chapter i

INTRODUCTION

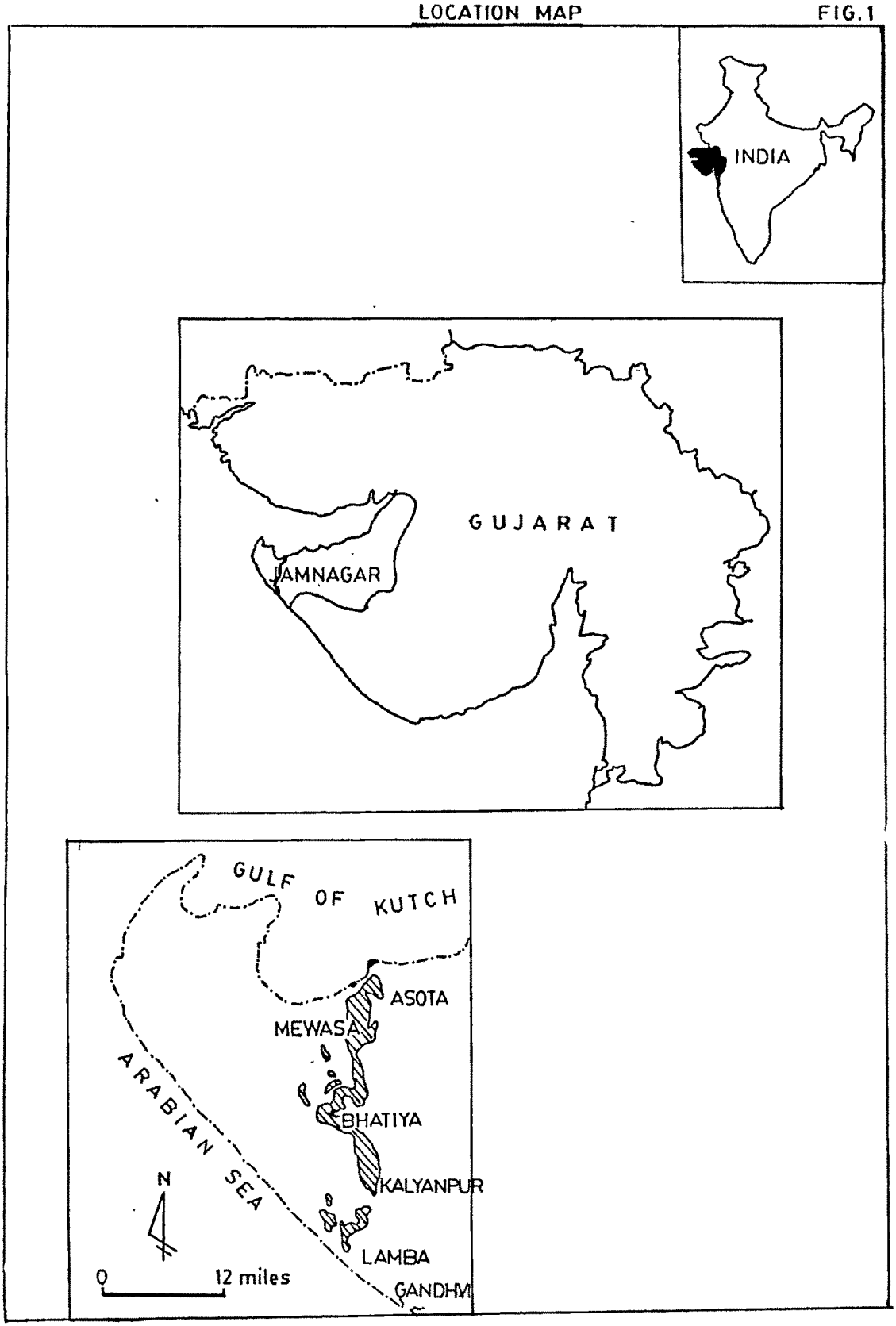
General

The Jamnagar district forms the south-western part of the Kathiawar or Saurashtra peninsula of Gujarat state (Fig. 1). Saurashtra has a well developed and well preserved geological record from Middle Jurassic to Holocene. The major occurrences of bauxite deposits associated with laterite in Kalyanpur taluka of Jamnagar district were well known even three decades ago. The laterite/bauxite belt runs in a north-south direction over a length of 50 km from Virpur near the Gulf of Kutch in the north, to Gandhvi on the coast of the Arabian sea in the south. The belt attains a maximum width of 6 km in the northern part near Mahadevia, Ran and Mewasa, while the average width remains about 1.5 km. It covers parts of Survey of India topo-sheet numbers 41 F/4,7 & 8 and 41 G/1, 5 & 9, and practically marks the border zone between the Deccan Trap basalt exposed in the east, and the Tertiary sediments (Gaj series) in the west.

Location

Jamnagar district lies between latitude 21° 47' and 22° 57' north and longitudes 68° 57' and 70° 37' east. The district occupies a total area of 10,291 sq. km with a north-south length of 128.75 km and an east-west breadth of 16 .37 km.

LOCATION MAP FIG.1



The study area in the Jamnagar district lies between latitudes 21° 50' and 22° 20' north, and 69° 12' and 69° 20' east longitudes, covering an area of nearly 600 sq. km.

The important bauxite deposits of Jamnagar district are located in and around Mota Asota, Virpur, Mewasa, Ran, Bhatiya, Nandana, Pindara, Kenedi, Habardi, Khakharda, Bankodi, Lamba, Hadmatiya and Gandhvi villages.

