

The Occurrence And Distribution Of Benthic Foraminifera From The Savitri Estuary, West Coast, Maharashtra, India

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Abstract: In the West Coast of Maharashtra, India's Savitri Estuary, a thorough investigation of intertidal foraminifera was conducted. This study examines benthic foraminiferal assemblages at five localities from the Savitri Estuary, documenting their diversity and abundance in subsurface sediments. These samples revealed 32 species. Only Agglutinated foraminifera have been found in mangrove sediments. Faunal diversity in the Savitri Estuary's foraminiferal assemblage is extremely low.

Key words - Benthic foraminifera, Mangrove, Savitri Estuary, Subsurface sediments, TMN.

INTRODUCTION

All marine settings contain single-celled protists with shells called foraminifera. Benthic foraminifera clings to seabed surfaces or reside in sediments. Because benthic foraminifera can reveal information about both past and present ocean conditions, it is essential to comprehend their distribution and biological response. All marine settings, ranging from brackish to hyper-saline seas, the tropics to the poles, and the deepest ocean trenches, are home to foraminifera. One of the most prevalent types of shelled organisms in many marine habitats are foraminifera.

Foraminifera from the Savitri estuary have been reported by Pachkhande et al. 2014, enlisting all the species encountered in the study. Modern benthic foraminifera have a wide distribution and have been utilized to evaluate the ecological health of estuaries (Nagendra and Reddy, 2019; Sreenivasulu et al., 2019). In addition, foraminiferal assemblages are influenced by their immediate surroundings and have been used in the past and currently to characterize paleoenvironments (Rao et al., 2013; Benito et al., 2016; Minhat et al., 2016; Kemp et al., 2018).

GEOLOGY AND GEOMORPHOLOGY

The Maharashtra coast is characterized by a medium to high tidal range that varies from 2.8 to 3.5 m. In addition to the spring and neap tides, semi-diurnal tides, seem to have more impact on the tidal estuaries and creeks. The coastline is indented, with numerous coastal inlets like bays, estuaries and creeks (Karlekar 1981). Tidal water penetrates to a distance of about 15 km inland at high tide. The shoreline is flanked by a hinterland which is basaltic. The environment is favourable for the muddy and clayey substratum in the estuarine and creek inlets.

Savitri River is northernmost river of the Raigad district, and it acts as a boundary for about 24 miles between Raigad district and the Kolaba district. The estuarine portion of the district has comparatively good soils, and they indeed form agriculturally the best lands of the district. The river takes its rise from the Mahabaleshwar hill complex. The Savitri in its course of about 50 miles has an ungraded course in the region of the Sahyadrian main range, with rocky channel and steep banks. Outside the mountain tract it develops a meandering course and passes by the town of Mahad in the Kolaba district.

NEED FOR SAVITRI ESTUARY?

Murray (2006) has observed that the marshes and estuaries being accessible easily have been studied extensively world over. In the Indian context the work on foraminifera from the estuaries is not much (West Coast) despite their accessibility. In view of this study under taken is significant as it highlights the foraminiferal composition, which is useful in depositional environment and ultimately to be used in understanding of the evolution of the Savitri Estuary.

THE MANGROVE

Mangroves are salt-tolerant plants of tropical and subtropical intertidal regions of the world. The specific regions where these plants occur are termed as 'mangrove ecosystem'. These are highly productive but extremely sensitive and fragile. These ecosystems are also well known for their economic importance. They are breeding, feeding and nursery grounds for many estuarine and marine organisms.

The coastal frontier is continuously influenced by the climatic changes, effects of global warming and consequential sea-level fluctuations all of them setting sights on the change in ecology. Besides the geological processes like plate tectonics and volcanism are more pronounced at the continental margins. Mangroves are the ecotonal communities which subsist in the transitional zone between the marine and the terrestrial environment, of the low-lying tropical coast lines which constitute the self-sustained eco-system known for its floral, fungal and microbial diversity.

Following species of Mangroves are observed in the study area:

- i) *Aegiceras corniculatum*
- ii) *Avicennia marina*
- iii) *Sonneratia apetala*
- iv) *Lumnitzera racemosa*
- v) *Sonneratia alba*

MATERIALS AND METHODOLOGY

At five various locations along the Savitri River subsurface sampling was carried out namely Bankot jetty, Vesavi, Vesavi jetty, Kante and Umroli. The subsurface sample collection was done using PVC pipes. PVC pipes with a diameter of 4 inches and a height of 10 cm were utilized to extract a significant amount of sediments using small cores. Subsurface cores were processed and examined individually after being divided into three sections in the lab, top, middle, and bottom, each measuring around 4 cm in length.

RESULT AND DISCUSSION

The distributional pattern of a typical estuary environment can be seen in the foraminiferal distribution of the sub-recent sediments from the Savitri Estuary. The diversity is greatest at the mouth and lowest upstream. Agglutinated foraminifera along the Savitri Estuary have remarkable preservation, which suggests a very high rate of accumulation.

