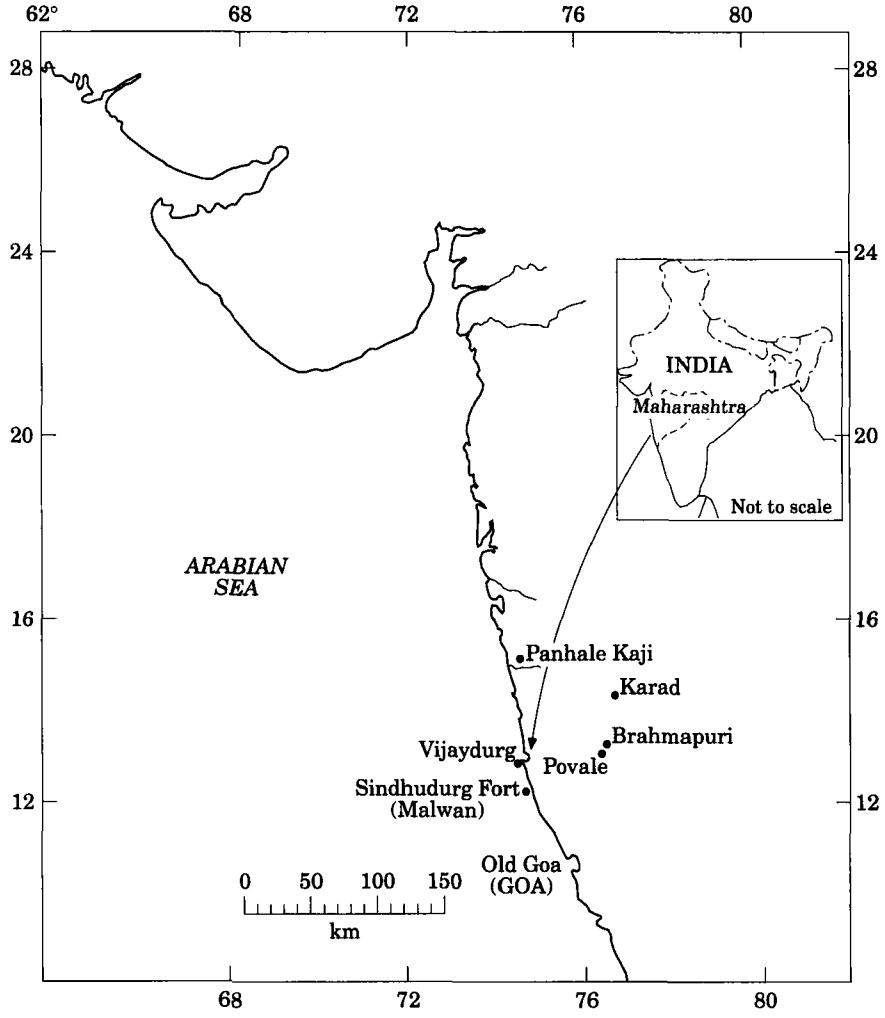

Figure 1. Map showing the location of sites mentioned in the text (Drawing: S. Chitari).

with an almost sheer ascent of about 15 m (50 ft). In earlier times there had been a wooden bridge connecting the fort to the mainland; this was drawn up at night. Due to siltation, the fort today is connected directly to the land. The built-up fortifications consisted of a thick double wall with round towers. Shivaji, the founder of the Maratha kingdom, constructed the third terraces around the fort and made it impregnable.

In order to develop a strong naval force, a number of fleets and naval bases were commissioned by Shivaji between 1659 and 1664 (Apte, 1973). Kanhoji Angre was the Admiral of the Maratha navy in 1699. For three decades, it was fully involved in daring actions at sea. During this period Maratha naval power reached its summit (Mookerji, 1912). The port was suitable for sheltering the Maratha fleets' *grabs* and *gallivats*, ships which were small in size and could easily enter the port and dock, whereas European ships with their deep draught could not pursue them in shallow water. The entrance of the harbour