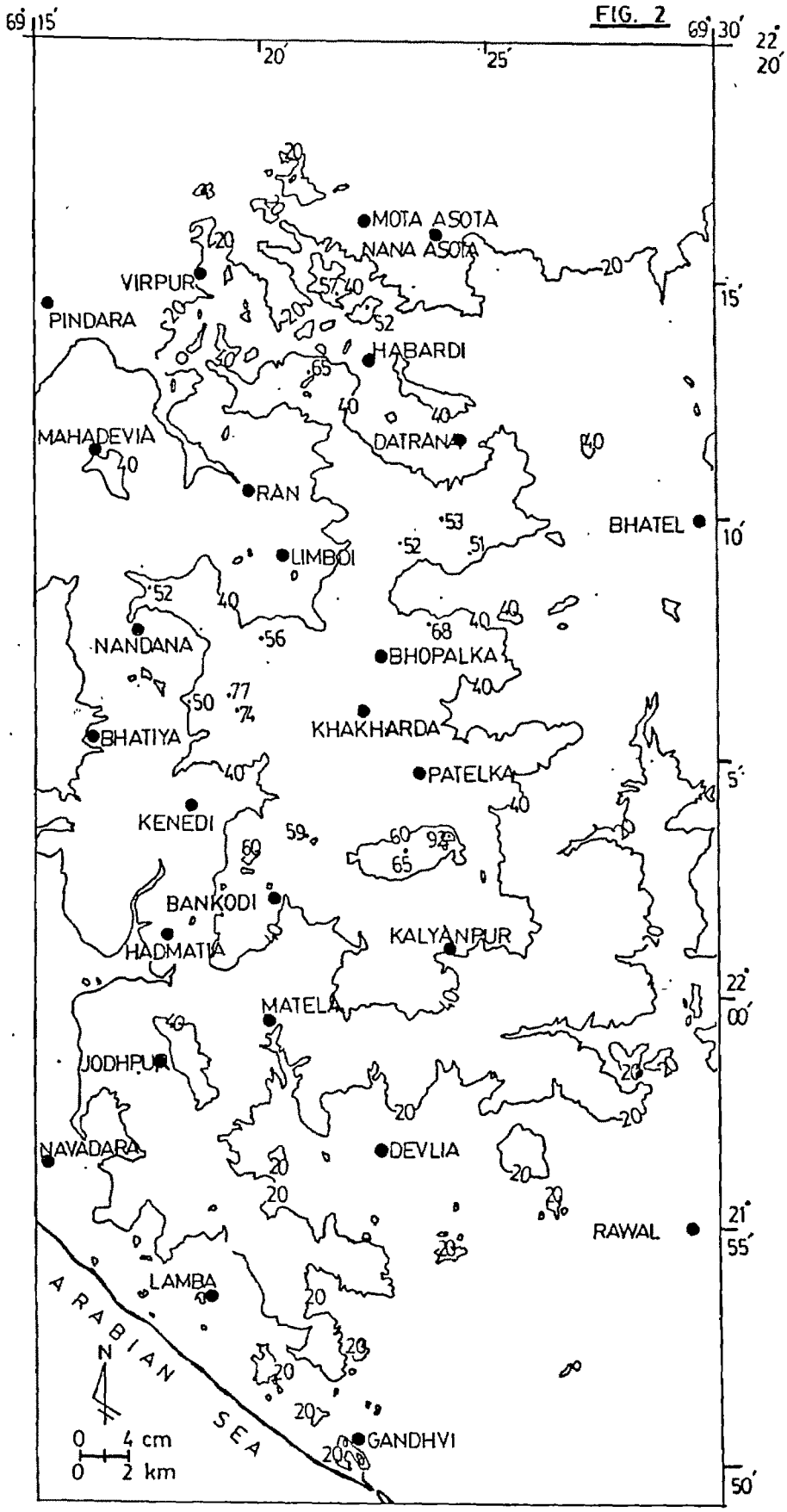
Geography

The Jamnagar district is bounded by the Gulf of Kutch and the little Rann in the north, in the east by Rajkot district, in the south by Junagadh district, and in the west by the Arabian sea.

Physiography and Drainage

Physiographically, the study area consists of a number of north-south lateritic ridges of varying height separated by low ground (Fig. 2). It has been observed that most of the hillocks have escarpments towards the north-west, while gradual slopes are encountered to the south-east. The general topography of the area is practically flat with the only relief corresponding to the arcuate ridges of laterite and flat topped mounds of limestone. The ridges have an elevation of 5 to 30 m above the ground level lying 15 to 30 m above MSL.

FIG. 2



PHYSIOGRAPHIC MAP OF THE STUDY AREA.

