CHAPTER I

INTRODUCTION

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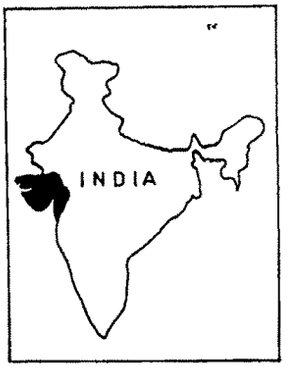
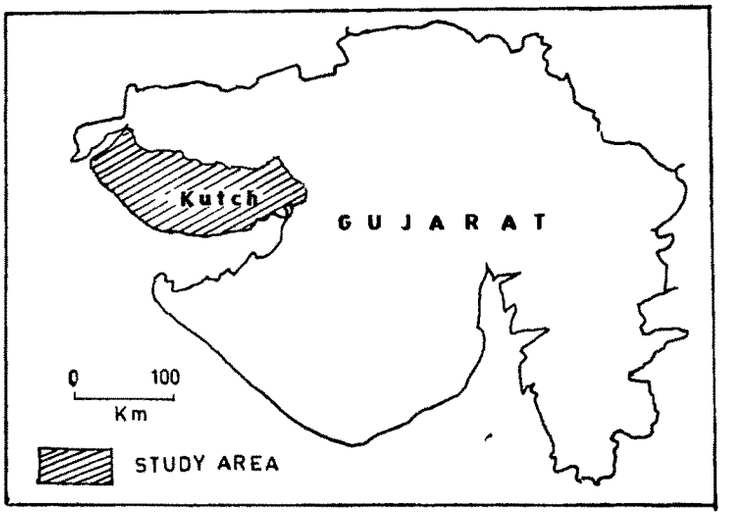
General

The Kutch peninsula, which forms the northwestern part of the Gujarat state (Fig.1) has always been an extremely interesting area for geologists of various tastes. The position of the Kutch basin in Indian geology is unique, as it has a well developed and well preserved geological record of the stratigraphical column from middle Jurassic to Holocene. Till recent times, the main topics of research in this area have been palaeontology, structure and seismicity. But recent studies by G.S.I., the State Department of Geology and Mines, and other agencies have shown that Kutch is a treasure house of economic mineral deposits such as lignite, bentonite, bauxite etc.

The present investigations were taken up to study the geology, mode of occurnence. and genesis of the laterite occurences in Kutch.

LOCATION MAP





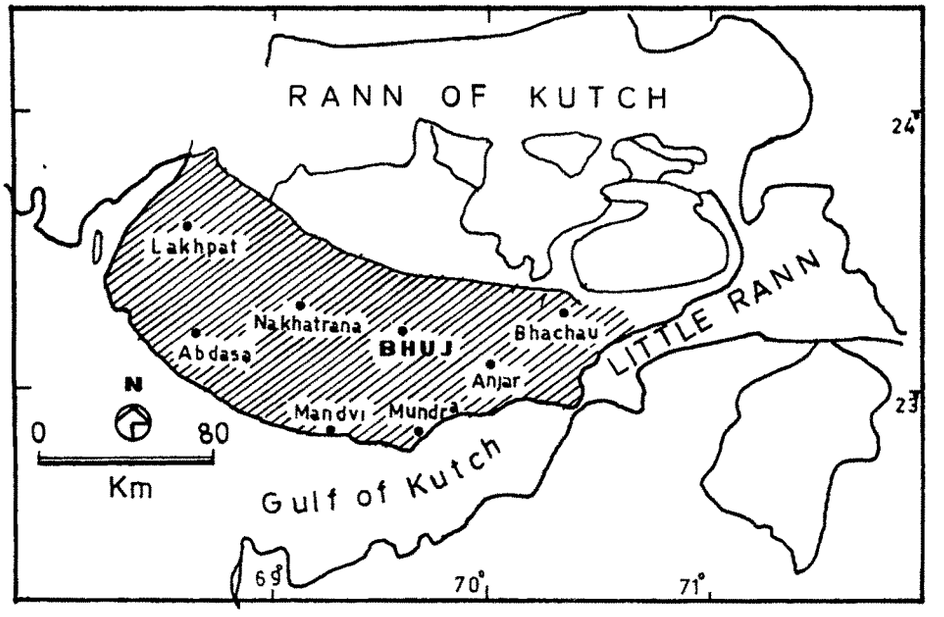


FIG 1.

