

'Saurashtra Stone Anchors' (Ring-stones) from Dwarka and Somnath, West Coast of India

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Introduction

Last two decades of marine archaeological research along the Indian coast has brought to light a large number of stone anchors of different types and sizes, indicating that the Indian coast has witnessed brisk maritime activities in the past. Gujarat provides evidence of the earliest such activity in the form of dockyard and stone anchors at Lothal (Rao 1979) and a jetty and stone anchors from Kuntasi (Dhavalikar *et al.* 1996). Each and every Harappan site in Gujarat evidences the use of conchshells and a variety of marine fishes highlighting the exploitation of marine resources.

Offshore explorations by the Marine Archaeology Centre of the National Institute of Oceanography, Goa, brought to light a large number of stone anchors from Okhamandal region (Sundaresh *et al.* 1999, 28:3:229-52 and Rao *et al.* 2001, 30.1: 95-108) and from Somnath (Rao *et al.* 1992, 3: 13-16) in Gujarat, Vijaydurg (Tripathi *et al.* 1998: 1-8) and Sindhudurg in Maharashtra (Tripathi *et al.* 1997: 51-57). A few grapnel-type stone anchors have been reported from Lakshadweep (Kapitan 1994: 1-6) and from Tamil Nadu coast (Jaykumar *et al.* 1999).

The majority of stone anchors from Gujarat fall in three categories: (i) composite, (ii) grapnel, and (iii) ring stone types. The last mentioned is a very enigmatic type

as it is spheroid in shape with an axial hole and has been reported mainly from Gujarat coast (Rao *et al.* 1999: and Gaur *et al.* 2002) and from Oman (Vosmer, 1999 per. Com.). A research paper entitled 'Ring stones from Gujarat coast' is in press. Subsequently, many more ring stones have been found from Dwarka and Somnath waters (NIO: 2001). The presence of these ring-stones in great number in Somnath and Dwarka (Fig. 1) provided an opportunity to discuss further their uses and origin.

The present paper therefore, deals with a detailed description of the ring-stone anchors discovered so far from Dwarka and Somnath and their association with other types. The possible date and various hypotheses on their uses are also discussed here.

Historical background of the sites

1. Dwarka

Dwarka is situated in Okhamandal taluka of Jamnagar district in Gujarat state on the extreme west of the Saurashtra peninsula on the Arabian Sea coast (Lat. 22° 22' N and Long. 60° 05' E). Okhamandal region is separated from the rest of Saurashtra by the *Okha Rann*.

Onshore excavations at Dwarka yielded an undisputed antiquity of the early historical period datable to second

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century BC (Ansari *et al.* 1996). Offshore explorations by the Marine Archaeology Centre of the National Institute of Oceanography have been carried out in Dwarka waters since 1983 and have brought to light a number of structures and anchors in water depths ranging between 3 and 15 m. The sea-floor in Dwarka is represented by the occurrence of rocky cliffs, sandy patches and submerged river channel. The offshore contours of Dwarka suggest a gentle slope. Archaeological artefacts have been recovered near the rocky cliffs or found partially buried in sediments. A dense vegetation growth over the artefacts is observed up to 8 m water depth. During fair weather, visibility is excellent for explorations and photography.

2. Somnath

Somnath is situated 5 km east of the famous port town of Veraval in district Junagarh. Onshore excavations yielded evidence of a township of 2000 BC old (IAR 1971-72; 1975-76). Prabhasa-Somnath is situated (Lat. 20° 53' N and Long. 70° 24' E) on the south-west coast of Saurashtra at the mouth of the river Hiranya or Hiran. Somnath-Prabhasa has a nearly straight coastline revealing a vivid manifestation of marine aeolian and fluvial processes that have resulted in a number of important geomorphic land-forms, such as the nearshore zone characterised by the formation of recent alluvium deposits, sand-bars, mud-flats and mangrove swamps. The coastal zone is covered with beach and littoral sands, oyster beds and sand dunes (NIO 1985). The sea-floor off Somnath is represented by uneven rocky patches, flat rocky bottom and sandy sea-bed. A large number of archaeological artefacts are encountered at different depths ranging from 7 to 15 m, near the disturbed rocky patches. A dense vegetation growth is also noticed up to 8 m depth.

Methodology

The offshore exploration comprised two systems such as SCUBA (Self Contained Underwater Breathing Apparatus) and SDDE (Surface Demand Diving Equipment). Each diving team covered an area within 50 m radius. A buoy was tied to each location wherever archaeological objects (structures and anchors) were noticed. Artefacts located underwater were interconnected with rope followed by measurement of distance and orientation. Underwater findings were documented by using u/w still camera and drawings.

Results

Offshore explorations at Dwarka and Somnath brought to light 133 and 43 different types of stone anchors respectively, besides a few stone structures in the Dwarka waters out of which ring-stones from Dwarka are 24 and 35 from Somnath. These ring stones have been collected in various field trips from the respective sites. The basic characteristics of ring-stone anchors are circular in shape with an axial hole. Often the base of ring-stone is flat and top is semi-circular rising to a certain height. The detailed description of ring-stones from each sites is given below.

Dwarka

Offshore exploration during last two decades has yielded a number of ring-stones in the Dwarka area. Important observation that may be mentioned here is that most of the objects have been found at the depth of 8 to 16 m and a few in shallow water and a lone instance is from inter-tidal zone. The position of the ring-stones discovered during last two seasons has been plotted on the map (fig. 2). A total of 24 ring-stones have been recovered from Dwarka waters. The anchor numbered 1 to 11 were recovered up to 2000 and then the remaining 12 to 24 in the season 2001 (figs. 3-4).

Most of the ring-stones were lying exposed on the sea-bed. However, a few, numbers 7, 10, 12, 14 and 22 were partially buried in sediment. Up to a depth of 8 m often the exposed portion of the ring-stones are covered with marine growth such as sea weeds while ring-stones beyond this depth are covered with a thin layer of grayish marine growth. They are lying in a vertical position which is the normal falling position of this anchor on the sea-bed and few ring-stones were marked, for example, number 14. Some ring-stones show chisel marks on the surface, in the hole and on the flat bottom side. On the basis of material and shapes, the ring-stones from Dwarka can be broadly divided into three groups.

Group I: Ring stone numbered 2, 4, 5, 7, 9 and 12 fall in this group. The raw material used for this category is basalt and are heavy. The basic features are low height, flat bottom, semi-curved top with an axial hole; diameter of the hole is same at both ends. Often the chisel marks have been noticed on the surface and in the hole. The

average estimated weight of ring-stones is 147 kg. Among them the heaviest one (no. 4) weighs 245 kg and the lightest (no. 12) weighs 80 kg.