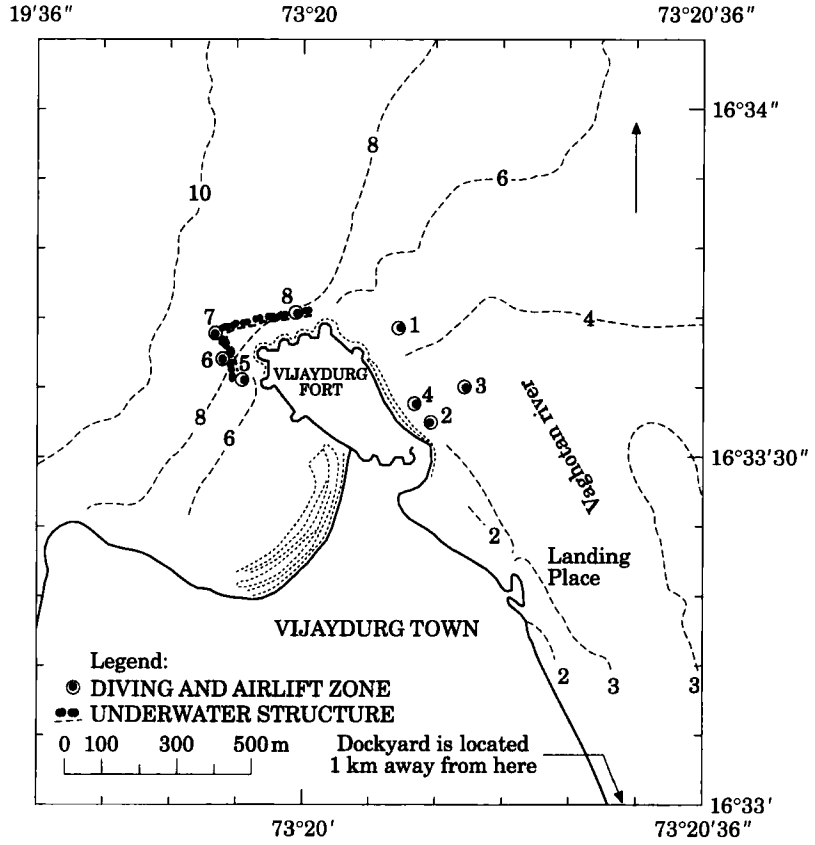

Figure 2. Figure showing the diving locations, airlift operation and underwater structure in Vijaydurg waters (Drawing: S. Chitari).

was also protected by a commanding fortress.

The British, the Portuguese and the Mughals were confronted with the strong Maratha naval presence at sea, and fought several battles with them. In most of these, the Maratha navy emerged victorious. It severely battered the *President*, the *Charlotte*, the *King William* and the *Success* of the British and several merchant ships. Admiral Watson of the East India Company arrived off Vijaydurg on 2 February 1756 with three ships, namely, *Protector, Revenge* and *Guardian* and there was a fierce exchange of fire. Finally on 7 April 1756 Vijaydurg Fort fell into the hands of the British (Sridharan, 1982).

Topography

The geography of southern Konkan is not suitable for agriculture due to the thick and extensive cover of laterite, deeply entrenched drainage, inaccessibility and isolation. Unlike northern Konkan the area around Vijaydurg does not have coastal plains. Although the region is drained by minor rivers, namely Kundalika, Vashi and Vaghotan, the riverine plains are narrow and confined.

The geophysical survey off Vijaydurg conducted a decade ago by NIO shows a smooth gradient sandy zone in the bay and a steep gradient around the cliffs and headlands. The river changes its course as a result of heavy siltation and the formation of a sand bar on the northern side.

