CHAPTER - IV

C O A S T A L E N V I R O N M E N T S

GENERAL CONSIDERATIONS

In the foregoing chapter the present author has already described the geomorphic characteristics of the various segments of the Saurashtra and Gujarat coastline. The diversity of various physical attributes of the different segments is directly related to, and to a considerable extent, comprises the controlling factors for the distinct differences in the ecological conditions prevailing in each segment. The microfaunal diversity in terms of relative abundance or otherwise, of certain genera and species, as also the degree of abrasion, is almost entirely dependent on the coastal marine environments.

The variations in the ecological conditions from segment to segment need to be spelt out in terms of certain important environmental parameters directly related to coastline processes both onshore and offshore.

The various salient features of the environmental parameters of the coastal segments have been summarized in the accompanying table (Table No. IV-1).

The purpose of the present study has been not only ~~tried~~ to sport out the microfaunal diversity along the coastline under study, but it has also aimed at an attempt to explain the diversity vis-a-vis the coastal ecology and the associated sediments. The author has therefore in this chapter highlighted the ecological conditions under which the foraminifers flourished in the various segments. She has further attempted to present an integrated picture of the various environmental parameters comprising processes and factors that have controlled the living conditions of these organisms.

She has taken into account the following parameters :

1. Shoreline configuration
2. Shoreline morphology
3. Coastal drainage
4. Substrate

5. Nature of the littoral zone :

   a. Slope, gradient and surface features

   b. Material

   c. Width.

6. Energy conditions :

   a. Wave action

   b. Tidal action

   c. Nature of currents.

7. Climatic conditions :

   a. Rainfall - Humidity etc.

   b. Temperature variations

   c. Wind direction

8. Salinity

9. Turbidity.

The bathymetric maps of the coastal waters (Figs. IV.1 to 6) ideally reveal the offshore and substrate conditions of the various segments. These maps, when interpreted in the light of the geology and meteorological factors, furnish adequate information on the diversity that marks the different segments in terms of environmental conditions.

JAMNAGAR COAST :(Between Jamnagar and Pindara)

Falling within the Gulf of Kutch environment this almost E-W running coastal segment is highly irregular and indented (Fig. IV.1). The littoral zone is fairly broad ranging between 5 and 10 kilometers and is dotted with a wide zone of coral reefs that have grown over a submerged basaltic platform. Substrate is either trappean or coralline, cut up by numerous submerged river channels. Rivers that flow into the gulf are generally very sluggish, and neither bring much fresh water nor carry any significant sediment load. Coastal waters are thus clear, with little turbidity, and show normal salinity. Tidal effect is quite prominent, the height of tides being of the order of 6 meters. Climatically, it is an area of low rainfall and semi aridity. The coastline is sheltered from the onshore southwesterly winds; thus wind-generated waves and related surf action are negligible. The sea is by and large, relatively calm and the coastal waters experience only tidal currents. On account of the highly irregular subsurface topography of the littoral zone with numerous deeper channels, the actual directions of tidal currents are also very variable and the total picture is fairly confusing. It is essentially a low energy coast with relatively clear waters of normal salinity, conducive for the growth of corals and mangroves.

OKHA COAST : (Between Pindara and Okha)

This coastal segment located at the mouth of the Gulf of Kutch, is again dotted with coral reefs and an uneven

coastline (Fig. IV.1). The substrate is highly rugged with numerous big and small projections. The littoral zone is comparatively narrower - not exceeding 3 km; though some big littoral islands are the most striking features of the offshore. As compared to Jamnagar, being nearer to the open sea, parts of it show fairly strong action of waves (Okha point). However, the bay portion is sheltered and affected only by tide action and related tidal currents.

DWARKA COAST : (Between Okha and Okhamadhi)

Facing the Arabian sea, this segment with rather smooth and unindented shoreline is marked by an abrupt change in the ecological conditions (Fig. IV.1 & 2). Characterized by a narrow littoral zone with a substrate of Dwarka rocks, the portion from Okha to Dwarka is under the influence of strong wave action and NNE longshore currents. Further offshore, the shelf extends for several kilometers, is rather smooth and shows a depth range upto 60 M for about 40 km. From Dwarka to Okhamadhi, only the wave action predominates and shows strong influence of southwesterly onshore winds. Coastal waters are clean, free from sediments and show normal salinity.

PORBANDAR COAST : (Between Okhamadhi and Kodinar)

This coastal segment is the type area for the coastal miliolites. Its geomorphic characteristics have already been described in the preceding chapter. An almost straight NW-SE

trending shoreline is characterised by an uneven substrate comprised of submerged miliolites (Fig. IV.2, 3 & 4). Almost all along the littoral zone and the immediate offshore portions, occurrences of submerged dunes are observed on the Naval Hydrographic maps. This coast experiences the maximum impact of powerful breakers and resulting surf action, for which strong southwesterly and westerly winds are mainly responsible. The unevenness of the substrate topography also contributes to the roughness of the coastal waters. The to and fro movement of the water normal to the coastline acts as an effective tool for (i) transporting onshoreward the tests, and (ii) for abrading the shell fragments, foraminifers etc. This high energy coastal segment is also seen to experience considerable erosion and planation of submerged miliolites. The various rivers which meet the sea along this coast do not carry much sediment load so the turbidity is minimum. But, the river waters contain dissolved $CaCo_3$, thus augmenting to the $CaCo_3$ content of the coastal waters.

DELWADA COAST : (Between Kodinar and Gopnath)

The change in the direction of this coastline to almost E-W has been responsible for substantial change in the coastline processes (Fig.IV.4 & 5). Here, the waves generated by the southwesterly wind strike the coast obliquely. The miliolitic substrate being uneven generates breakers at many places in the offshore area, and the wave-generated energy is seen to

bring about significant eastward Longshore drift. Compared to the previous segment, the shoreline configuration is much more irregular and as a result the projecting cliffy headlands are the sites of strong surf action and erosion, while the protected crescentic bays provide areas of calm waters where the processes of beach development are predominant.

BHAVNAGAR COAST : (Between Gopnath and Vithalbandar)

This coastal segment of Saurashtra located right within the Gulf of Cambay provides an example of highly muddy coastal environments (Fig. IV.6). Being protected and sheltered against southwesterly winds, the water movement here is controlled mostly by tides (which are very high), and as a result, the sediment transport is exclusively dependent on tidal currents. The muddiness of the coastal waters is on account of the churning up of the sediments brought to the gulf by the rivers from the Mainland side. The tidal currents are seen to have deposited extensive mudflats. In this segment, the near offshore areas are rocky in the southern half. To the north of Ghogha, it comprises a muddy substrate. The rocky platform to the south of Ghogha has however a thin veneer of mud. Even the Tertiary and Quaternary substrate in the deeper parts of the gulf has a substantial cover of silt and mud. As already stated the shoreline currents are essentially controlled by the flood and ebb tide action, the waves and related surf activity being minimal. The water is hyposaline and this is due to the constant influx of fresh river water into the gulf.