

CHAPTER 1

INTRODUCTION

INTRODUCTION

PROLOGUE

The period of about last one million years in the geological history has witnessed climatic changes, effects of which are more pronounced in coastal areas. The climatic changes have resulted because of the Pleistocene (?) Glaciation in high, mid and low latitude areas. The coastal areas have the imprints of these changes in both forms and in degrees, mainly in the context of evolution of coastal geomorphic features.

Observations and studies made for a period of about last century have indicated that there is a sea-level rise by 10 to 15 cm. Detailed investigations along the coasts have confirmed that in the recent geologic past, maximum sea-level rise is of the order of about 2.2 meters/100 years.

These changes are due to, "Greenhouse Effect" that bring about melting of polar ice caps, resulting in increase in sea-level in mid and low latitude areas. This has affected the coastal geomorphic configurations during the Quaternary period, also along the Indian Coast. Along the Western continental margin of India, West Coast Fault was formed during Miocene (Krishnan, 1953) and subsequent tectonics and neotectonism have further modified the coast, giving rise to present configuration. However, the evolution of the coastal region is not only the result of the marine processes, but it

is also the result of fluvialerosional and depositional processes. It is therefore said that the landforms in the coastal region are the result of the interaction of various marine and fluvial processes. The neotectonic activity is reflected in the marked variations of the geomorphic features like 'Ria deposits'. Analysis of geomorphic features thus help in understanding the role of fluvio-marine processes in their evolution and response of the coastal belt to neotectonism during the Quaternary period.

Field studies can help in identifying and establishing submergent and/or emergent behaviour of the coastal area. These studies reveal spatio-temporal relationship of the coastal geomorphic features, indicative of the coastal evolution. The geomorphic features reveal nature of the various processes that have operated during geologic past. It is anticipated that an analysis of geomorphic configuration will help in identifying the geomorphic features of emergent and submergent characters. It can be said that evolution of the landscape is not merely due to erosional or depositional processes, but types of rocks and their structural disposition are also the major controlling factors.

Purpose of the present study is to identify and describe geomorphic features present along the coast as well as to know the morphometric parameters and their role in shaping up of the area under investigation.

AREA OF INVESTIGATION

The present study incorporate geomorphological investigations of the area between the Bhatya Creek (lat. $16^{\circ} 59'$ N; long., $73^{\circ} 10'$ E) in the north and the Vijaydurg Creek (lat., $16^{\circ} 34'$ N; long., $73^{\circ} 20'$ E) in the south, Ratnagiri district, Maharashtra. The coastal tract under present investigation stretches for a distance of about 70 km. in length with a width of about 15 km. The area lies in the Survey of India topographic sheet Nos. 47 H/5 and 47 H/6. The important towns in the area are Bhatya, Pavas, Nakhare, Gaonkhadi, Nate, Jaitapur, Madban and Ansure. These are located either on or near the coast and are connected by all weather road from Ratnagiri and Rajapur on Bombay-Goa Highway. (Fig.1.1)

PHYSIOGRAPHY, CLIMATE AND VEGETATION

The present area under study is the coastal tract which lies to the west of the Western Ghats. The area is hilly and intersected by the major and minor Creeks, viz; Bhatya, Pavas, Purangad, Rajapur and Vijaydurg. In the western part of the study area, along the coast, development of marshes and tidal inlets have been predominantly observed.

The area experiences humid and tropical climate. In general, months from June to September receive heavy rainfall, with an average of about 3290 mms/year. During the rest of the year, temperature varies between 33° C to 43° C.