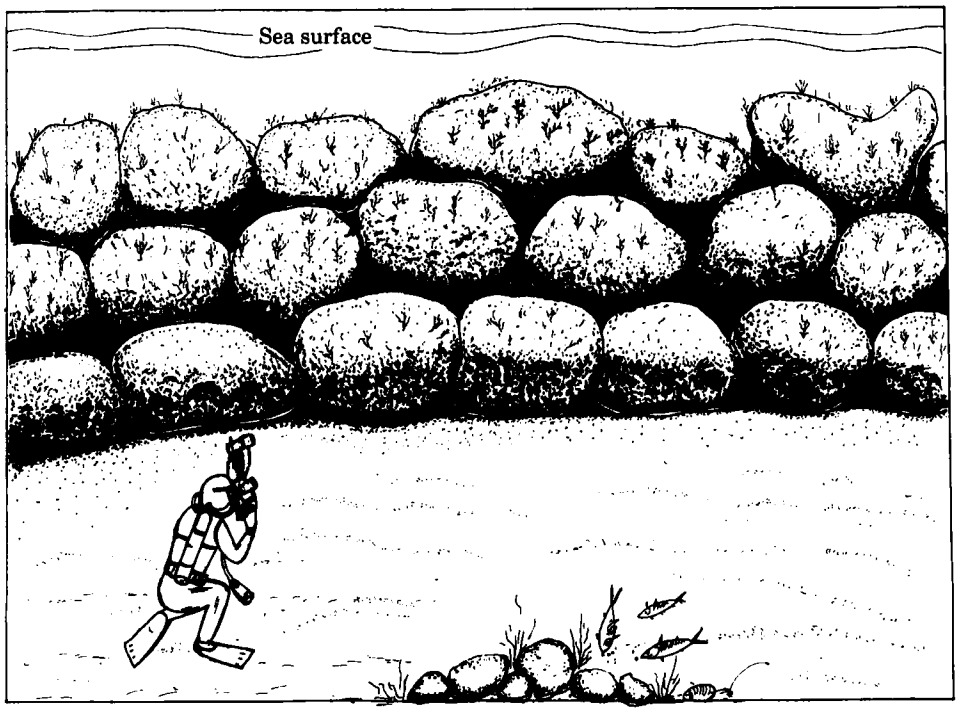

Figure 3. Underwater structure noticed during exploration in Vijaydurg waters (Drawing: S. Chitari).

Further, the offshore extension of the palaeo-channel of the Vaghotan River was also traced (Gujar *et al.*, 1986). The topography of the seabed is uneven above a depth of 9 m due to a reduction in wave turbulence. The contrast in coastal features derives from sea level changes, climatic variation and local tectonic movements. The observed wave convergence in the area is due to the coastal configuration (projecting promontory) which also controls sediment transport (Gujar, 1996). The erosion and accretion of the coast is demonstrated by progradation along beaches and retreat along the cliffs and headlands (Wagle, 1989).

Survey objectives

The main objectives of the project were to explore the various onshore and offshore structures at the site of the port systematically, and to understand the methods of construction, their use and history. Documentation of all coastal and underwater data would be helpful for further studies.

Methodology

A preliminary survey was carried out to assess the nature of the seabed in and around the work-site without disturbing any of the artefacts. For this, a detailed visual seabed survey was carried out. During the course of this pre-disturbance survey much attention was paid to natural features such as rock outcrops, seabed topography, depth, movement of sediments and the current direction.

Two mild steel probing rods of 1·5 and 2 m length, with pointed tips at one end and with handles at the other were used to obtain information on subsurface layers. The rods were used to probe the sediments carefully to search for buried objects of

Figure 4. General view of the dockyard of Vijaydurg (Photo: S. N. Bandodkar).

wood, metal and stone. Maximum care was taken, so that the probing should not damage any buried archaeological objects.

The Pulse 8 X JW Fishers handheld metal detector was used for the survey, especially around the locations of anomalies. The survey was conducted because parts of a ship and cargo may be scattered over a large area and subsequently buried when a shipwreck occurs. After location, the positions of buried objects were fixed by Magellan NAV 5000 DLX GPS, followed by systematic underwater excavation using an airlift.

Underwater exploration and excavation

Diving operations were gradually extended to the adjoining areas. Each dive covered a circle of about 5 to 20 m radius and lasted for more than 30 minutes. The seabed consists of coarse sand and shells. The underwater exploration showed sediment deposition to be more than 3 m in this region. The airlift operations yielded remnants of a shipwreck such as timbers, clinker and coal. All such materials were either buried under more than 3 m of sediment or washed out by currents. The shallow water airlift investigation led to the discovery of certain archaeological and shipwreck material (Fig. 2).