Group II: Ring-stone numbered 3, 8, 10, 13-17, 19-21, 23 and 24 fall in this category. The majority of ring-stones of this category are made out of limestone and sandstone. Shape of these ring-stones is the same as of the first category. However, they have often blunt edges and widened axial holes. A few anchors are having smooth surface while a few have very rough surface. Sometimes chisel marks have also been noticed on some of the anchors. The average weight of this group is 98 kg. The heaviest anchor (no. 8) weighs 205 kg and the lightest (no. 14) 64 kg.

Group III: Ring-stone numbers 1, 6, 11, 18 and 22 fall in this last category. They are made out of porous limestone. As usual they are circular in shape with comparatively lesser height and have equal diameter on upper and lower side ends. Often axial holes are wide and irregular. They have blunt edges and rough surfaces. The average estimated weight of these ring-stones is 66 kg. The heaviest anchor (no. 1) is weighing 109 kg and lightest anchor (no. 6) 20 kg.

Somnath

Underwater explorations off Somnath were carried out in three seasons 1991-92, 1999-2000 and 2000-2001 (fig. 5). The explored area in Somnath waters is located at a distance of 400 m south-west of the Somnath temple. The study area comprised rocky out crop, flat rocky seabed and sandy patches. The first season yielded 6 objects, and the second 8 objects and in the present season 2001, 21 objects. Somnath yielded the largest number of ring stones (figs. 5-8). Out of 43 discovered stone anchors, 35 belong to ring-stone variety which is more than 80 per cent. The water depth varied from 7 m to 15 m. The ring-stone noticed that below 8 m depth, were overgrown sea weeds. However, ring-stones from deeper depths have a layer of grayish marine growth. On the basis of shapes and raw materials the ring-stones have been divided into three groups.

Group I: Ring-stone numbered 25 (P1. 1), 26, 31-33, 35 and 42 are made of basalt. Most of them were lying exposed on the sea-bed, a few of them lay partially

buried, viz., no. 1. This is upside down. The exposed portions of these ring-stones are covered with grayish marine growth. They are spheroid in shape with flat bottom. The upper edge of the axial hole is sharp while the lower edge is blunt. Chisel marks are also noticed on the exterior as well as in the hole. Often they are very heavy and the average estimated weight of a ring-stone of this group is 220 kg. The weight of heaviest ring stone (no. 25) is 392 kg and the lightest (no. 35) is 114 kg.

Group II: Ring-stone numbered 27, 29, 36-40, 43, 45-50, 52-56 and 58 are made out of two types of rock, i.e., limestone and sandstone. They are spheroid in shape with a wide axial hole. Some of the ring-stones of limestone are very rough and have been integrated (?) with the sea-bed. The majority of ring-stones were lying exposed on the sea-bed and a few partially buried in sand. The edge of the upper end of the axial hole is sharp and lower end is blunt. A few ring-stones of sandstone have chisel marks in the axial hole, the average estimated weight of ring-stones of this group is 82 kg. The weight of heaviest ring-stone (no. 29) is 221 and the weight of the smallest ring-stone (no. 39) is 36 kg.

Group III: Remaining ring-stones numbered 28, 30, 34, 41, 51, 57 and 59 are made out of very porous limestone. They are irregular, circular in shape with less height. The axial hole is irregular and wide. Each ring-stone has a rough surface and blunt edges. Most of them are lying exposed on the seabed. One ring stone is broken. The estimated average weight of these ring stones is 54 kg. The weight of the heaviest ring stone (no. 28) is 122 kg and weight of the lightest stone (no. 51) is 16 kg.

Discussion

The above descriptions of the ring-stones from the areas suggest that they are very similar to each other in shape. However, the size and raw material varied. The possible uses, date and probable origin of these ring-stones have been discussed here. Before that, a few facts about these objects given below must be considered.

1. These are man-made objects and have not been found in association with any habitation sites in Somnath or Dwarka.
2. Their association with composite and grapnel stone

anchors indicate that these were used for navigational purposes.

3. These ring-stones were often found in disturbed rocky sea-bed.
4. These anchors have been found in large numbers in the Saurashtra coast which seems to be the place of origin of these ring-stones.

Ring stones from other places

A number of similar type of objects have been reported from Mohenjo-Daro (Marshall 1973 and Mackay 1976) and Harappa (Vats 1975) where they are described as limestone rings, which have very smooth surface and are used for making pillars or for some ritual purposes. Marshall has mentioned that the most typical of them have their upper and lower surface undulating, in some others, the lower surface is flat, and the top takes a quatrefoil form and believes that these objects were used for either ritual or architectural purposes. About the ring-stones from Mohenjo-Daro Mackay (1976) says that 'the height of the ring and the diameter of the central hole increases more or less progressively with the diameter of the ring. The ring stones of Mohenjo-Daro also have dowel holes. On the three rings-stones there were two holes in the top and two in the base, averaging 1/2 inch in diameter, 1 inch deep and set at equal distances from the edges of the central hole.' However, this phenomenon has not been observed in Dwarka and Somnath. A similar type of stone object is reported from Sri Lanka (Souter 1998) with square axial hole and has been described as a ring-stone anchor. There are examples from Maldives where similar type of objects have been recovered and described as ring-stone anchors (Vosmer 1999, personal communication). Six ring-stones have been discovered off Oman and it is suggested that these objects were used to anchor large fishing nets or traps until the 1950s.

Various views on the uses of ring-stones

Rao (1999) has suggested the use of these objects in combination of door-jamb as they were found along with the stone structure off Dwarka. However, this observation is not tenable as the objects have been found along with other stone anchors also where stone structures were not noticed. The recent explorations off Dwarka have also

indicated that the stone structures may be the remains of an ancient jetty or harbour (NIO 2000).

Ethno-archaeological explorations in Oman suggested that these ring-stones could have been used as an anchor for fishnet. The size of the stone used depended on what type of fish was being caught (Vosmer 1999, Per Com). The local fishermen of Oman suggest that 5 to 7 stones were used at a time and they were not more than 40 kg in weight. However, the size and the weight suggested by the fishermen do not match with the present available ring-stones in India as well as in Oman. The weight of ring-stones in India varies from 16 kg to 392 kg and the fishermen would not be using ring-stones weighing so heavy for fishing nets. Another point may be mentioned here is that, if these stones are, as per suggestions made by fishermen of Oman, it should be only for very shallow waters whereas these objects have also been found in 15 m water depth. Out of 59 ring-stones, 14 are below 50 kg, 22 are more than 50 kg, 17 are more than 100 kg and 6 are more than 200 kg. Therefore, these ring-stones may not be suitable as weights for fishing nets. Hence this has to be ruled out.