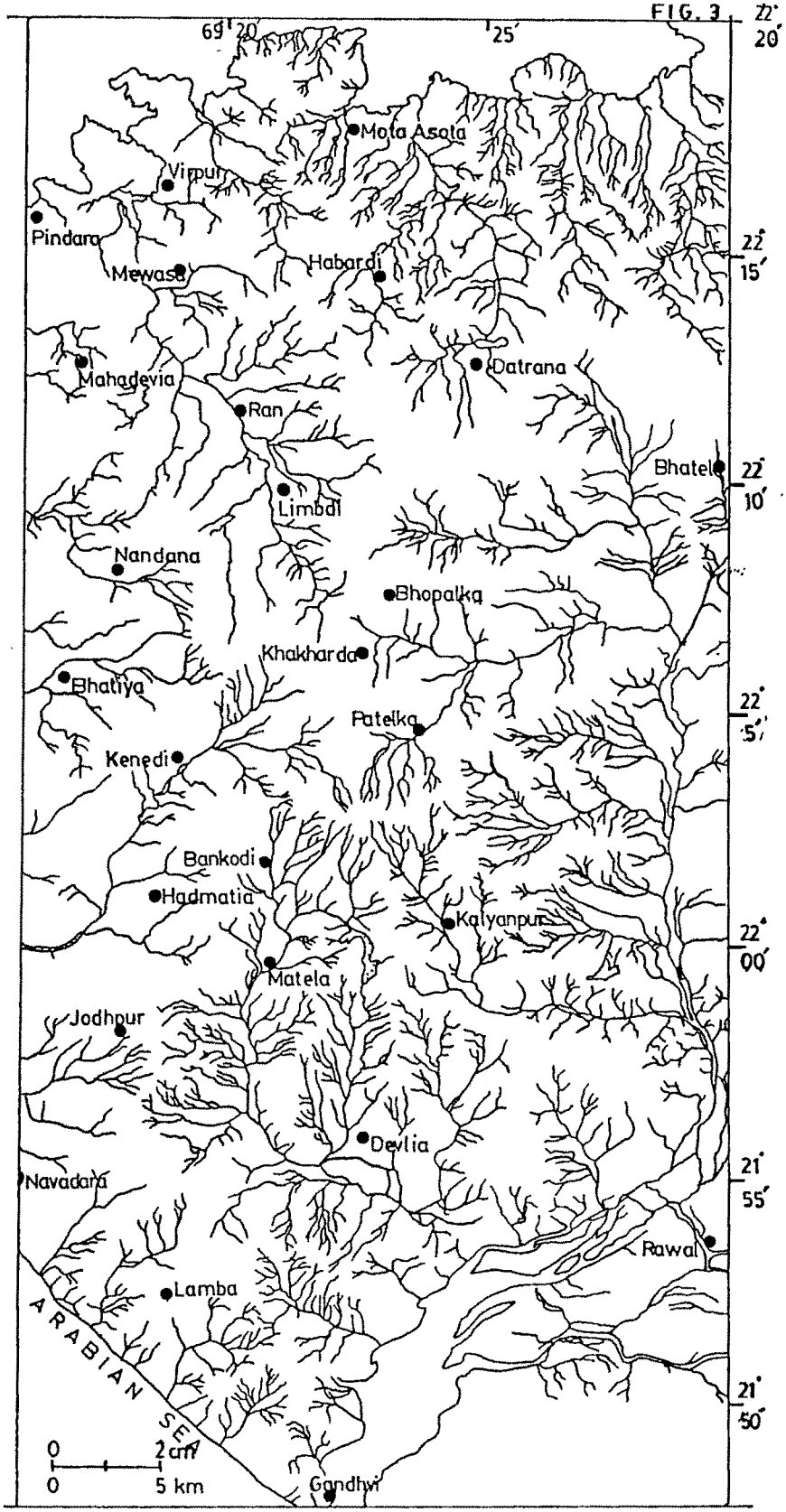
The ridges of limestone are lower than those of laterite, the latter however, forming typical 'questa' or 'hogback' with gentler dip slopes of 2° to 7° (average 4°) on one side, and scarp slopes of 60° to 85° on the other.

The area is dissected by numerous streams, which control the drainage of the area (Fig. 3). The remarkable feature about the drainage in the area is that there are two groups of drainage, one north flowing and the other south flowing, separated by a ENE-WSW trending water divide passing through Bhatiya village. All the rivers and streams, north of the water divide flow northerly, into the Rani nadi which flows into the Gulf of Kutch. On the other hand, the drainage to the south of the water divide meets with the Kalipat river which flows southwesterly to merge with the Arabian sea. The highest point in the area viz., 78 m (R.L.) lies on this water-divide at a distance of 3.5 km ENE of Bhatiya. Oval outcrops of laterite have, in many cases, locally given rise to a radial drainage pattern. The rivers in general, remain dry throughout the year, except at a few places, along the two major rivers during monsoon. Jamnagar district is devoid of any perennial river.

Climate and Rainfall

The Jamnagar district falls within the semi-arid to arid climate belonging to the steppe bush type as per Koppen's classification (Fig. 4). Though the area is close to the

FIG. 3



DRAINAGE MAP OF THE STUDY AREA.