Structure

The offshore exploration in Vijaydurg waters revealed a stone structure on the western side of the fort. It lies EW and turns in a NS direction. It measures 122 m in length, 7 m in width and is 3 m high. Different sizes of large, weather-worn rounded stones were used in its construction (Fig. 3). In some places dressed blocks are also visible and small blocks have been placed between big blocks. The use of small blocks between big blocks perhaps provided additional strength and prevented collapse. No mortar had been used in the construction. The small blocks have dimensions of $100 \times 40 \times 30$ cm; $70 \times 50 \times 30$ cm and $55 \times 30 \times 22$ cm while big blocks are $3{\cdot}5 \times 2{\cdot}5 \times 2{\cdot}5$ m in size. Some blocks are even larger than these. Overlap of blocks has not been noticed on the structure. Its width and height vary and it is damaged in places. Scattered blocks are also visible on the fort side. The growth of white and orange gorgonians can also be seen on it. It was probably constructed to destroy enemy ships as well

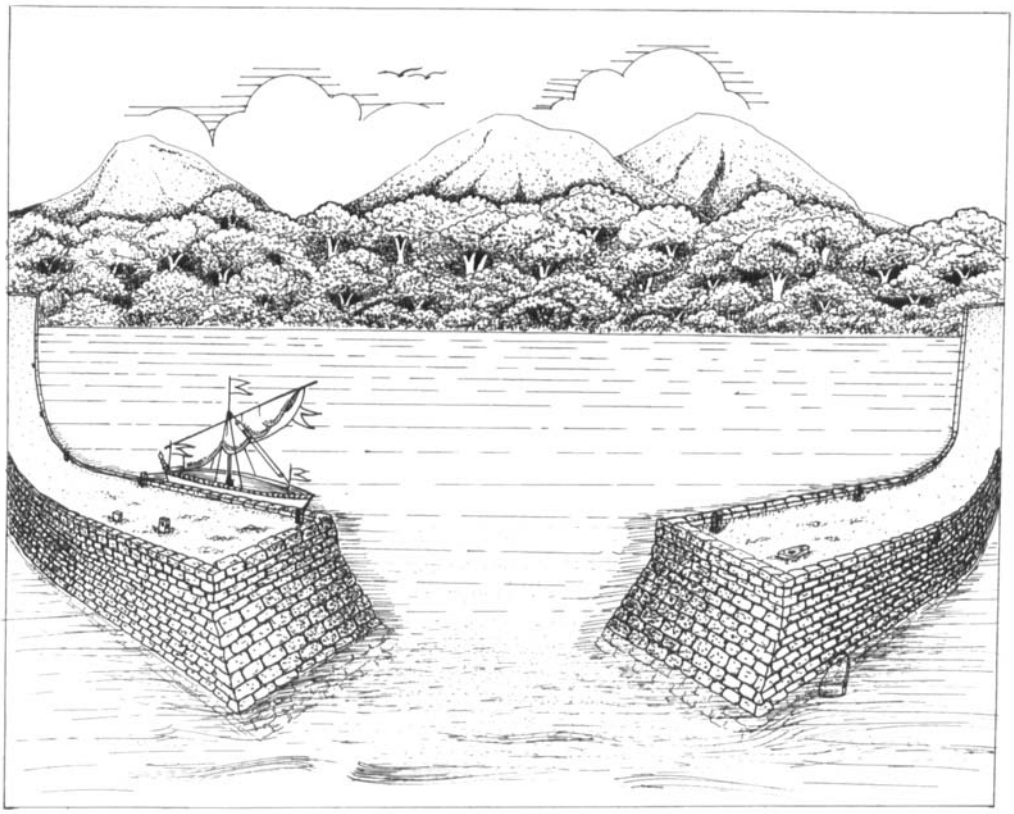

Figure 5. Artistic impression of the dockyard of Vijaydurg (Drawing: V. Gowthaman).

as to protect the fort from wave and current action. The structure reflects the high engineering skill of the period.

Vijaydurg was the main naval base of the Maratha navy and as European strategy was to capture the fort, it suggests that it was constructed to destroy enemy shipping. The historical evidence suggests that it belongs to the Maratha Period. This is the first time that a major structure has been noticed in the course of underwater exploration. It is of scientific interest due to its method of construction underwater, designed to provide strength and additional protection.