Recently, Prof. A. Raban of Haifa University suggested that this also could be a lifting device of Grapnel type stone anchors (Raban 2001, Per. Comm.). This suggestion may not hold water in view of findings from Somnath. Of the total 44 anchors reported from Somnath, six are composite type and only 3 are grapnel type and the rest are ring-stones. With this data it can be argued that they may not be lifting devices.

There is a strong possibility that these ring-stones might have been used as anchors for boat. Vosmer (personal communication, 1999) has some information on similar type of objects from Maldives suggesting the use of these as anchoring boats in coral reef areas. It seems that these objects were used as an anchor of a boat in the disturbed rocky bottom. Two objects off Oman, 35 off Somnath and 24 off Dwarka have been noticed in disturbed rocky bottom. There may be apprehension about the uses of ring-stones especially of those ring-stones which have less weight (less than 50 kg) as anchors and that these might be fishing net weights as well. However, the size of anchors always depends on the size of boats. Even today stones weighing less than 15 kg are being used by small out-trigger boats off the Konkan coast and else-

where in India. Therefore, a few ring-stones having less weight does not indicate that their function would be different from the anchors. It is possible that a single boat might be carrying all types of stone anchors and the same were used depending upon the sea bottom since all of them have been found together in the Dwarka and Somnath waters. If it were sandy, certainly, composite anchors were more effective and in the rocky area, where there was not much grip, heavy prismatic anchors were in use and in the most disturbed area ring-stones were much effective.

In all probability, it may be said that ring-stones would have been used as anchors for boat. The shape of ring-stone is spheroid and the flat part would serve as the lower end while curved portion would be the upper end. A wooden log would be inserted in the axial hole, and the thickened portion would be on the lower side. Often the lower edge of axial hole is blunt which may be due to the insertion of the thickened part of wood while the upper side of the wooden log will not affect the edges and therefore, the edge of the upper side is sharp. The central wooden log will be further attached to a cross wood which will be tied with a rope, so whenever the ring-stone is thrown in water it would fall with the flat base down and semi-curved at the top and the rope of the boat will be the upper side and would not entangle with any rocky outcrop. The findings also suggest that most of the ring-stones have been found in the same position.

Probable Date

Dating of these ring-stones would be speculative since they have not been found associated with any datable material. Scientific dating may not be possible in the absence of any wood remains in the hole of the ring-stone. However, they have been found with composite and grapnel stone anchors. Therefore, a date ranging between eighth century and seventeenth century AD will be more appropriate for other stone anchors. A reference has been made by Schoff (1974) about the visit to Oman by Gemelli Carreri, in 1693-39, and mentions that, for anchors, they have a large stone with a hole. This could be a ring-stone and if the reference is for this type of anchor then this will be a lone authentic record of the seventeenth century about ring-stones. The majority of these objects are made out of locally available rock and a few are of hard rock (may be basalt) indicating that these were

made indigenously.

Origin of ring-stones

The largest number of ring-stones have been reported from Somnath waters and followed by Dwarka. As mentioned above, a few instances have come from Maldives and Oman and perhaps, totally absent in Red Sea and Mediterranean (as no nautical archaeological publication has published these type of stones). Perhaps these must have been invented by the Indian sailors after gaining experience of sea-beds, specially in the Gujarat coast where submerged reefs and uneven sea-bed pose problems for lifting heavy grapnel and composite types of anchors. Another important point that may be mentioned here is that these anchors need a very thick wooden stock which will not be easily lost on the sea bed as compared to other types of anchors where a thin wooden log was inserted. The present data suggests that ring-stone anchors are the speciality of the Saurashtra coast of Gujarat, in the medieval period. The sailors of this coast must have visited Oman and Maldives from where similar type of ring-stones has been reported. Therefore, it is proposed a new nomenclature, '**Saurashtra stone anchor**', for these stone anchors, (pp 90).

Conclusion

Discovery of a large number of ring-stones from Somnath and Dwarka along with other stone anchors indicate that these ring stones are related with navigational requirement. After considering various views on their uses we came to a conclusion that these ring-stones would have been used as stone anchors. This could also be a special contribution by the ancient sailors of the Saurashtra coast in the development of stone anchors. Therefore, it will be appropriate to call the ring-stones as 'Saurashtra stone anchor'. The raw material also indicates indigenous origin. Based on available data these anchors may be linked with other type of stone anchors found along with ring-stones and dated between eighth and seventeenth century AD.

