CHAPTER - ONE

INTRODUCTION

THE PURPOSE OF STUDY

The Maharashtra coastline provides an interesting evolutionary model of a complex interplay of sea-level changes and tectonism during Quaternary periods. The present study, restricted to a stretch of about 75 km of coastline between Dahanu and Kora, was taken up. The coastline is endowed with an interesting history of geological and geomorphic evolution. Practically, very little work has been done on this coastal segment and the study, undertaken by the present author, provides for the first time, an integrated picture of the various terrain attributes of the coastline in particular and the West coast thana in general. The present author has, attempted to investigate almost all aspects of coastline evolution including effects of eustatic sea level rise, role of tectonism in the development of various geomorphic features, influence of wave

dynamics and shoreline configuration on energy level of deposition and pattern of nearshore sediment transport.

GEOGRAPHIC LIMITS

The study area comprises the coastline between Dahanu and Kora, falling within the districts of Thana of Maharashtra and lies between the latitudes 20°N and 19° 30′ N and longitudes 72° 38′ E and 72° 50′ E (Fig.1.1). The various villages from north to south dotting the coastline are those of Dahanu, Tadalpada, Gungwada, Vadapokhron, Vadhavan, Varor, Dandepada, Tarapur, Nawapur, Alewadi, Muramba, Satpati, Vadrai, Shirgaon, Mahim, Mangelvad, Usarni, Mathana, Yedvan and Kora. This study pertain a coastal terrain covering an area of approximately 1575 sq km., forming a portion of the Survey of India. Toposheets No 47 A/9, 47 A/10, 47 A/13, and 47 A/14., has been studied.

PHYSIOGRAPHY

Physiographically, the study area can be divided into three zones.

1 - Eastern hill ranges and plateau

2 - Coastal plain

3 - Shore zone

Lying to the east of the alluvial stretch, hill ranges rise rather abruptly to form a vast rocky terrain with an average