LOCATION

The 1-2 km wide laterite belt is located 20-40 km inland from the present shoreline and runs parallel to it from Lakhpat to Bhachau.

GEOGRAPHY

The terrain of the Kutch peninusula has been classified into three zones from north to south : (1) The Rann, (2) The Central hilly region, and (3) the southern coastal plains (Fig. 2).

The Rann, which is divided into the Great Rann and Little Rann, forms a wasteland to the north of the main land, which is practically covered by saline waters during the ensuing dry spell.

The central hilly region comprises of 4 parts as under :

(1) Island belt : which consists of 4 islands viz. Patcham, Khadir, Bela and Chorar from west to east.

(2) Banni : Which extends from patcham in the north to the mainland in the south.

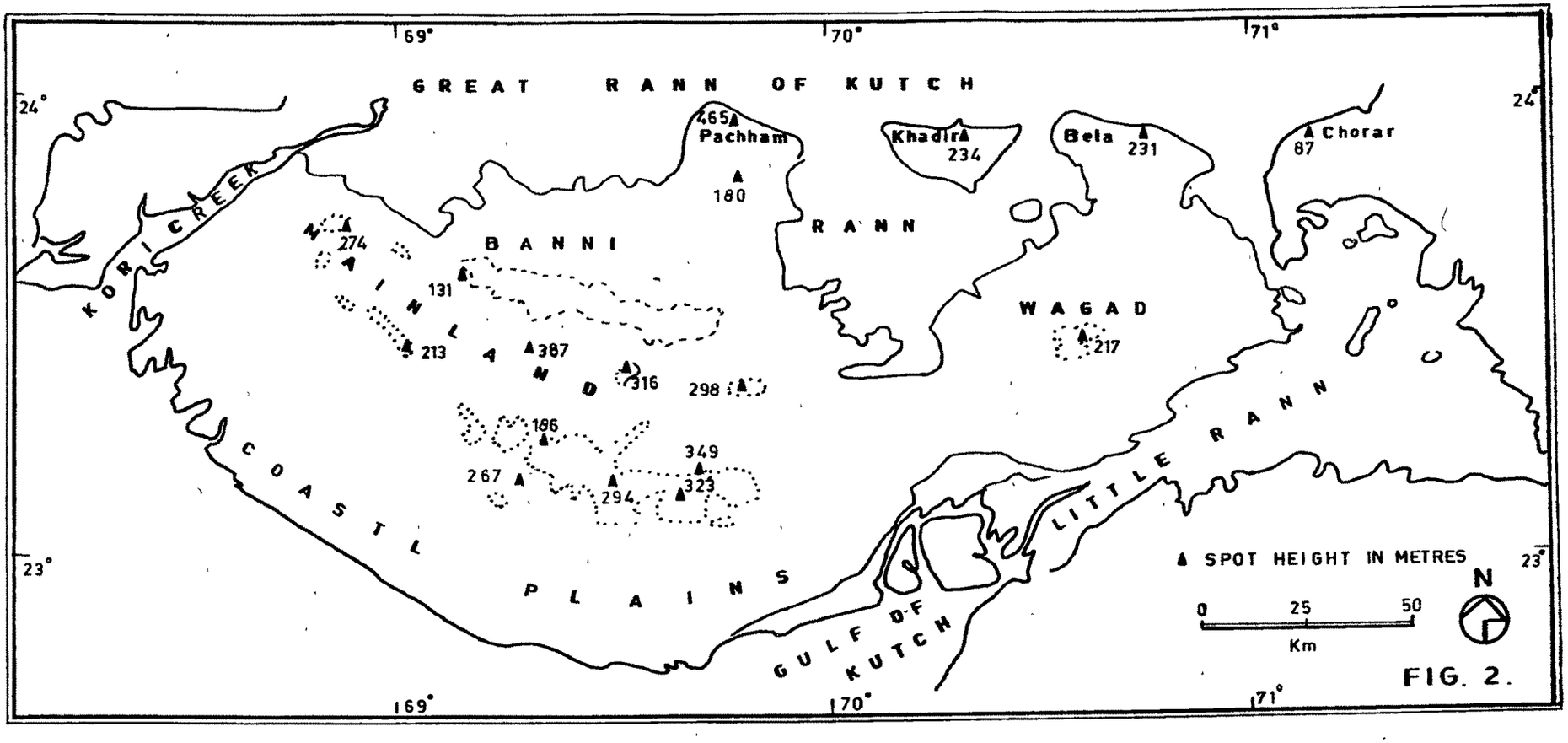
(3) Mainland : is the aea lying south of Banni and extending upto the Gulf of Kutch in the south.