Acknowledgements

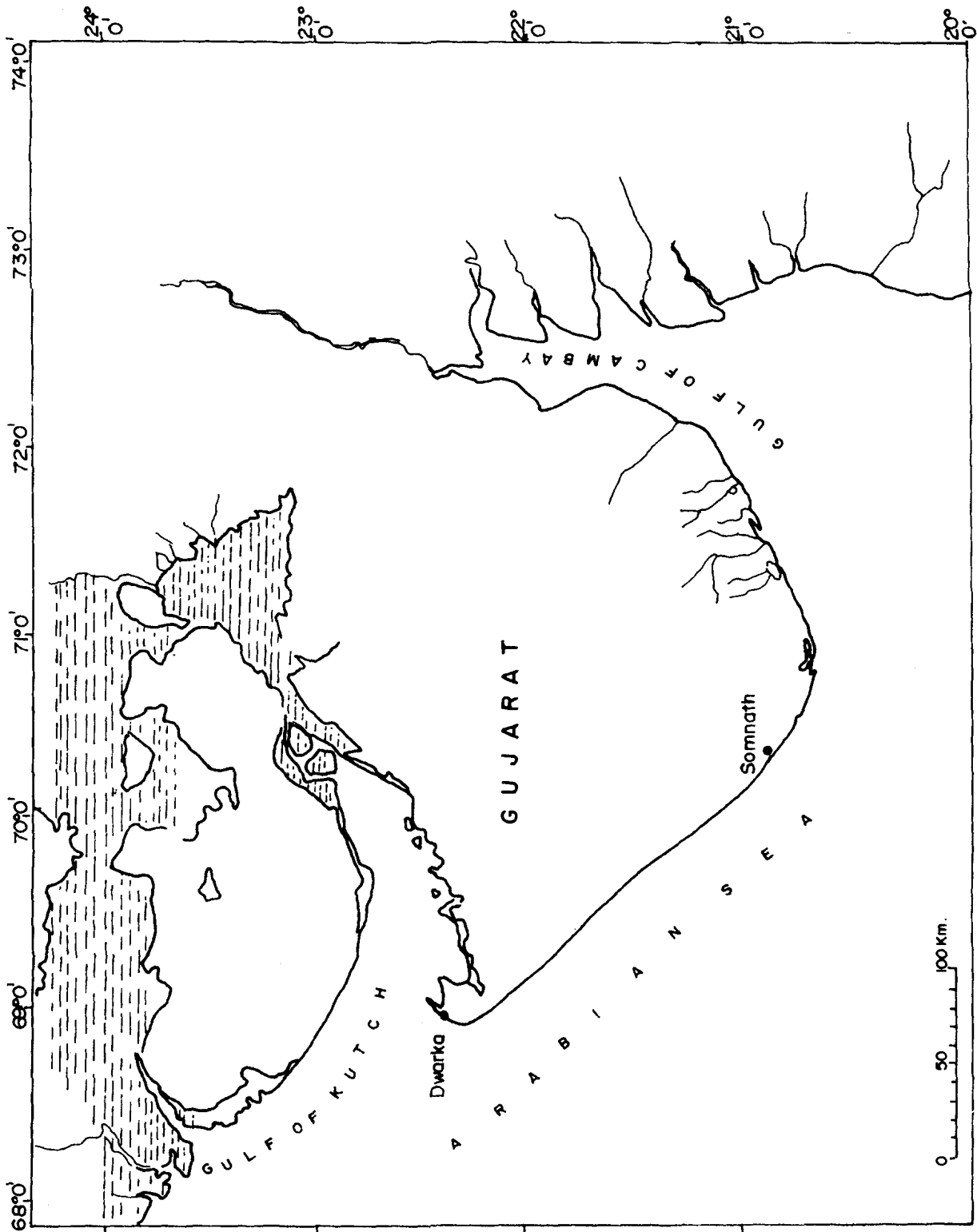
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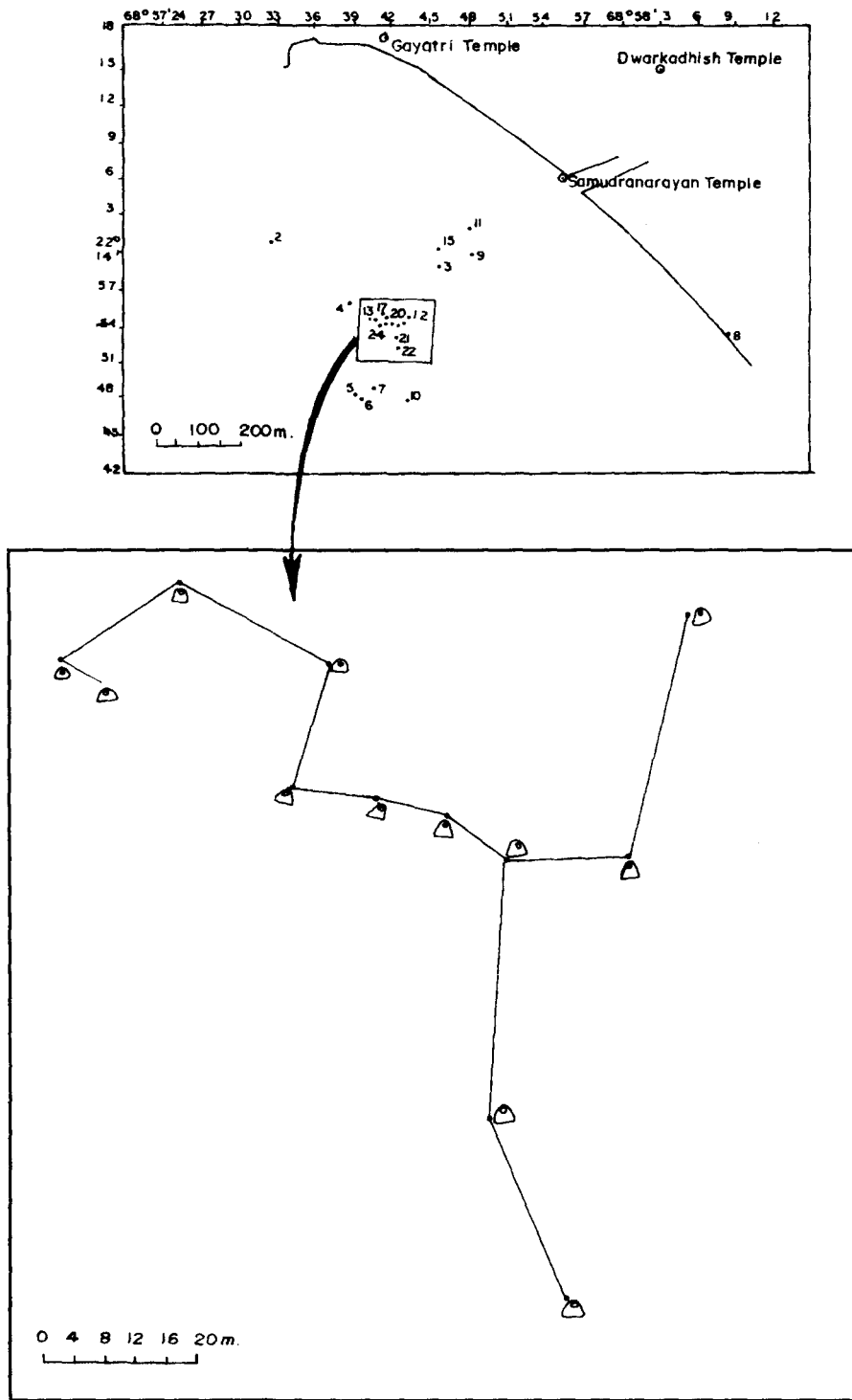


Fig. 2. Ring-stone lying off Dwarka.