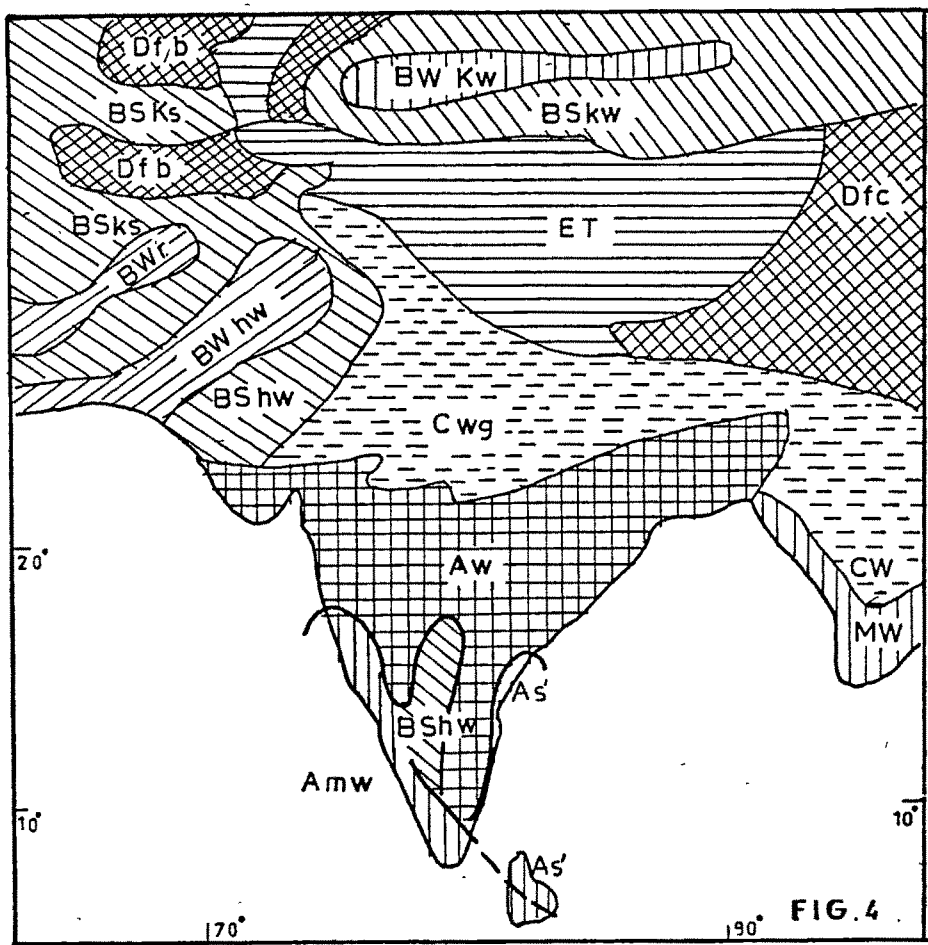


FIG. 4

The coded symbols of the climates in Fig 4 have the following meanings:

First letter

A,C,D Sufficient heat and precipitation for high-growth trees.

A, Tropical climates, as at Singapore, Malaysia.

B, Dry climates, as at Aswan, Egypt.

C, Humid, mesothermal climates: coldest month between 64° and 27° F; Mediterranean type of climate as at Palmero, Italy.

D, Humid, microthermal climates. warmest month over 50° F coldest. month below 27° F, as at Moscow, USSR.

Second letter

S, Steppe climate.

W, Desert climate (German Wüste)

f, Sufficient precipitation each month.

m, Forest, tropical climate despite dry period.

s, Dry period in summer of respective hemisphere.

w, Dry period in winter of respective hemisphere.

Third letter

a, Warmest month over 72° F.

b, Warmest month below 72° F, at least 4 months over 50°

c, Less than 4 months over 50° F.

d, Less than 4 months over 50° F, coldest month below 36° F.

h, Dry-hot; mean annual temperature over 64° F.

k, Dry-cold; mean annual temperature below 64° F.