TMN

Except for the Bankot Jetty, no other site has shown any significance of the presence of other microfossils (Table 1). Ostracod is the only Fossil Group present at this site. The other microfossils include shells of gastropods, bivalves, diatoms, etc. Thus, from the diversity of microfossils, it appears that the Savitri Estuary has very low diversity.

Table 1 – TMN (Total Microfossil Number)

No.	Location	Microfossils	
		Ostracods	Other
1.	Umroli	-	-
2.	Kante	-	-
3.	Vesavi Jetty	02	18
4.	Bankot Jetty	409	45
5.	Vesavi (along the road cutting)	-	-
6.	Ovale	-	-

It is observed that there is uneven distribution of foraminifers across the Savitri Estuary. This may be attributed to the patchiness. Murray (2000) has noticed that there is no any relation between the standing crop and the season. Murray (2000) has also noticed that the production of foraminifera may be directly linked with an availability of organic matter as nutrients.

Subsurface sediments

The areas where the subsurface sediments were collected were Umroli, Kante, Veshavi Jetty, Bankot Jetty, Veshavi (by the road cutting), and Ovale. There aren't many foraminiferal forms in the lateritic clay sample under study, which comes from Umroli and Kante. Agglutinated foraminifera are the sole species that often represent the assemblage. There was a significant amount of foraminifera in the Bankot Jetty (Fig. 1), with calcareous foraminifera predominating, followed by agglutinated foraminifera, with Porcellaneous foraminifera being the least prevalent.

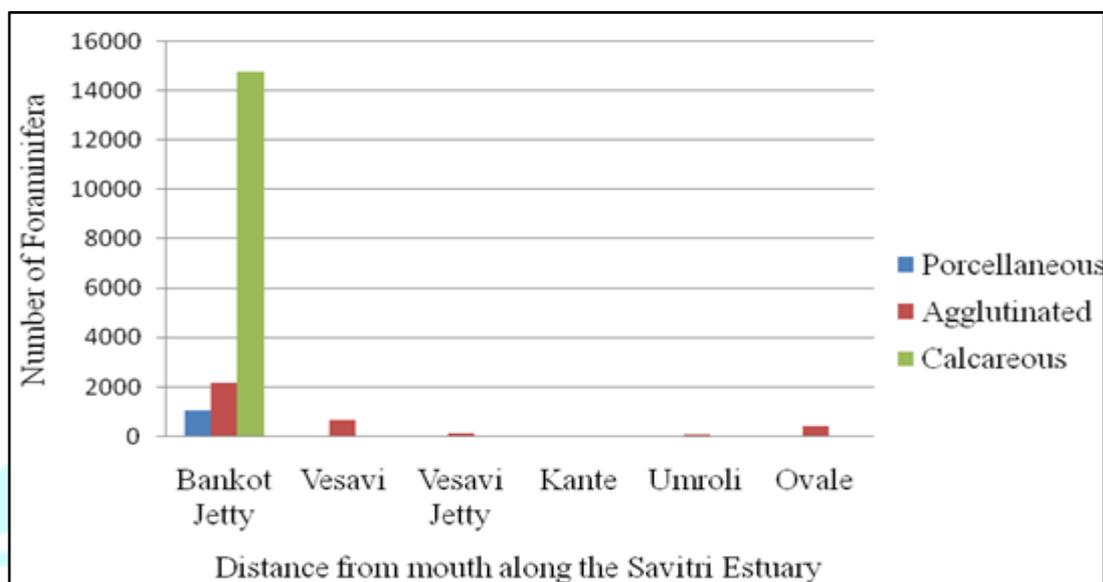


Fig. 1 – Distribution of Foraminiferal types

The occurrence of Planktonic Foraminifera

Planktonic foraminifera occurs in open marine conditions. Their recurrence in the sediment associated with Estuaries is very interesting. The sediments at Bankot Jetty near the mouth of Savitri Estuary have contained Planktonic foraminifer but represented by transparent, delicate-keeled *Globorotalia* (*G. menrdie*) and *Globigerinoides* sp. Their occurrence may be associated with storm events, Tsunami and upwelling events. In addition, the specimen of Radiolaria is also encountered. Similarly, the occurrence of Radiolarian specimens in the far-off site from the mouth may be attributed to the storm like event in this part of the tropical Arabian Sea, on the eastern side.

CONCLUSIONS

The Savitri Estuary's mangrove sediments have exclusively yielded Agglutinated foraminifera. The predominant native foraminiferal component of the mangrove is *Trochammina inflata*. The faunal assemblage of foraminifera is characterized by a very low diversity. In the mouth, diversity is highest, and in the up reaches, it is lowest. There has been no evidence of the occurrence of other microfossils at any site other than Bankot Jetty. At this location, the only Fossil Group found is Ostracod. The occurrence of Planktonic foraminifera and Radiolaria in the Mangrove sediments suggests tidal influence.

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