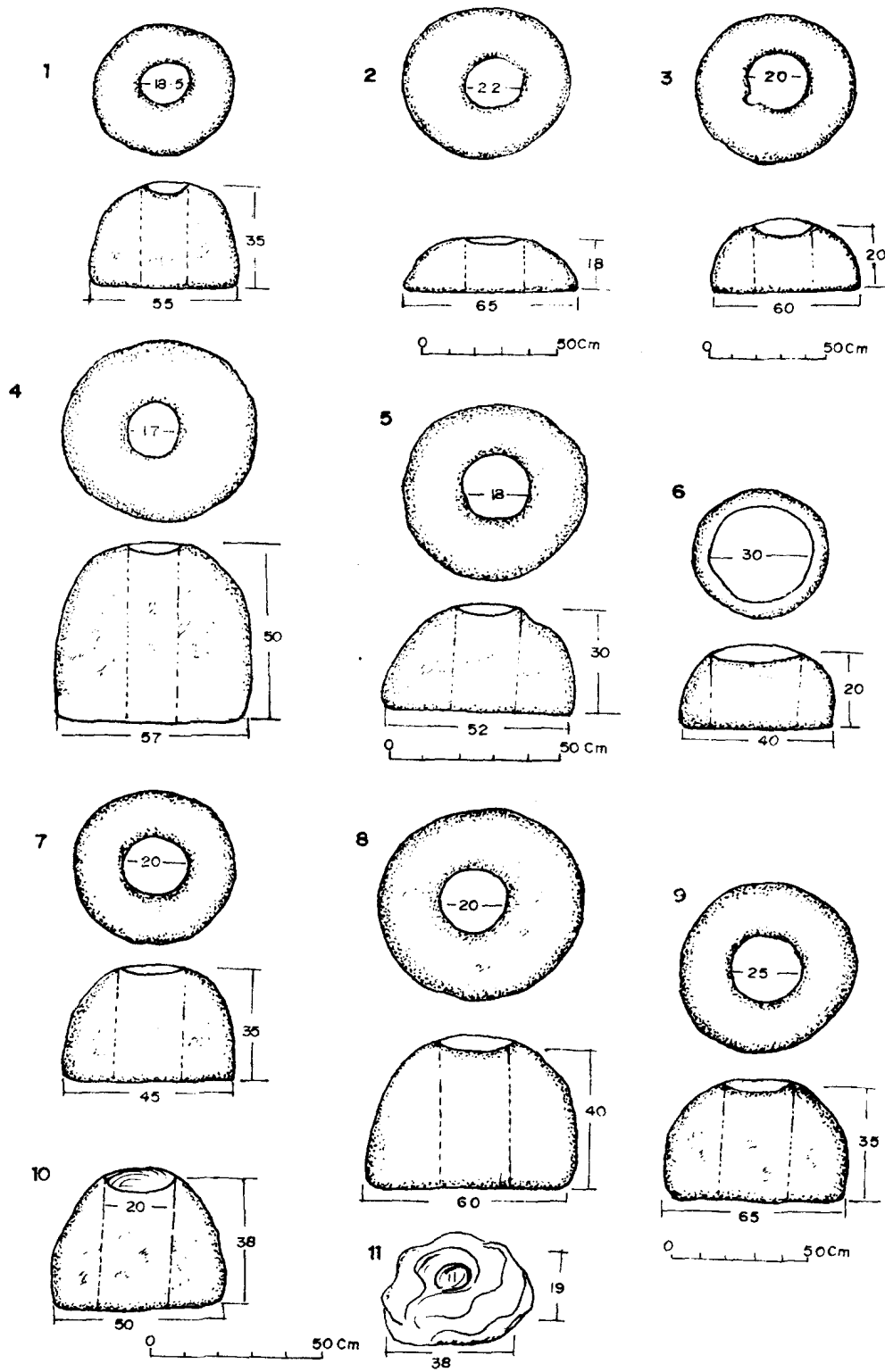


Fig. 3. Ring-stones, Dwarka.

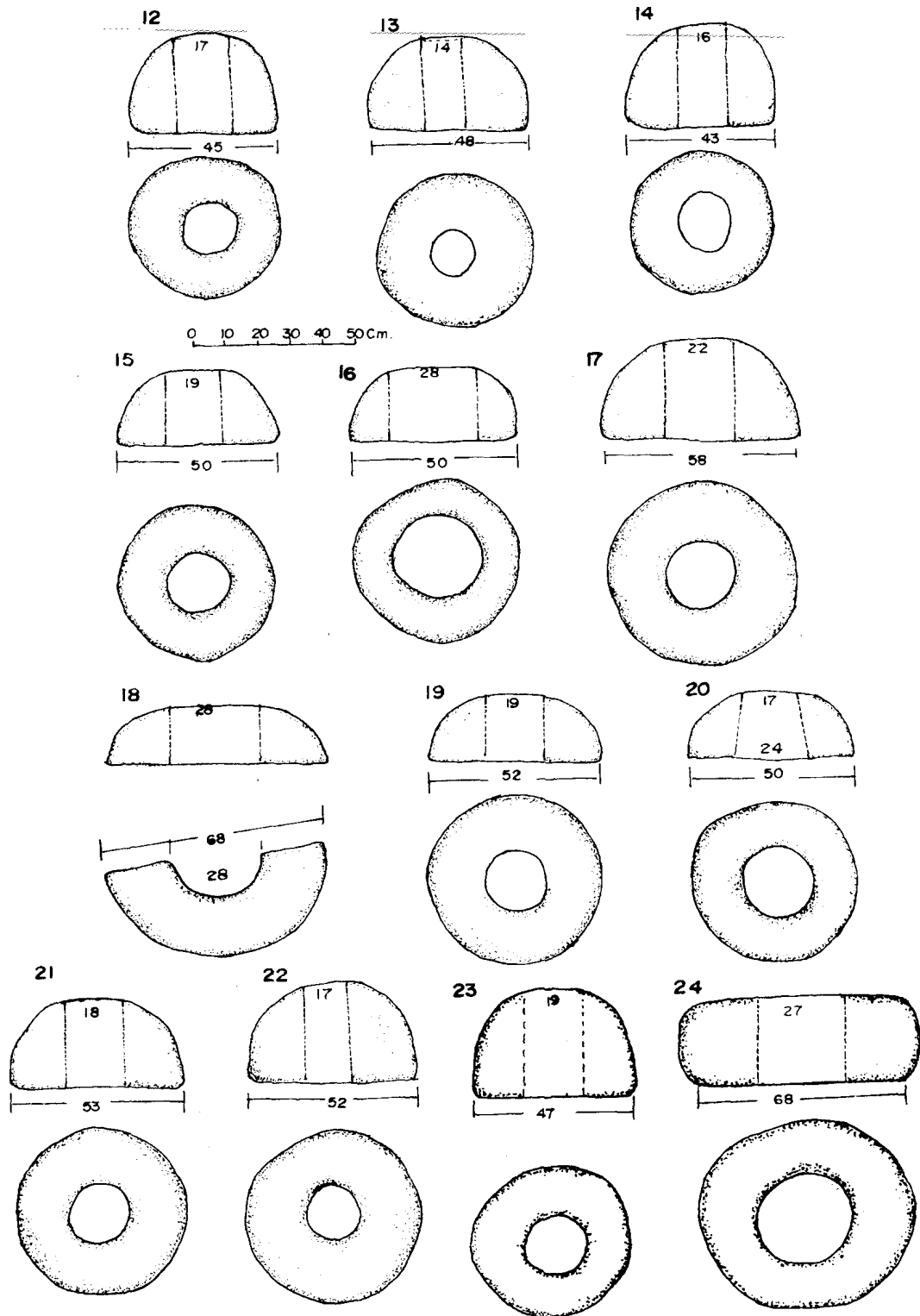


Fig. 4. Ring-stones, Dwarka.