CLIMATIC ZONES OF INDIA

(AFTER KOPPEN, 1931)

A

Tropical Rainy climates

1. Tropical Rainforest Climate (Af, Am)
2. Tropical Savanna climate (Aw)

B

Dry climates

3. Steppe climate (BS)
4. Desert climate (BW)

C

Humid Mesothermal climates

5. Warm climate with Dry Winter (Cw) (Monsoon and Upland Savanna)
6. Warm climate Dry Summer (Cs) (Mediterranean)
7. Humid Temperate climate (Cf)

D

Humid Microthermal climates

8. Cold climate with Moist Winter (Df)
9. Cold climate with Dry Winter (Dw) (Monsoon Type)

E

Polar climates

10. Tundra climate (ET)
11. Climate of perpetual Frost (EF)

Tropic of Cancer, it being surrounded by the waters of the Gulf of Kutch and the Arabian sea, the temperature variation is slightly less than that of a typical arid climate. Maximum temperature in May-June is about 35°-36°C which sometimes goes to as high as 44°C in the winter months of December - January, the temperature ranges from 6° to 7°C, though it may occasionally go down to as low as 3°C. The month of May is the hottest, and January is the coolest month of the year. The winter season lasts usually from the middle of November to the end of February and is not severe. Northerly and easterly cold winds blow over the region during the winter. Summer follows from March to the middle of June, when the winds blow, mainly from the west and south-west. During the summer, storms are uncommon. The period between mid-June to September constitutes the monsoon. The average annual rainfall is an insufficient 421.2 mm which causes famine and scarcity conditions during the summer months. The study area being a coastal zone, the humidity is rather high with an average beyond 60% throughout the year. During the monsoon, it goes upto 85%. In the winter, when the air is dry, the humidity is as low as 32%.

Vegetation

Vegetation is very poor, with cactus and thorny bushes seen sporadically. Some amount of the greenness may be noticed in the basaltic country where palm trees and cultivable lands are to be seen.

Fauna

The area being arid, food and water supply is rather scarce. Hence, the existence of wild animals is very limited. Some animals like fox, wild cats, etc. are seen in the south-eastern area. Varieties of snakes, both poisonous and non-poisonous, are common along river banks. Other reptiles like lizards and crocodiles are encountered in the cactus occupied coastal areas. Domestic animals like cows, dogs, buffaloes, oxen, horses, goats, sheep, donkeys and camels are common in large numbers.