LOCATION MAP

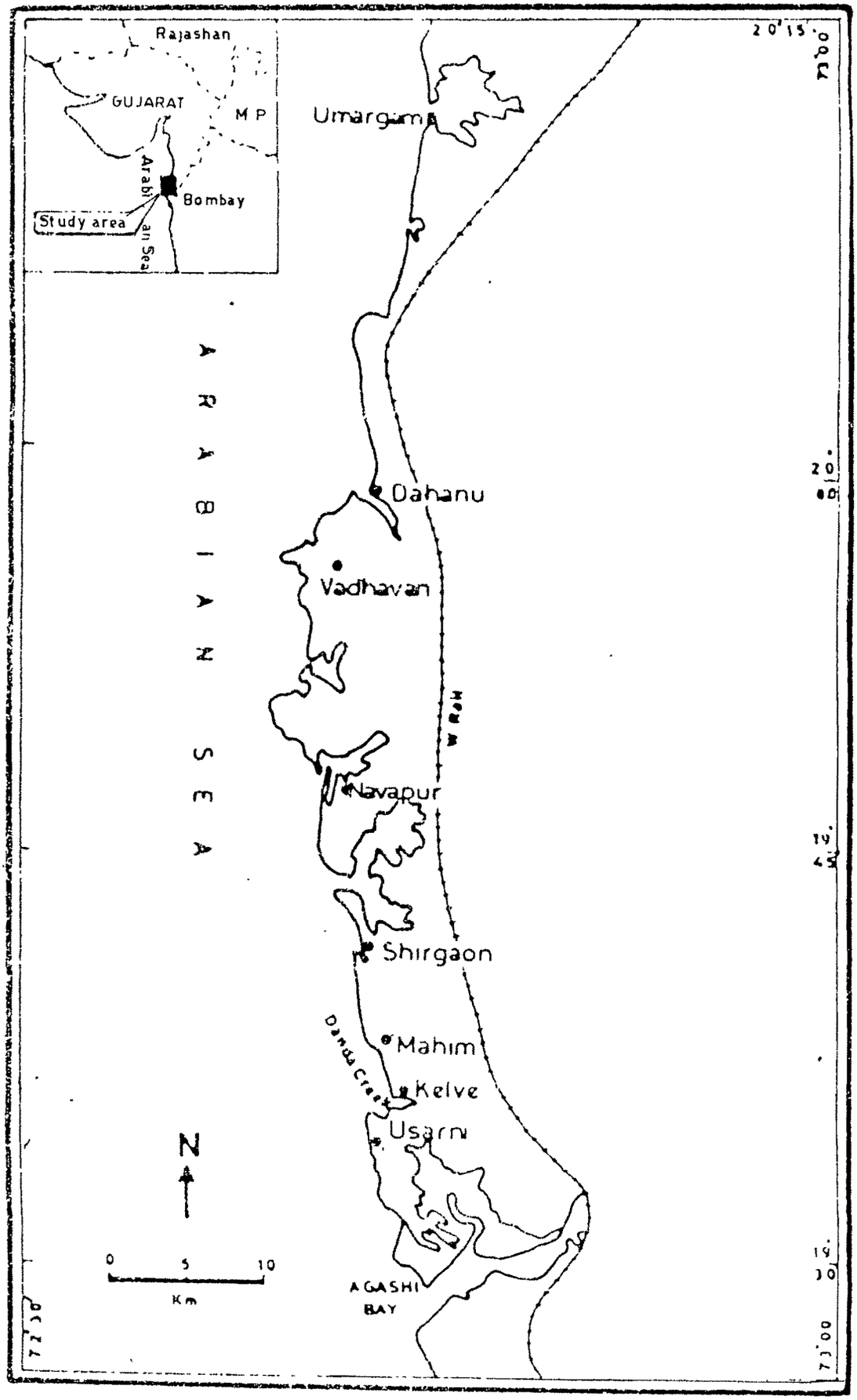

FIG-I-1

height of about 300 m; - weathering and erosion of these high trappean hills have given rise to a variety of flat topped features such as buttes and mesas and also pedeplains. Within the highlands, at the foot of the hills, subarial erosion has given rise to extensive colluvial deposits. On going seaward, the rocky terrain passes into the coastal plains; these plains are charterized by alluvial and residual soils. The coastal plain shows a very gentle slope towards the sea and are cut by a few shallow streams. The actual shore zone provides interesting coastal features comprising beach, beachrocks, mudflats, numerous creeks, cliffs and sand dunes.

CLIMATE

The climate is of subtropical type, rather mild and humid. The average maximum temperature during summer is 42°C while the minimum winter temperature is 12° C. The temperature rises gradually from February and reaches its peak in May. Sometimes the mercury may touch as high as 46°C during summer and may occasionally fall to 4°C during winter. The coldest month is January. With the onset of monsoon the temperature falls. The average annual rainfall around Dahanu is 2600 mm. The rainy months are June to September but July is the wettest month. Humidity, on the whole, is high in comparison to the inland portions. Relative humidity is maximum in the early hours, and decreases towards, afternoon and increases again at night, with the fall of temperature. Humidity, on the whole, is high in comparison to the inland portions. During summer and winter it

is lowest. In the morning it is 60 % and afternoon 30 %. The average humidity during monsoon is 80-85 % in the morning and 70-75 % in the afternoon.

During winter, the winds are light and north easterly throughout day and night. Similar winds prevail during the morning hours from January to March but in the afternoon they blow in a westerly direction. During the months of April and October the wind direction is variable. From May to September, the south-westerly winds blow all throughout the day and night from the Arabian sea. The daily mean speed is 7 km per hour from May to August and 3-4 km per hour for the other months.

VEGETATION

From the vegetation point of view, the study area provides a marked diversity between the flora of the nearshore areas and that of the inland. On going west to east, from shoreline to hilly terrains, a progressive change in the types from haline through xerophytic to mesophytic, is observed. The vegetation of the study area could, therefore, be divided into four main types as follows :

A. Strand Vegetation
B. Tidal Flat Vegetation
C Mangrove Vegetation
D. Semi-Arid Vegetation.

A. Strand Vegetation

Strand vegetation is characterised by open mat forming pioneers, in varying porportions, closely followed by the scattered herbs, shrubs and trees. The following species are encountered : Ipomea pes-caprae, Canevalia maritima, Portulaca oleraceae, Spinifex littorus, Cyperus aranerius, Aristida sp, Septaria glanea, Zizyphus nummularis, Argemons mexicana, Indigofera corodofolia, Crotolaria juncea, Cladophora sp., Ulva sp., Dictyota sp., Sargassum sp., Atriplex stocksii, Euphorbia thymiflora, Goniogyra hirta, Leptidogathus sp., Kickxio ramosissima, Portulaca quadrifida, Capparis decidus, Barleria prioritis, Tinospora cordifolia, Luffa acutangula, Echinos echinata, Lepidogathess triervia, Cyperus sp., and Solanum xanthocarpum.