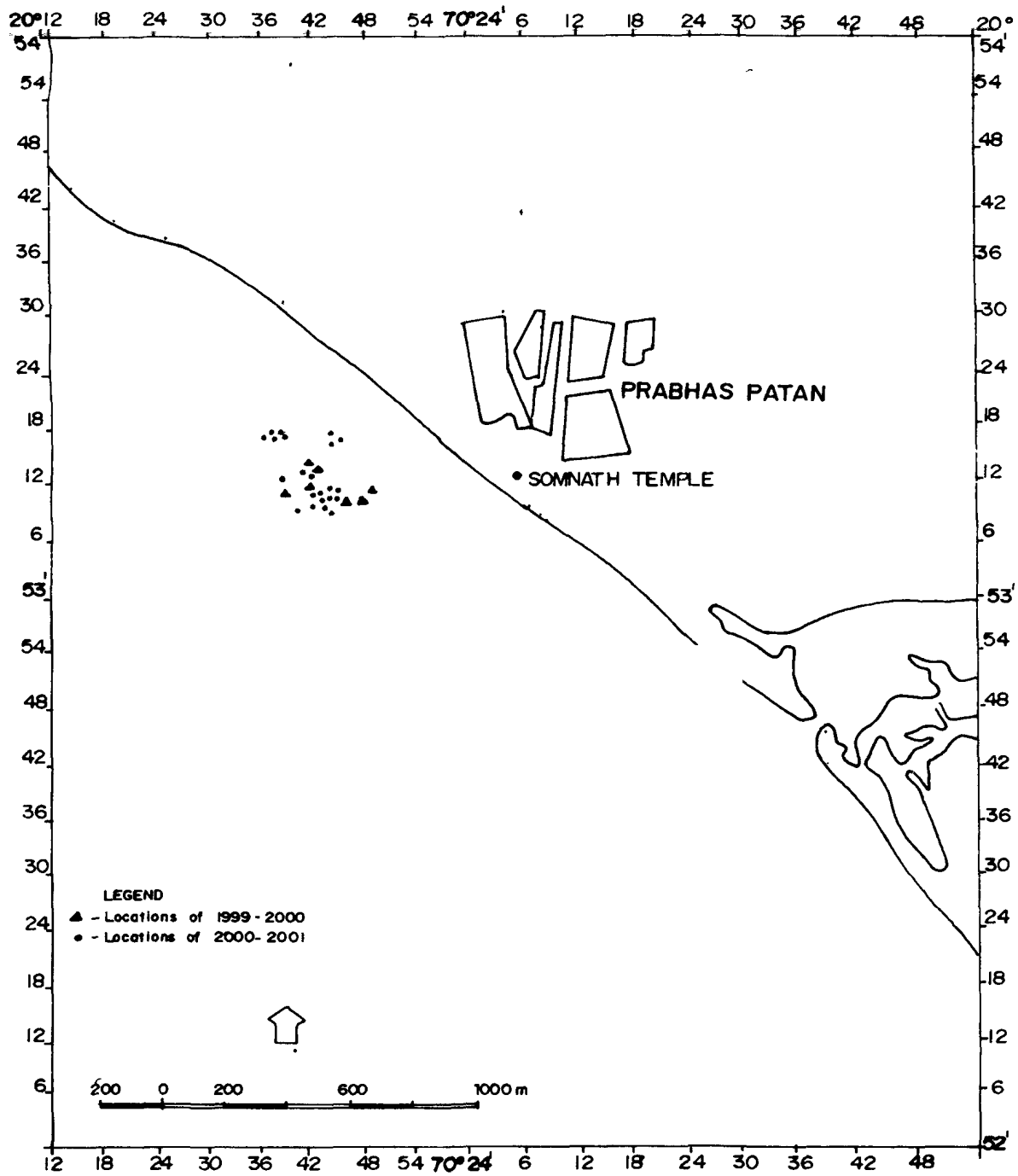


Fig. 5. The location of Archaeological findings off Somnath.