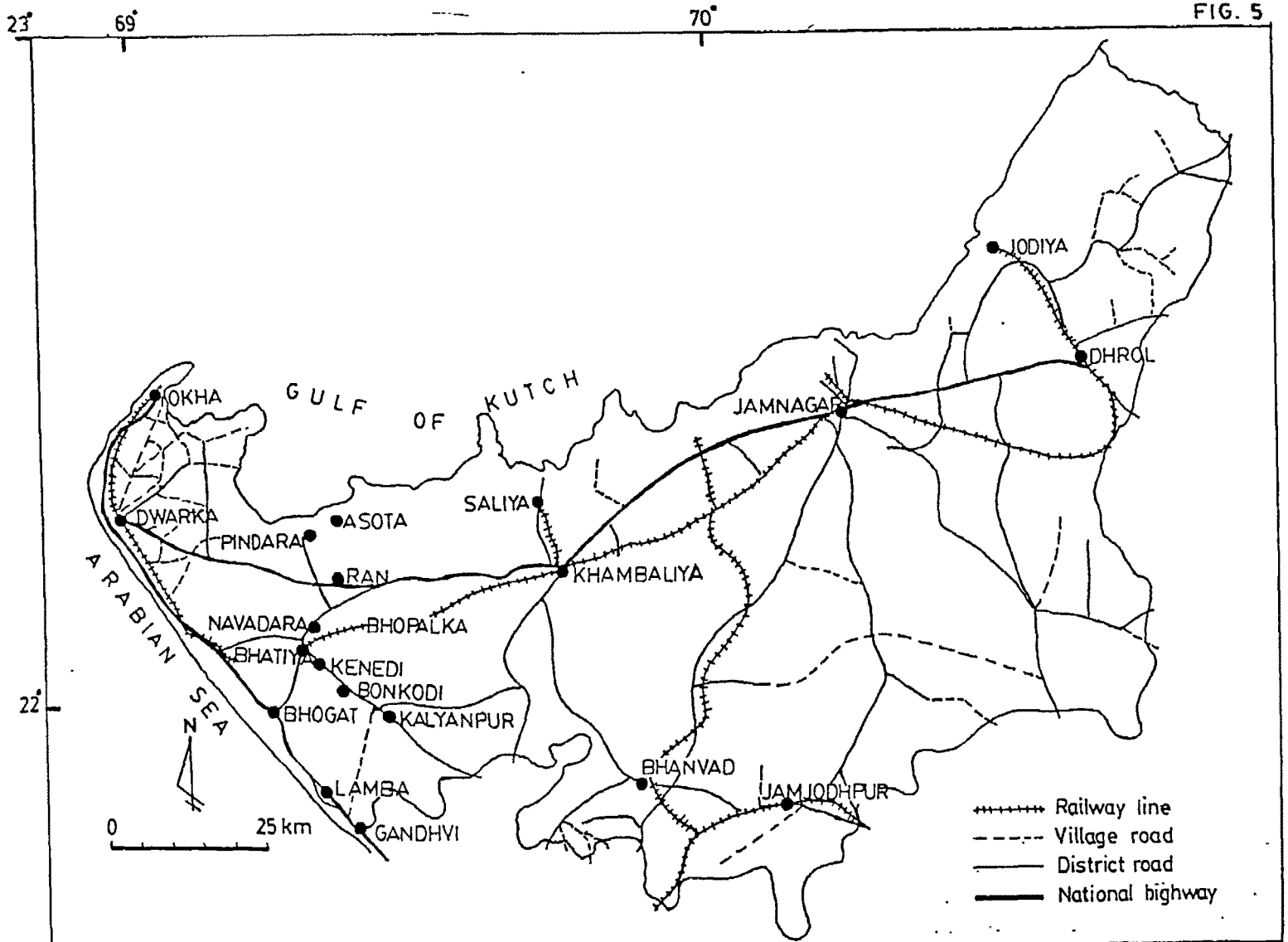
Communication and Transport

Jamnagar, the district headquarters, is situated in the eastern part, quite close to the coast (Fig. 5). Bhatiya and Bhopalka are the nearest railway stations on the Jamnagar-Okha broad-guage line of the western railway, situated at a distance of 90 to 95 km west of Jamnagar city and 42 km ESE of Dwarka. Bhatiya is also connected by a number of bus routes. The nearest airport is at Jamnagar, which lies on the Bhuj-Bombay flight route of Indian Airlines. The nearest port of Okha is about 75 km from the study area.

Scope of Work

The study of the bauxite deposits of Jamnagar district was taken up with an aim to establish their geology, mode of

FIG. 5



COMMUNICATION MAP OF JAMNAGAR DISTRICT.

occurrence, and genesis. This involved systematic geological mapping of the entire bauxite bearing area, followed up by detailed investigations of various mine-, pit-, well- and river-sections. Sampling of the complete profiles was done systematically. These samples were subjected to detailed laboratory investigations like major and trace element analyses and XRD studies. These studies highlighted the chemical and mineralogical variations in numerous profiles, which in turn were useful in the formulation of the genetic model. Bauxite formation has taken place by the in situ chemical weathering of Deccan Trap basalts, which has given rise to both primary and secondary reworked deposits.