B. Tidal Flat Vegetation

Coastal mud Tidal flats that are constantly under tidal action are generally barren except for some sparse vegetation of grasses such as Aeluropus lagopoides and some algae. On the present day mudflats the common halophytic plants are : Suaeda fructiosa, S.nudiflora, Sesuvium portulacastrum and Cyperus sp. The flora of the raised mudflats which are abore the present day tidal influence comprises the following xerophytic plants : Urochondria setulosa, Echinops echinata, Spinifex littoreus, Prosopis Cinneraria and Capparis decidua.

C. Mangrove Vegetation

Sporadic patches of mangroves are encountered on saline and brackish muddy soil of intertidal zone and along the creeks, The common species are Avacennia alba, Acanthus illicifolius, Salvadora oleides, Sesuvium portulacustrum, Sonneratia apetata, Exoecaria agallocha and Rhizophora nucronata.

D. Semi Arid Vegetation

Vegetation away from the shoreline is a mixture of inland open communities and scrub forests. The most common plants are phonix sylvestris, Borassus flabellifer, Butea monosperma, Salvadora persica, Ficus religosa, Ficus bengalensis, Casia auriculata, Cassia occidentals, Barleria prinitis, Boerhavis diffusa, Calotropis Giganta, Ocinum ammericana, Capparis indica, Tridax procumbanus and Solanum surattena.

FAUNA

On account to above conspicous of land forest a vegetation the coastal area does not support animal population. Hence, only lizards, mongooses, squirrels, rats and chameleons are seen. On the other hand in the hinterland, wild animals such as tigers, panthers, wild cats, foxes, stags, hares, etc. are common. In the thick forests a variety of birds of different species are encountered. Among them, the most common are mullards, pritails, gargry, ducks, pochard, cranes, partridges, sand grouses, storks and agres. Snakes such as cobra, python, viper, brown snakes

and blind snakes are occasionally seen. The marine fauna consists of different types of fishes, prawns, crabs and lobsters.

POPULATION

There is no uniform distribution of population in the study area. The coastal belt is chiefly inhabited by the fishing communities whereas on the fertile alluvial areas, agriculturists are dominant. The majority of the inhabitants of the study area are Hindus followed by Muslims and Parsees.

COMMUNICATION AND TRANSPORT

The broadgauge Western Railway track passes through the major villages, amongst which Dahanu and Palghar the most important stations. The entire study area is connected by numerous State Highways and District Roads. Practically all the major villages are linked by metalled roads motorable during fair weather. The various ports used for carrying goods by sailing vessels and motorships are Dahanu, Tarapur, Nawapur, Muramba, Mahim and Danda. Ferry boats are used to cross various creeks in the area.

SCOPE AND METHOD OF INVESTIGATIONS

This investigation included a detailed study of the geology and geomorphology of the coastal terrain, and a critical evaluation and appraisal of the various processes that have been

operating during the Quaternary period, to give rise to the existing landforms and shore deposits. The scope of this investigations could be listed to comprise :

i. Geological studies of the trappean rocks and the Quaternary deposits.
ii. Geomorphological studies consisting of the identification of various landforms, erosional as well as depositional.
iii. Recent hydrodynamics and the formation of bedforms.
iv. Beach rocks formation.

In order to achieve his objectives and to obtain as coherent picture as possible of the various geodynamics phenomena operating in the study area, the present author had to enlarge his scope and method of investigation to cover a broad spectrum of investigation. His investigation comprised following steps :

i. Exhaustive reference work of all available literature on the different geological, geomorphological, tectonic and marins aspects of the coast in general.
ii. Studies on the airphotos and satellite imageries to delineate and mark the regional lineaments, drainage features and major geomorphic features.
iii. Analysis and evaluation of data available on the Survey of India Toposheets (on various scales 1:250,000 and 1:50,000) to delineate the landforms, identify features and shoreline configuration.

iv. Actual field work to various parts of the study area and its immediate neighbourhood. The field work was done with a view to collect representative samples from various locations, to recognise landforms, record their morphology and actual field characteristics. Special attention was paid to the recent coastal sediments. Sediments from different environments such as beach, tidalflat, coastal dune etc. were collected. In most cases, samples from a depth of about 20 cm were obtained. To retrieve samples from the low waterline zone, trips were undertaken during low tide. At selected spots, samples were collected from the upper 1 cm to study wave dynamics in relation to sand transport.

v. The laboratory investigation comprised (a) Routine petrographic studies in thin section. (b) Granulometric analysis of consolidated and unconsolidated sediments from various environments including marine and aeolian and (c) separation of micro fossils and their identifications.