CHAPTER

II

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CHAPTER II

P R E V I O U S W O R K

GENERAL

The Gulf of Khambhat has received very little attention of scientists in the past, and only in recent years some data is available on the geological and geomorphological aspects of the Gulf coastline and some information has been generated on the offshore processes. No integrated investigation exclusively on Gulf of Khambhat has been conducted, nor any attempt has been made to synthesise the existing data on the onshore and offshore environmental conditions. With a view to obtain a suitable background for the present investigation, the

author critically persued through all available geological and geomorphological information on the coastal areas of the Gulf. Also with the help of published research papers as well as toposheets, hydrographic charts and satellite imageries, he endeavoured to collect maximum information on the offshore conditions viz., tidal currents, waves, sediment transport etc. In the following pages, he has summarised the available details.

TECTONIC ASPECTS

Studies by ONGC have shown that the configuration of the Gulf of Khambhat is fault controlled. The shape of the Gulf, coastline features, drainage pattern and the Cenozoic depositional history are all related to numerous regional faults. The tectonic framework of the Gulf is, in a way the manifestation of the various bounding faults which have given rise to the oil bearing Tertiary Cambay Basin (Raju 1968; Mathur et al., 1968; Chandra & Chowdhary, 1969; Eremenko, et al., 1969; Markevich et al.,1976, Rao & Talukdar, 1980; Biswas, 1982). The work of the ONGC has clearly established the existence of the Western Cambay Basin Bounding Fault (WCBBF) which extends along the Bhavnagar coast of the Gulf. The extension of the Narmada Fault marks the southern limit of the actual Gulf on the

Saurashtra side, whereas along the Mainland, the Gulf environment extends upto the mouth of the river Tapi. The various ONGC workers have shown a number of faults within and around the Gulf. According to Chandra & Chowdhary (1969) the mouth of the Sabarmati river and the WCBBF almost coincide. These workers have shown an ENE-WSW fault along the river Mahi. On the other hand, Raju (1968) does not show any significant extension of WCBBF and instead he has shown a WNW-ESE trending fault extending from Mahi upto and across the Sabarmati river mouth. Although the Mainland coast of the Gulf does not reveal any fault, the Eastern Cambay Basin Bounding Fault (ECBBF) which lies approximately 50 km inland does have its effect on the coastal configuration. Subsurface data (Chandra & Chowdhary, 1969) have revealed an enormous alluvial thickness. Obviously this coastal segment is marked by a period of subsidence during Pleistocene followed by some uplift during the Holocene.

GEOLOGY AND GEOMORPHOLOGY OF COASTAL AREAS

Earliest reference to the Saurashtra coast is available in the work of Fedden (1884) which has formed the basis for all the later works. Describing the coastal rocks of southern Saurashtra he included Quaternary rocks

also (except miliolite) into his Gaj Beds of Tertiary age. After Fedden's work the coastal geology of the Gulf did not receive any attention for almost 60 years. During the last three decades, however, officers of the ONGC (Negi, 1955; Babu, 1958; Rao & Jain; 1959 and Datta, 1959) in connection with the oil exploration programme, conducted geological and geophysical studies along the Bhavnagar-Ghogha coast. These authors mainly mapped the Tertiary rocks. To Datta (1959) goes the credit of a detailed geological mapping of Bhavnagar-Ghogha coast. Shrivastava (1963, 1968 a, 1968 b) also of ONGC furnished a systematic petrographic account of the various rocks of the same area. He however emphasized on the Quaternary formations. References to the Saurashtra side of the Gulf coast are also found in the works of Mathur et al. (1968), Raju (1968) and Chandra & Chowdhary (1969). The most recent work on the Bhavnagar-Ghogha coast is that of Ganapathi (1981), who has given a precise and integrated stratigraphic picture of the western coast of the Gulf.

It is rather interesting to observe that whereas the Saurashtra coast of the Gulf has been investigated in fair detail, the Mainland coast did not receive any attention. Perhaps as this part of the coast comprises mostly Quaternary alluvium, it has not attracted any one geologically and has

thus remained uninvestigated. The works of Chandra & Chowdhary (1969) which described the stratigraphy of the Cambay Basin is the only source to obtain the geological details of the eastern coastline of the Gulf, but that too pertains to the sub-surface information only.

From the point of view of the coastal geomorphology the onshore areas around the Gulf of Khambhat, are of great interest and provide a striking diversity of landscapes. No exclusive and systematic study of this aspect has been taken up by any one in the past, except for some preliminary studies carried out by Iqbaluddin & Banerjee (1978) on the geomorphic processes operating along the Bhavnagar coast. However, recently Ganapathi (1981), Ganapathi & Merh (1982), Patel & Merh (1982) and Patel et al. (1985) have described the coastal geomorphology of the Gulf. Ganapathi (1981) has given a very elaborate description of the Bhavnagar-Ghogha coast. Patel & Merh (1982) have described the landforms of the Bhogavo-Sabarmati confluence area that marks the northern tip of the Gulf. The geomorphic features of the Mainland coastline between the rivers Mahi and Tapi have been described by Patel et al. (1985). In these works carried out by the Quaternary Research Group of the M.S.University of Baroda, attempts have been made to describe the different landforms vis-a-vis sea level changes and neotectonism.

Most recent information on the coastal areas is available in the works of Pandya, K (1984) and Patel **K.F.** (1985). Pandya (1984) has given a list of the foraminifera occurring in the coastal sediments while Patel, K.F. (1985) has described their lithology.

Some indirect geological information on the paleo-climatic changes and eustatic sea-level fluctuations during the Holocene epoch are available in the works of archaeology pertaining to the Harappean port town of Lothal located quite close to the Gulf (Rao, 1973, 1979, Pandya, S. 1985).

OFFSHORE INFORMATION

Not much information is available in literature on the Gulf offshore because the Gulf of Khambhat has remained uninvestigated. From that angle in fact no serious attempt has been made to study the nature of the Gulf sediments, the behaviour of tidal currents and the nature of interaction between the tidal waters and the river waters. Perhaps the rough Gulf waters rendered it somewhat inaccessible.

However, with the availability of Satellite Imagery the offshore areas of the Gulf have recently attracted some attention. As a result, the Survey of India Toposheets, Naval Hydrographic Charts and Satellite Imagery

now do provide considerable offshore information. The toposheets and naval hydrographic charts reveal the depth conditions of the Gulf and also show various mud bank accumulations. Satellite Imagery have not only provided information on the configuration of the coastline and mudbanks but have also revealed the amount of turbidity of the Gulf waters in different parts and the movement pattern.

In recent years some offshore data have appeared in the form of research papers by Rao (1975); Borle et al. (1982), Vishwanathan et al. (1984), Nayak & Sahai (1985) and Muley et al. (1985). Whereas Rao (1975) has described the foraminiferal content of the Gulf sediments, Borle et al.(1982) have described the composition of the estuarine sediments, Vishwanathan et al.(1984) have on the basis of Landsat Imagery studies, given a preliminary account of the sediment plume dispersion and have correlated the phenomena with bathymetry. The works of Nayak & Sahai (1985) and Muley et al. (1985) which are based mainly on satellite imagery studies, appear to be the only systematic studies. Nayak & Sahai (1985) on the basis of Landsat Imagery has described the tidal as well as seasonal sea level changes, current patterns and sediment transport and the relationship of these phenomena with some erosional and depositional coastal geomorphic features. Muley et al. (1985) have

studied the SALYUT-7 space photography and have described the coastal geomorphology as well as the sediment transport in the Gulf.