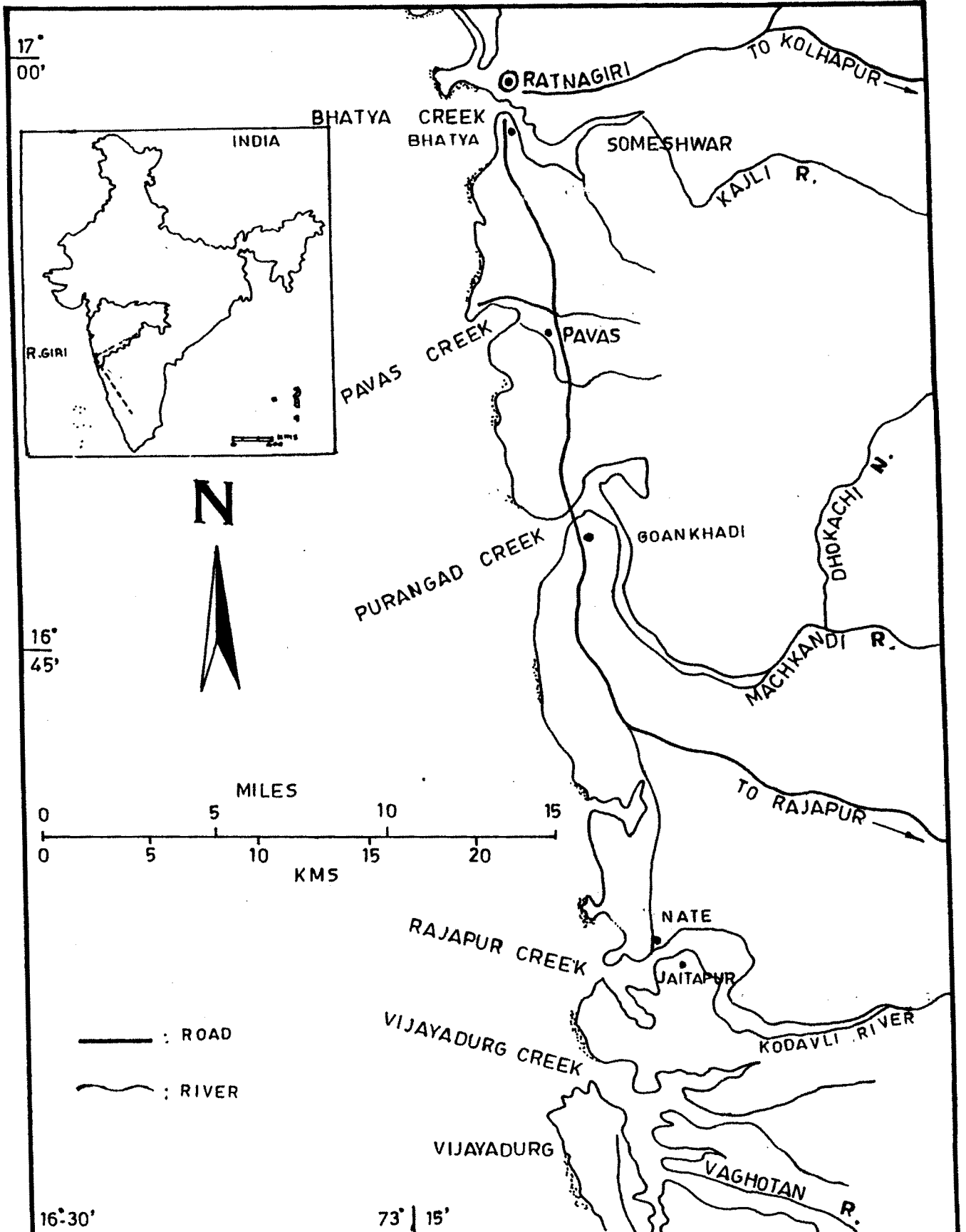


FIG. 1.1 : LOCATION MAP .

The humid and tropical climatic conditions, i.e. heavy rainfall, high temperature and high relative humidity are suitable for mango and cashew plantation, which is extensively carried out in the area under investigation.

PREVIOUS WORK

The problem of sea-level rise has been tackled as one of the major fields of research by all the countries of the world. Nature of the anticipated sea-level rise depends not only from latitude to latitude, but also upon the course of evolution the respective coastline has followed during the geologic past. Considering the importance of the problem, Earth scientists have attempted to investigate the coast from various aspects.

Geomorphological study of the West Coast of India has been carried out by many workers. However, the detailed and systematic studies relating to terrain characteristic parameters have not been studied and analysed in detail.

The geomorphological observations relating to the West Coast of India have been made by Ahmed (1972), on the basis of data obtained from large scale topographic maps. The coastal region according to Dikshit (1970, 1976 a and b) is characterised by a number of erosional surfaces. The coastal plain between Bombay and Goa is a result of the combination of marine and fluvial activities which acted in succession. The important information on the evolution of the Maharashtra