Dockyard

During a coastal zone survey of the region, a tidal dockyard was found on the left bank of the River Vaghotan about 3 km from Vijaydurg Fort (Fig. 4). The dockyard was built by Maratha Admiral Kanhoji Angre during the 17th century and was subsequently remodelled by Anand Rao Dhulup to increase its capacity to hold ships of as much as 500 tons. The length and width of the dock is 110 m × 75 m and the gateway is 7 m wide at its base and 11 m at the top without any gates. The bottom of the dock slopes upwards from the entrance. The wide base is designed to confer stability on the structure (Fig. 5). The floor of the dockyard is made of lime mortar. This floor is now covered by a deposit of sediment more than 2 m thick. Repair and maintenance of the dockyard was generally carried out during the lowest low tides of the full and

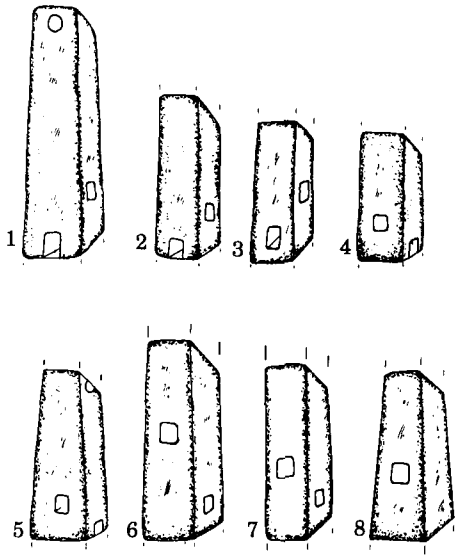

Figure 6. Stone anchors of grapnel type found in the adjoining area of the dockyard. (Drawing: S. Chitari)

Figure 7. A stone anchor of grapnel type lying on the eastern side wall of the dockyard of Vijaydurg (Photo: S. N. Bandodkar). Scale in 5 cm units

Figure 8. A stone anchor of grapnel type used as a mooring bit found on the left side wall of the dockyard of Vijaydurg (Photo: S. N. Bandodkar). Scale in 5 cm units.

Figure 9. Stone anchors of grapnel type are laid on the ground to prevent soil erosion behind the dockyard of Vijaydurg (Photo: S. N. Bandodkar). Scale in 10 cm units.

new moon. Ships used to enter the dockyard at high tide. There is a platform in the central part where ships were positioned for bottom repair and cleaning. Even during the monsoon the dockyard was a suitable shelter for ships. The Indian Navy has retrieved a two-fluked iron anchor from the dockyard, thought to be of the Maratha Period. A stone-built water channel runs from the south-east corner to drain excess water from the dock. The entrance of the dockyard is blocked with sediment. It is said that there was a small shipyard and a mast-house here. Wooden planks from ships have been found inside the dock. The significance of the dockyard

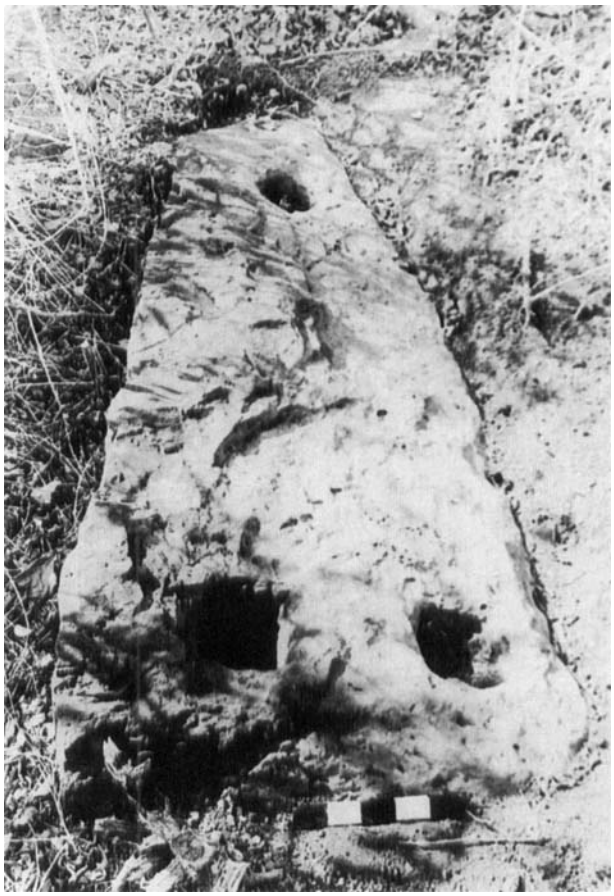

Figure 10. Triangular stone anchor found 200 m beyond the dockyard of Vijaydurg (Photo: S. N. Bandodkar). Scale in 5 cm units.