(4) Wagad : is the region lying to the northeast of the mainland.

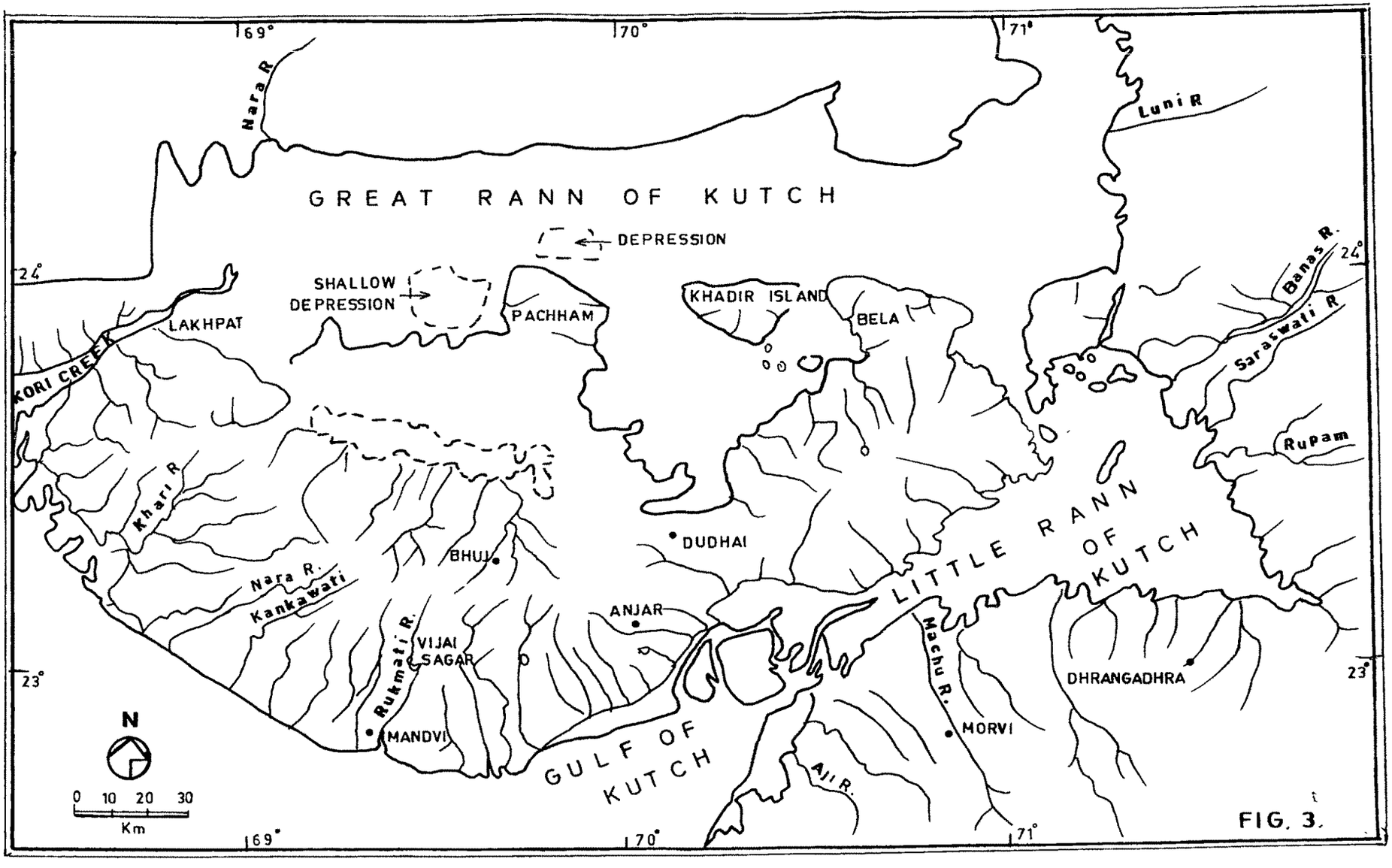
The southern coastal plains border the mainland against the gulf of Kutch in the south and the arabian Sea in the west.