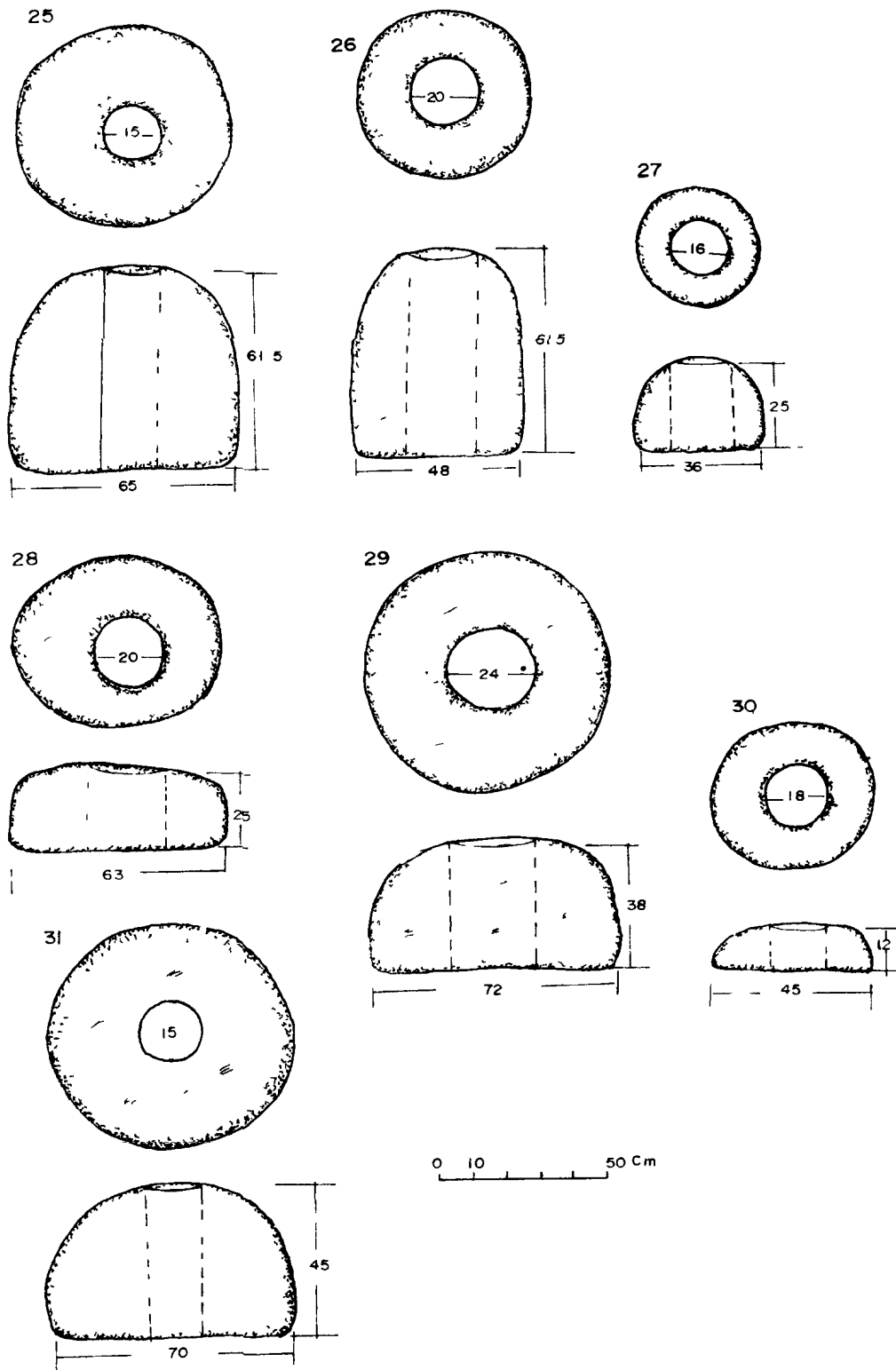


Fig. 6. Ring-stones, Somnath.

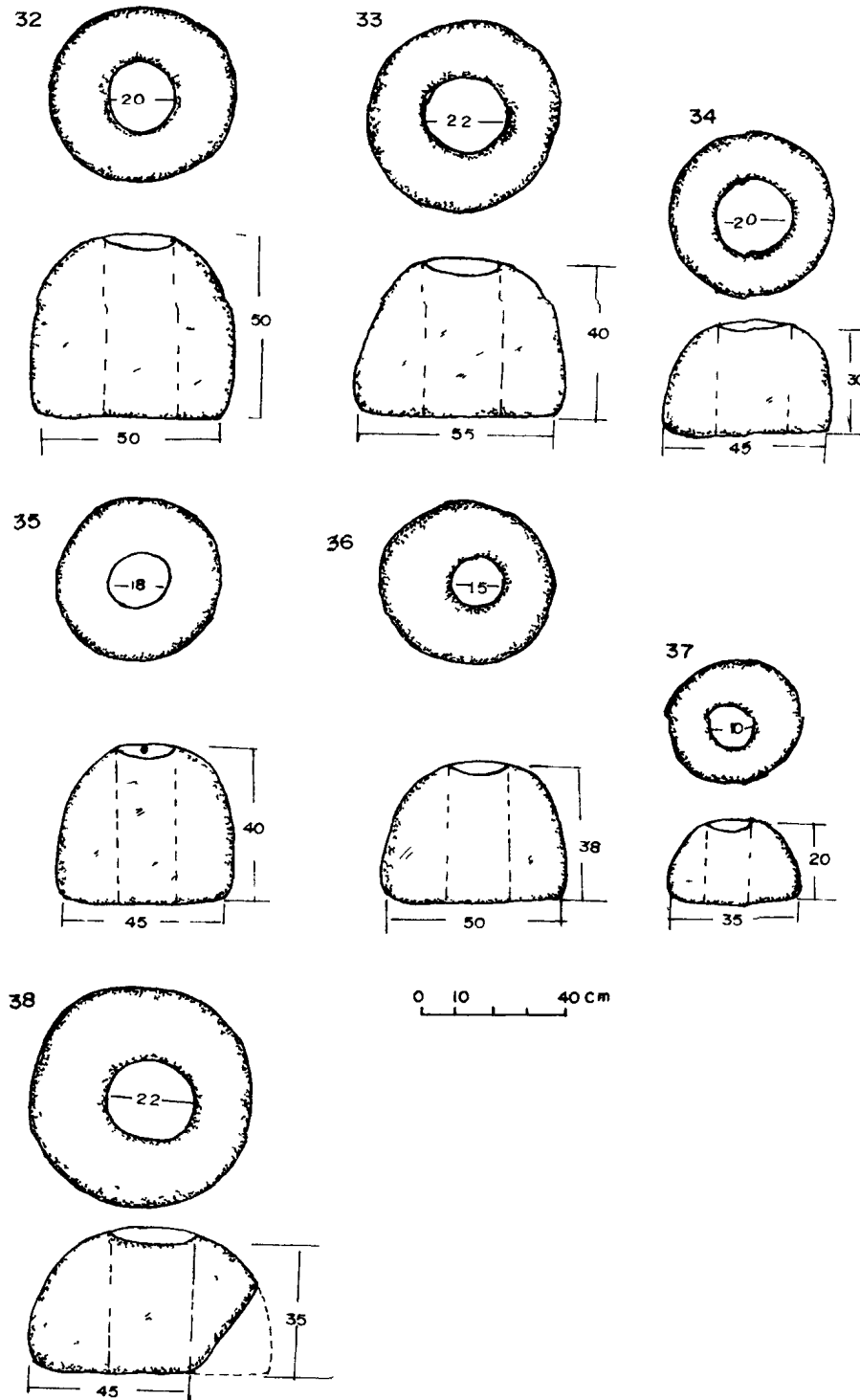


Fig. 7. Ring-stones, Somnath.