of Vijaydurg is that it is the first of its type to be found in this region dating to the Maratha Period. The site selected for the dockyard was sufficiently far from the sea and not affected by normal tidal changes. However, it was within range of the spring tide so that a ship could be floated from the dock on completion of repair work. The site is protected from the tempestuous SW monsoon by a hill and this enabled shipwrights to continue work even in the stormy season. It is obvious that the Marathas had a good knowledge of dock construction and also of how to keep them dry when required.

Stone anchors

The area surrounding the dock was overgrown. Thorough search in the adjoining area revealed a number of grapnel-type anchors (Fig. 6). These anchors were placed on both sides of the entrance to the dock for use as mooring bits. Eight anchors were found on the right side wall of the dock. Of these, three were found erected on the wall and two were embedded in the soil. Only the top portions of the anchors are visible. The other three are lying on the eastern side of the wall (Fig. 7). Out of these eight, two are broken whilst the rest are in good condition.

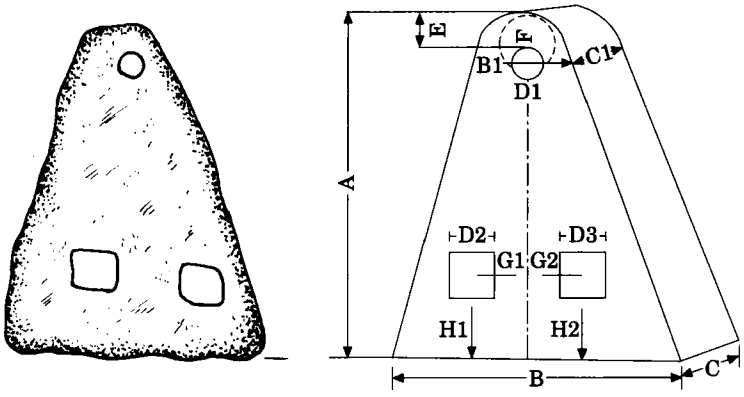

Figure 11. Anchor dimension (after Galili *et al.*, 1994: fig. 17, with additions to accommodate all three anchor holes). A—Maximum height: 1·90 m. B—Maximum width at lower part: 0·85 m. B1—Maximum width at hole centre: 0·47 m. C—Maximum thickness at lower part: 0·20 m. C1—Maximum thickness at hole centre: 0·20 m. D1, D2, D3—Average hole diameters: 0·13, 0·19, 0·15 m. E—Distance from hole to top of anchor: 0·36 m. F—Distance between apex centre and hole centre: 1·60 m. G1, G2—Distance from centre of lower hole to anchor's vertical axis: 0·10 m (each side). H1, H2—Distance from centre of lower hole to anchor's base: 0·17 m.

Similar anchors were also found on the left side wall (Fig. 8). A further five grapnel stone anchors were noticed behind the dockyard. At one spot two have been erected and one is laid on the ground probably to prevent soil erosion (Fig. 9). The other two anchors have been erected at different places for use as mooring bits for ships berthed in the dock.

About 200 m SE from the dock, a triangular stone anchor (Fig. 10) was found lying on the wall (Fig. 11). Stone anchors constitute the earliest antiquities discovered in the region. Such anchors were in use in India up to the 17th century AD, until the advent of iron anchors. The availability of the raw material and thus reduction in the cost of manufacture facilitated the extensive use of such anchors over a long period. It is still not clear whether these stone anchors were used for coastal or oversea voyages. All the grapnels and the triangular stone anchors found in clusters are made of local sandstone and fine laterite. These anchors have been uniformally chiselled on both sides and are similar to anchors from Sindhudurg Fort (Malwan) which belong to the Early Historic Period (Sila *et al.*, 1997).

Figure 12. Grapnel stone anchors noticed as lintel on the arches of the parapet wall of the second fortification of Vijaydurg Fort (Photo: S. N. Bandodkar). Scale in 5 cm units.

