

SEA LEVEL FLUCTUATIONS OF NORTH KONKAN WITH SPECIAL REFERENCE TO SOPARA

SAVITA GHATE

Department of Archaeology, Deccan College, Pune 411 006, India.

ABSTRACT

Sopara (19°24' N, 72°48' E), mentioned in the Mahabharata as 'Shurparak', was an early historical port on the North Konkan coast. It was an important religious and trade centre for nearly 2500 years (1400 BC–1300 AD). To reconstruct sea level fluctuations during the Holocene period around Sopara a multidisciplinary study involving archaeological, geomorphological and micropalaeontological investigations was carried out. Field observations and geomorphological investigations suggest that normal configurational changes, rather than tectonic activity, played an important role in changing the coastal landscape of North Konkan. A dozen ^{14}C dates ranging between 6850 ± 130 BP and 2755 ± 100 BP support the field observations and laboratory analysis. These dates suggest that the sea level at around 8000 BP was lower by about 2 m than at present and reached the present level by about 5500 BP. Since 5000 BP the sea level has fluctuated within limits of 1 to 1.5 m.

THE western coast of India has for many centuries been an area of interest to those 'that go down into the sea in ships and occupy their business in great waters'. Scientific study of the coast is a recent development. Along the western coast of Maharashtra (popularly known as Konkan) there are many archaeological sites that are dated to the lower Palaeolithic to early historic periods. Most of the early historic sites were ancient port sites, such as Dahanu (72°43' E, 19°58'29" N), Sopara (72°48' E, 19°24' N) and Chaul (73° E, 18°30' N). Sopara is the coastal town (figure 1) with the most ancient historical background. It has been mentioned in the 'Mahabharata' as 'Shurparak'. There are several literary records about Sopara's trade with Greece, Persia and Arabian settlements. Sopara, which was an important religious and trade centre for nearly 2500 years (1400 BC to 1300 AD) suffered a setback in the eighteenth century¹. The disturbed habitation deposits around Sopara, except in some parts of Bhuigaon, reveal archaeological material dating from the Shatavahana (second century BC) to the Muslim (14th–15th century) period. The habitation deposits rest unconformably on the beach rock which is locally known as *Karal* in North Konkan.

Surface Mesolithic sites are abundant on the Konkan coast but for the first time at a depth of 1.5 m Mesolithic tools were collected. These tools were dated to 3260 ± 90 BP. Though this date suggests that the Mesolithic culture in this area is older than 3500 years, the ^{14}C date, being a

minimum estimate, cannot help in building and understanding the geoarchaeological stratigraphy. Hence a multidisciplinary approach was attempted. Archaeological, geomorphological and micropalaeontological investigations were carried out between Dahanu and Chaul along the North Konkan coast (figure 1).

The coastal deposits of North Konkan are the tidal clays or *Mendha*, sand, beach dune complex rock or *Karal*, and flood loams. These deposits attain a thickness of about 5 to 10 m and range in age from late Quaternary to Recent. They are mostly confined to an area extending up to 6 km inland from the present coast. They are fairly uniform and do not appear to have been disturbed by any catastrophic movements².

The general stratigraphy of the area is as follows: Habitation deposit — 1 to 3 m in thickness; *Karal* or beach rock — 1 to 3 m forming horizontal layers of 3 to 5 cm in thickness, at places interlayered with sand, rich in shells; Greenish grey tidal clay — 2 to 4 m in thickness, silty to clayey with shells, shell fragments, driftwood fragments and animal burrows, at places showing mottling.

The fossil or older tidal flat sediments occurring at about 1.5–2.5 m above present high-tide level are rich in microfossils. Two profiles, one from Nirmal (19°23'45" N, 72°47' E) and another from Purapada (19°27' N, 72°47' E) (figure 2), were analysed for pollen and microforaminiferal assemblages. It was thought that differential preservation of microfossils may help in distinguishing marine and fluvial sedi-