Coast, based on radio-carbon dates has been provided by Agarwal and Guzdar (1972) and Agarwal, et.al.(1973). Powar et. al.(1978, 1979 a and b) have described and classified various geomorphic features of the coastal region of Maharashtra from Palghar in the north and Vijaydurg in the south. Geological Survey of India (1980) published a special bulletin of the Kerala Coast and in 1984 published another bulletin on 'Geomorphology of Maharashtra'. Rao and Subramanian (1983) have studied regional geomorphology along the West Coast around Ratnagiri, stating that it is evolved due to rifting and drifting of the subcontinent, which was initiated towards the Late Mesozoic and continued till the end of Deccan Trap eruption. They have further stated that NNW-SSE trending coastline appears to be affected by ENE-WSW trending faults. By observing geomorphological evidences, it is considered that it is a strike-slip type of fault. Morphotectonic evolution of the southern part of the western coast of Ratnagiri and Sindhudurg districts of Maharashtra has been studied by Tiwari (1984). According to him, the coastal tract of Maharashtra has evolved under the tectonic influence, coupled with erosional processes and the erosional surfaces from 300' above msl to lower elevations have formed due to periodic uplift of the coast. Eustatic Quaternary sea-level changes from the observation of dissected aggradational channel lags of the present streams and the presence of marine cliffs have also been pointed out by Tiwari, along this coast.

Rajguru and Marathe (1984), on the basis of geomorphological characters of primary and secondary laterites have suggested that the coastal tract around Ratnagiri has experienced neotectonic activity. Kale and Rajguru (1985) have brought out the evolutionary history of the Maharashtra Coast on the basis of Neogene and Quaternary marine transgressional and regressional cycles. Varadrajan and Ganju (1986) have studied the configuration of the Indian coastline, which, according to them, is controlled by a series of lineament trends. Movement along the NW-SE and NNW-SSE trends are responsible in shaping the Western Coastal belt. The coastal geomorphic features in relation to neotectonism have also been studied by Ganapathi et.al.(1984), Sukhtankar (1986, 1989), Patil et.al.(1988), Sukhtankar and Pandian (1990).

Based on the nature, location and relative positions of landforms, the coastline configuration and coastlines of emergence, of submergence have been reported by different authors. A review of the studies, on Coastal Geomorphology of India has been given by Vaidyanadhan (1987). The similar study has also been carried out by Niyogi et.al.(1971). Merh (1987) has taken an overview of the Quaternary sea-level changes along the Indian Coast on the basis of erosional and depositional features in relation with the high or low strandlines. Ganapathi and Merh (1987) studied in detail the features of the Saurashtra Coast and delineated the coastal features, observing that all the coastal landforms are made

up of the Quaternary sediments. Ramasamy (1989) suggested that geomorphic architecture of the West Coast consists of a disorganised patchy pediments and the coastal cliffs are encircled by Quaternary Sediments; Bruckner (1989) classified the West Coast of Maharashtra as a "Ria type" coast. On the basis of the geomorphic features, he has further suggested that it as a submerged coast. Vaidyanadhan (1987) have mapped coastal erosional and depositional landforms along the rocky coast and discussed about the marine and terrestrial sediments, present along the coast. Evolution of sea-level rise on the shore zone areas of the Maharashtra Coast has been delineated by Sukhtankar and Pandian (1990).

Various descriptive morphological studies of the plateau region have been carried out by many. To quote a few amongst them include King (1953), Pascoe (1964), Worcester (1965), Thornbury (1969), Doornkamp and King (1970), Radhakrishnan (1971), Vaidyanadhan (1971), Davis (1972), Mathur and Verma (1972, 1979), Gray (1973), Roy Choudhary (1978), Subramanian (1979), Sawant (1980, 1985), Iqbal-Uddin and Banerjee (1982), Banerjee and Bhattacharya (1982), Chopra (1984), Pomar (1991), Frank Siracko (1991), Vivian Gornitz (1991).

PURPOSE OF THE PRESENT STUDY

A review of the earlier work revealed that there is few attempt in working out the various geomorphic and terrain

parameters in the context of the evolution of the coastal region, under present investigation. It is therefore proposed to undertake these studies in detail.

The studies are aimed at -

- i. to enlarge a part of the topographic sheet of the area to the scale of 10 cm. = 1 km. to understand the drainage characteristics,
- ii. to demarcate major basin and sub-basin from the area,
- iii. to carry out lineament analysis,
- iv. to study various drainage parameters, namely, bifurcation ratio, stream length, drainage density, constant of channel maintenance,
- v. to study the parameters of terrain characteristics namely, Hypsometric analysis, slope analysis, altimetric analysis, and
- vi. to synthesize these studies to understand geomorphic evolution of the coastal region, under present investigation.