A further eight grapnel stone anchors were noticed for the first time on the arches of the parapet wall of the second fortification of Vijaydurg Fort (Fig. 12). These anchors have been used as lintels of arches

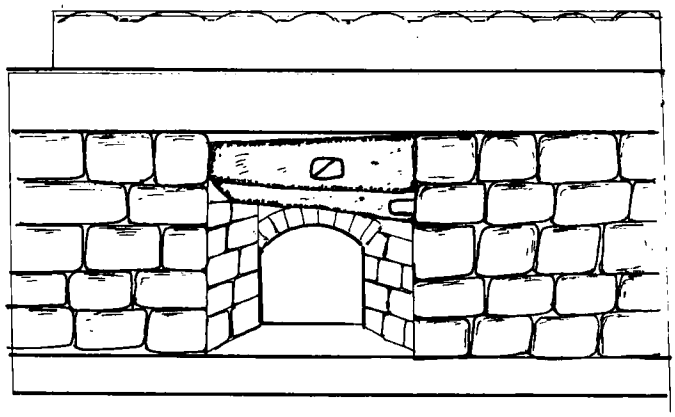

Figure 13. Reuse of grapnel stone anchor as a lintel in the second fortification of Vijaydurg Fort (Drawing: S. Chitari).

Table 1. *Dimensions of the grapnel anchors used as a lintel in Vijaydurg Fort*

No.	Type of anchor	Raw material	Length (cm)	Width at lower and top side (cm)	Distance between lower hole and top (cm)	Lower hole (cm)	Lower side (cm)	Top hole (cm)
1.	Grapnel	sandstone	138	36 × 33	123	15 × 15	14 × 14	11
2.	Grapnel	sandstone	110	40 × 35	94	14 × 14	17 × 17	not visible
3.	Grapnel	sandstone	108	40 × 35	102	15 × 15	15 × 15	not visible
4.	Grapnel	sandstone	106	40 × 35	73	14 × 14	15 × 15	not visible
5.	Grapnel	sandstone	113	32 × 27	79	14 × 14	14 × 14	11
6.	Grapnel	sandstone	117	38 × 28	39	14 × 14	15 × 15	not visible
7.	Grapnel	sandstone	115	33 × 33	56	16 × 16	14 × 14	not visible
8.	Grapnel	sandstone	62	36 × 36	36	14 × 14	not visible	not visible

(Fig. 13). They are made of locally available sandstone, and are in good condition (Table 1).

Pottery

The exploration yielded a quantity of medieval pottery, Chinese ceramic and celadon sherds. The main shapes in the assemblage are bowls, dishes, jars, a knobbed lid and small pots. The sherds are small and highly rolled, rendering it difficult for identification of designs and painting. The pottery is mostly well fired and fast wheel-turned. Painting is not visible on indigenous pottery; the fabric is medium to thin. Painting is destroyed by lengthy immersion in water. The Chinese ceramics belong to the hard paste variety and are painted in blue on white with flower motifs like lotus, narcissus, pomegranate, sunflower or chrysanthemum, peony and acanthus leaves (Fig. 14). Very often, Chinese ceramics are painted with symbols related to Chinese mythology and traditions. The painted decoration was confined to shoulder, body, rim and base portions of the ceramics. The Chinese sherds are greater in quantity than the other pottery.

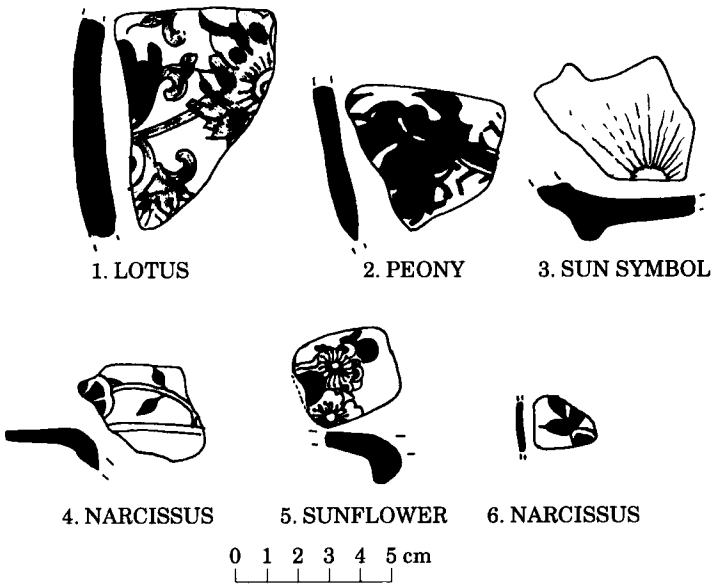

Figure 14. Chinese ceramic sherds found during the Vijaydurg exploration (Drawing: S. Chitari).