PHYSIOGRAPHY AND DRAINAGE

Physiographically, the study area consists of a number of east-



PHYSIOGRAPHIC MAP OF KUTCH



OVERALL DRAINAGE MAP OF KUTCH DISTRICT

west lateritic ridges of varying height separted by large tracts of low ground. All these ridges and the intermittent low grounds run charcteristically parallel to each other giving a clue to the role played by the geological features in the study area. There are no perennial rivers in the sutdy area. But occassionally the terrain is dissected by nalas and gullies (Fig.3)

CLIMATE AND RAINFALL

Kutch has a semi-arid climate belonging to the steppe bush type as per Koppen's classification (Fig.4). the steppe is a transitional belt, bordering a real desert and separating it from the humid climate beyond. The Tropic of Cancer passes through Kutch region and hence the area records the extremes of temperatures, typical of an arid climate. The average maximum temperature in May is about 39°Ø which sometimes goes a high as 47°Ø. Minimum temperature in January is 9°Ø C which can go even lower. The winter season is from December to February. Easterly and northerly cold winds blow over the region during the winter months. The winter is followed by the summer from March to about the middle of June. It is during this period, especially in the months of April and May, that violent dust storms are registered at times. These dust storms caused by the strong cyclonic winds spread over a large area, restricting visibility, are of a short duration and are generally common in the afternoon. The period from the middle of June to middle of September constitutes the southwest monsoon season. October and November months form the post-monsoon transition period from the rainy to the cold season in which the days are hot and sultry while the nights are breezy, cool and pleasant.