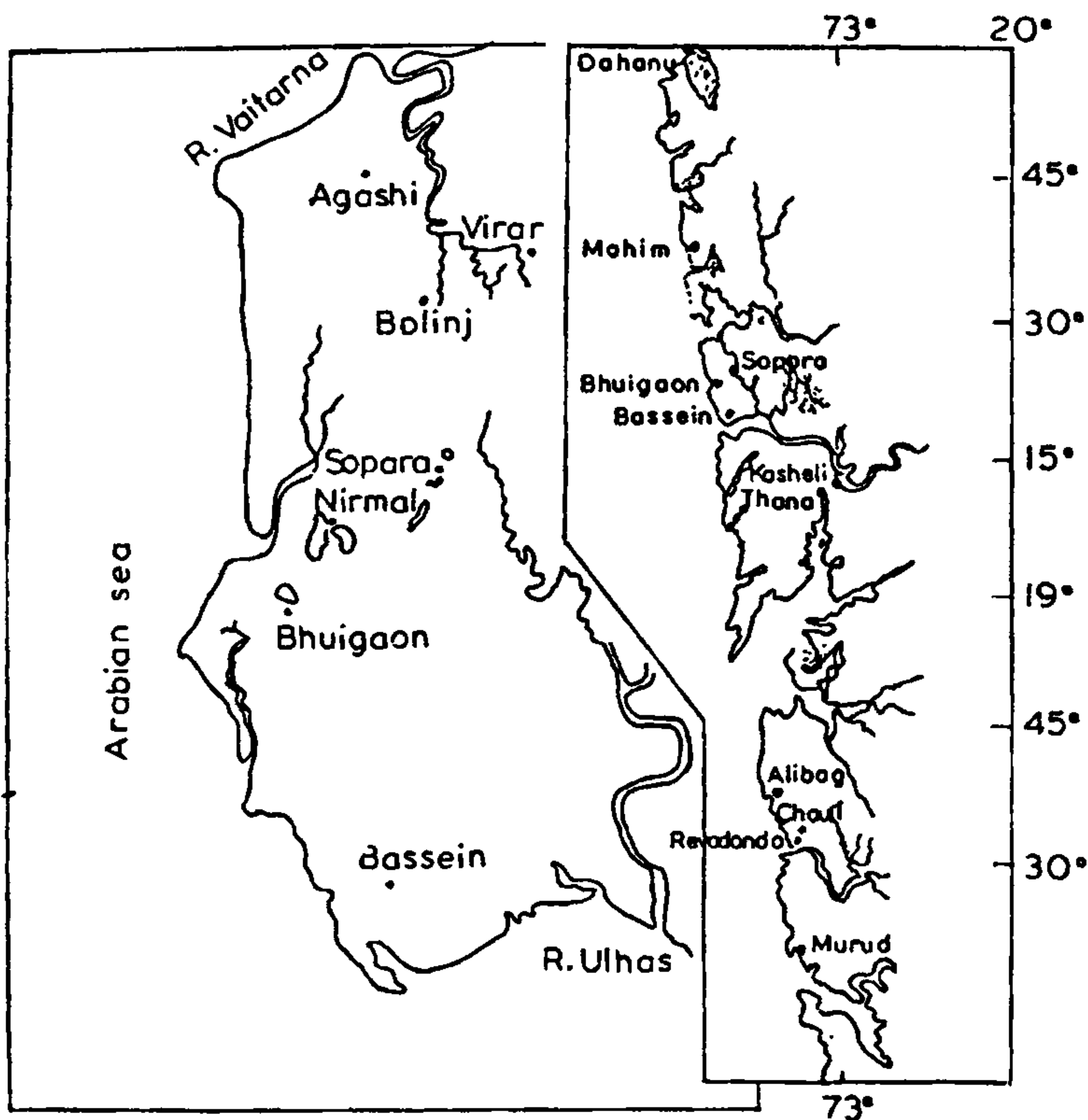


Figure 1. Location map of study area.

ments on a micro-level; such distinction is difficult in the field. Another reason for carrying out a palynological investigation was that earlier attempts^{3,4} to study the vegetational history of the area around Bombay had not proved successful.

From Nirmal well (figure 2) 38 samples were collected at intervals of 10 cm from 5.5 m to 3.5 m and at intervals of 20 cm from 3.5 m to the surface. Eight samples at intervals of 20 cm from Purapada were collected, avoiding surface as well as inter-sample contamination. These samples have been analysed using Faegri and Iversen's HF technique (1950), avoiding acetolysis. The slides were mounted in a jelly. The frequency of pollen per slide was 25–30 grains. The majority of pollen grains were of mangroves, which are the low-pollen-producing plants in this area⁴.

For observation of Foraminifera, palynological samples were treated with 5% NaOH for the

removal of organic matter. These samples were first dispersed with sodium hexametaphosphate and then washed with deionized water and dried.

The observations revealed that pollen were preserved in equal quantities irrespective of the type of sediment. Hence the palynological study did not help in differentiating the sediments and processes of sedimentation. On the other hand, the frequency of microforaminifera varies with the type of sediment (figure 2). Microforaminifera are sensitive to salinity and temperature conditions. They do not thrive in freshwater sediments⁵ and suggest three distinct phases of retrogradation and progradation, with a few minor phases of retrogradation and progradation. This was also substantiated by a dozen ¹⁴C dates of wood samples collected from tidal clays and shells separated from *Karal* samples. The dates range between 6850 ± 130 and 2755 ± 100 BP in North Konkan, mainly around Bhuigaon and

(iv) Today the area round Sopara is almost entirely tidal flats, with very few creeks of 1–2 km in length.

Thus geomorphological and field data reveal that the changes in the landscape of North Konkan during the last 7000 years were due to normal depositional and erosional processes, known as configurational changes, operating in the region and not due to neotectonism. These changes were more in the form of horizontal overlapping and inter-fingering of clastic sediments than vertical displacement due to neotectonism, as reported⁸ on the north coast of New Guinea.

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NEWS

ARTIFICIAL DIAMOND FROM SILICA

Two Soviet researchers, Sergei Stishov and Svetlana Popova staged a series of experiments at the Institute of Physics of High Pressures of the USSR Academy of Sciences. They obtained, with a pressure exceeding 100,000 times the atmospheric one, from a widely occurring silica its hitherto unknown modification with high density which exceeds by 65% the density of the initial mineral. This modification named "Stishovit" is transparent and semi-transparent crystals. It can cut glass as

easily as diamonds. Later this form of silica was discovered as a natural formation in the Arizona crater which was formed as a result of a meteorite impact: (super-high pressures develop during a collision between the Earth and meteorites travelling at tremendous velocities). (*Soviet Features, Science and Technology*, Vol. xxvii, No. 130. Published by Information Department, USSR Embassy in India, P.B. No. 241, New Delhi 110 001.)