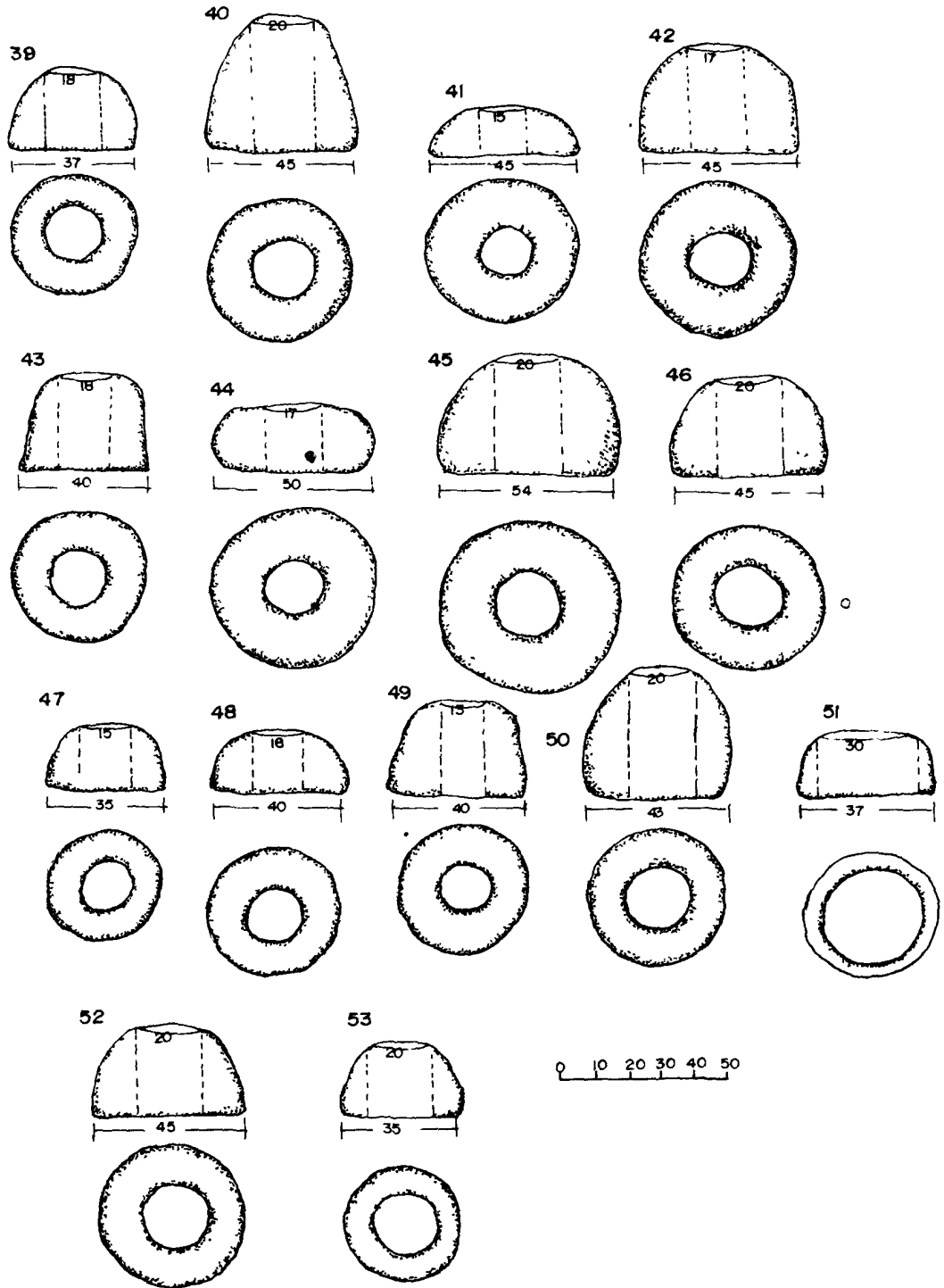


Fig. 8. Ring-stones, Somnath.

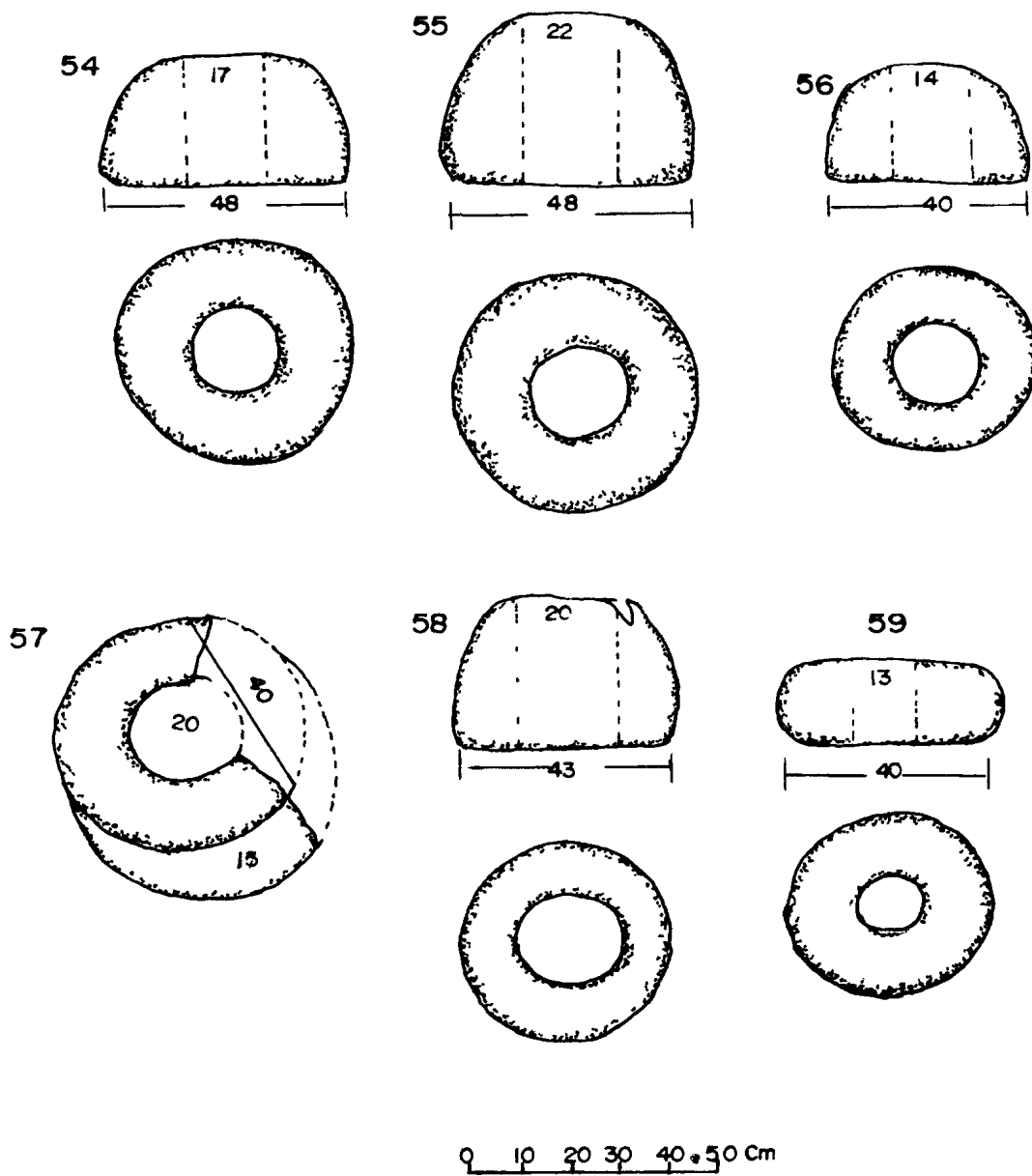


Fig. 9. Ring-stones, Somnath.