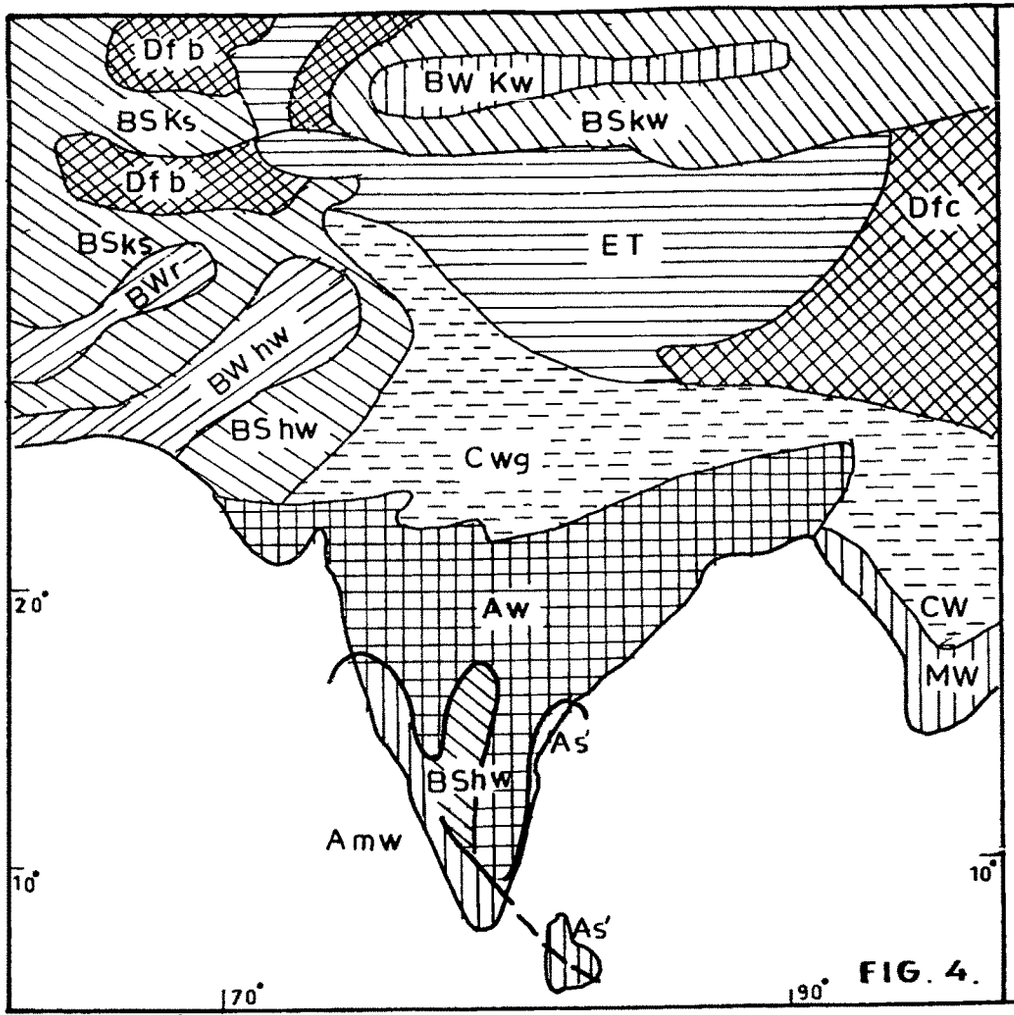


FIG. 4.

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 Most Winter (Df)

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

E

Polar climates

10 Tundra climate (ET)

11 Climate of perpetual Frost (EF

The rainfall in Kutch is rather scanty, as this region escapes the heavy monsoon that prevails on the western shores of India. The average annual rainfall is 32.2 cm. This insufficient rainfall causes famine and scarcity conditions.

VEGETATION

Kutch, as a whole, presents a desolate landscape with scanty vegetation. The irrigated green patches are located near towns and villages. The rest of the vegetation can be classified into two main types :

a) Halophytic vegetation near the sea.
b) Typical low, thorny shrubs of 'Xerophytic' type in the dry, sandy plains.

The Halophytic vegetation consists of Aleuropsis.sp., Cress criteria and Chenopodium sanda. The thorny shrubs mainly consist of an association of low trees of Accacia arabica (Babul), Prosopis spicigera, Salvadora persica (Piludi), etc. interspersed with shrubs like Catotropis gigantica (Akdo), Capparis aphylla (Kerdo), Aerra, etc. Besides these shrubs, few trees of wild date, mango, common nim, pipal, tamarind, banyan etc., are commonly found near villages and on the sides of roads. There is an absence of dense forests in Kutch.

FAUNA

The fauna of Kutch consists mainly of deer, fox, wild cats and wild rabbits which habitat the hilly terrains. In the Rann, forest donkeys are also seen. Kutch is well known for its migratory flamingoes which arrive in the area during winter months.