The only piece of terracotta glazed pottery has a dark chocolate glaze. The importance of the piece is that the glazing has craquelure. The blue and white combination of Chinese ceramic flourished under the Ming dynasty (AD 1368–1644) (Savage, 1954), and probably these ceramics were made by the Chinese for the European market. Analogous pottery is found in the Old Goa region which suggests that pottery was coming in through trade by the Mughals, Portuguese, English and Dutch in the Konkan region of the Maharashtra coast of India (Muhammed, 1994).

Slingshot

The Maratha navy had used slingshot during their wars against European powers. Two cast-iron slingshot were collected from shallow water (Fig. 15); their diameter and weight are 66 cm and 18 kg and 69 cm and 23·6 kg respectively. The thickness of the sling ball is between 20 and 25 mm, each has a hole at the top, and

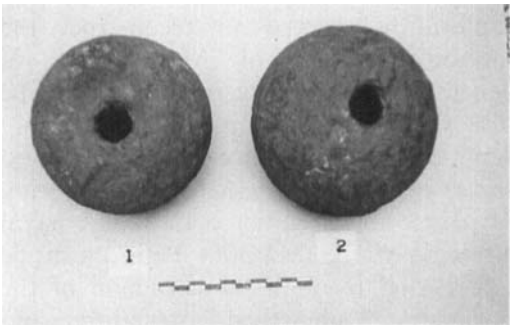

Figure 15. Castiron slingshots found in Vijaydurg waters (Photo: S. N. Bandodkar). Scale in 2 cm units.

is hollow inside where gunpowder and other explosives were placed (Fig. 16). The outer core of these balls has undergone substantial changes due to weathering. During battle, the gunpowder was ignited and they were thrown on enemy ships causing damage. However, it appears that they did not explode. Slingshots made of stone and lead were also found. In addition, a cannon stand was also identified near the third fortification of the fort.

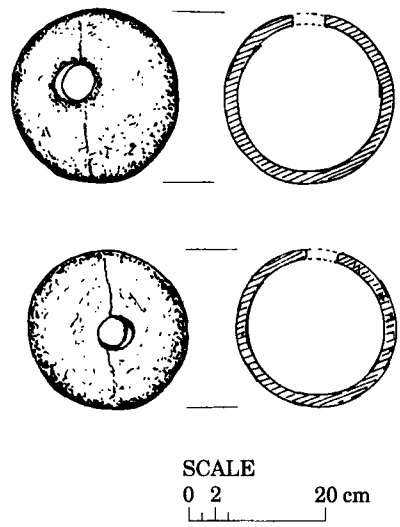

Figure 16. Castiron slingshot recovered during underwater operations at Vijaydurg (Drawing: S. Chitari).

Conclusion

The onshore and offshore Vijaydurg explorations helped to reconstruct the maritime history of Maharashtra in general and Vijaydurg in particular. The discovery of the submerged stone structure was among the major discoveries and shows expertise in the field of engineering of people in an earlier period. The naval strategy of the Maratha Period can be understood from the construction of the dockyard, submerged structure and slingshot. The stone anchors are the only evidence to support Vijaydurg as a port similar to Malwan during the Early Historic Period. It is evident that during the Early Medieval and Medieval Periods the use of grapnel anchors was more common than triangular anchors. The reasons why grapnel anchors were preferred to triangular anchors are unknown. However, grapnel anchors were useful as mooring bits, lintels and to prevent soil erosion. Alternative uses for anchors were recorded for the first time along the Maharashtra coast of India. Further exploration of ancient port sites of Maharashtra and naval bases of Shivaji may bring to light more information on the reuse of anchors and remnants of naval installations.

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