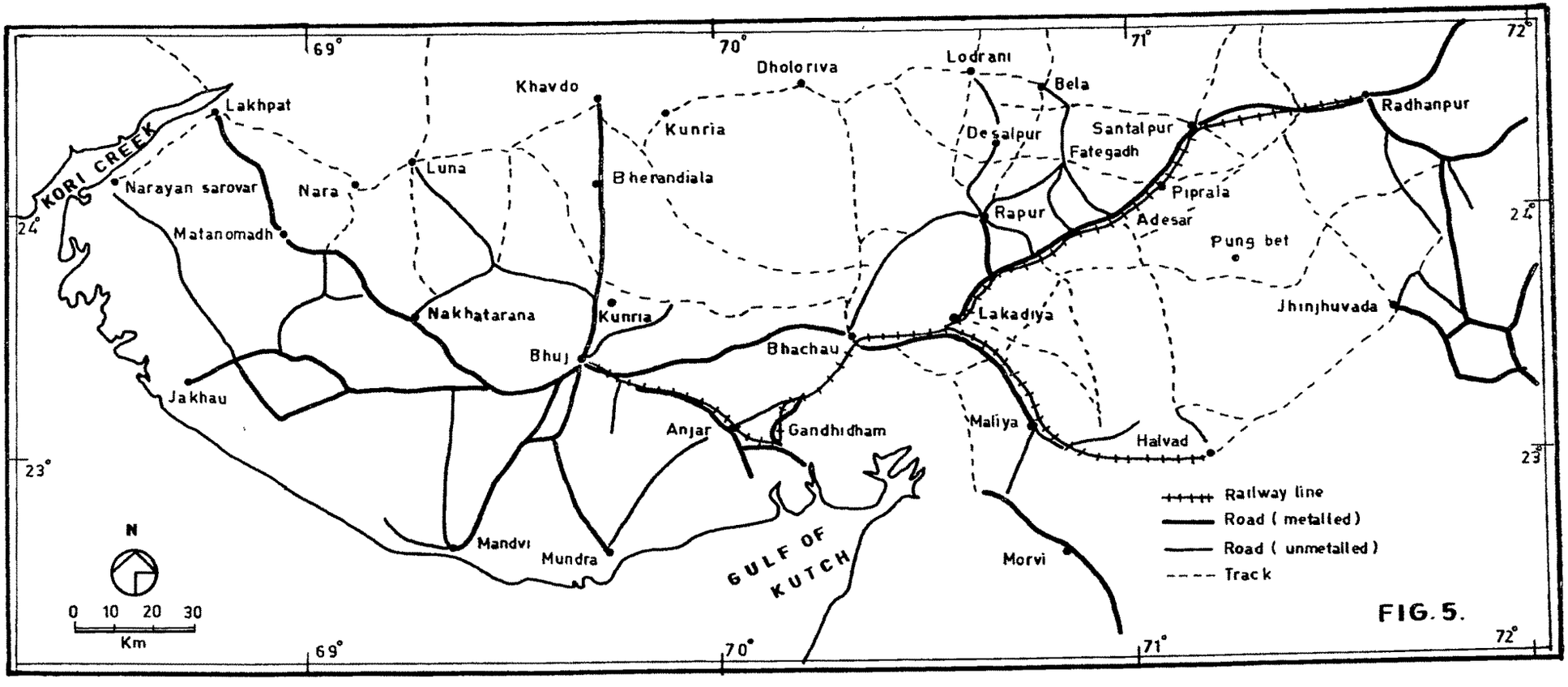
COMMUNICATION AND TRANSPORT

Bhuj, the district headquarters is connected with Ahmedabad via Palanpur by meter-gauge railway line. Bhuj is also connected to Gandhidham by a meter-gauge railway line which is further connected to Baroda by a broad-gauge line of the Western Railway. Indian Airlines flights daily connect Bhuj with Jamnagar, Rajkot and Bombay. State Transport buses regularly ply on the all-weather roads which connect Bhuj with other important towns of this district viz. Mandvi, Mundra, Gandhidham and also ply on fair-weather roads connecting Wandh, Sherdi, Hamla, Nangrecha, Saran etc. villages.

PURPOSE AND SCOPE

This research was taken up with an aim to make in depth study of the occurreence, geology, geo-chemistry and then to postulate a genetic model for laterite dependent upon, then prevalent palaeo-climate, topography, geography and the geo-chemical environment.

Field work in the laterite areas included critical examination of all available mines, pits, rivers and hill sections and this was followed by systematic sampling. Two types of sections were observed i.e. high silica type with bentonitic/kaolintic saprolite and low silica type with kaolintic saprolite. The field characters and the nature of occurence of laterite pointed towards the insitu nature of these deposits. This was supported by chemical analyses, XRD and trace element studies of the samples from various sections . Both the field characters and the laboratory studies indicated that there had been both vertical and lateral differentiation of major elements due to



COMMUNICATION MAP OF KUTCH

high level and flow of ground water and that varying efficiency of subsurface drainage produced lateral facies variation leading to the formation of the above two types of sections.