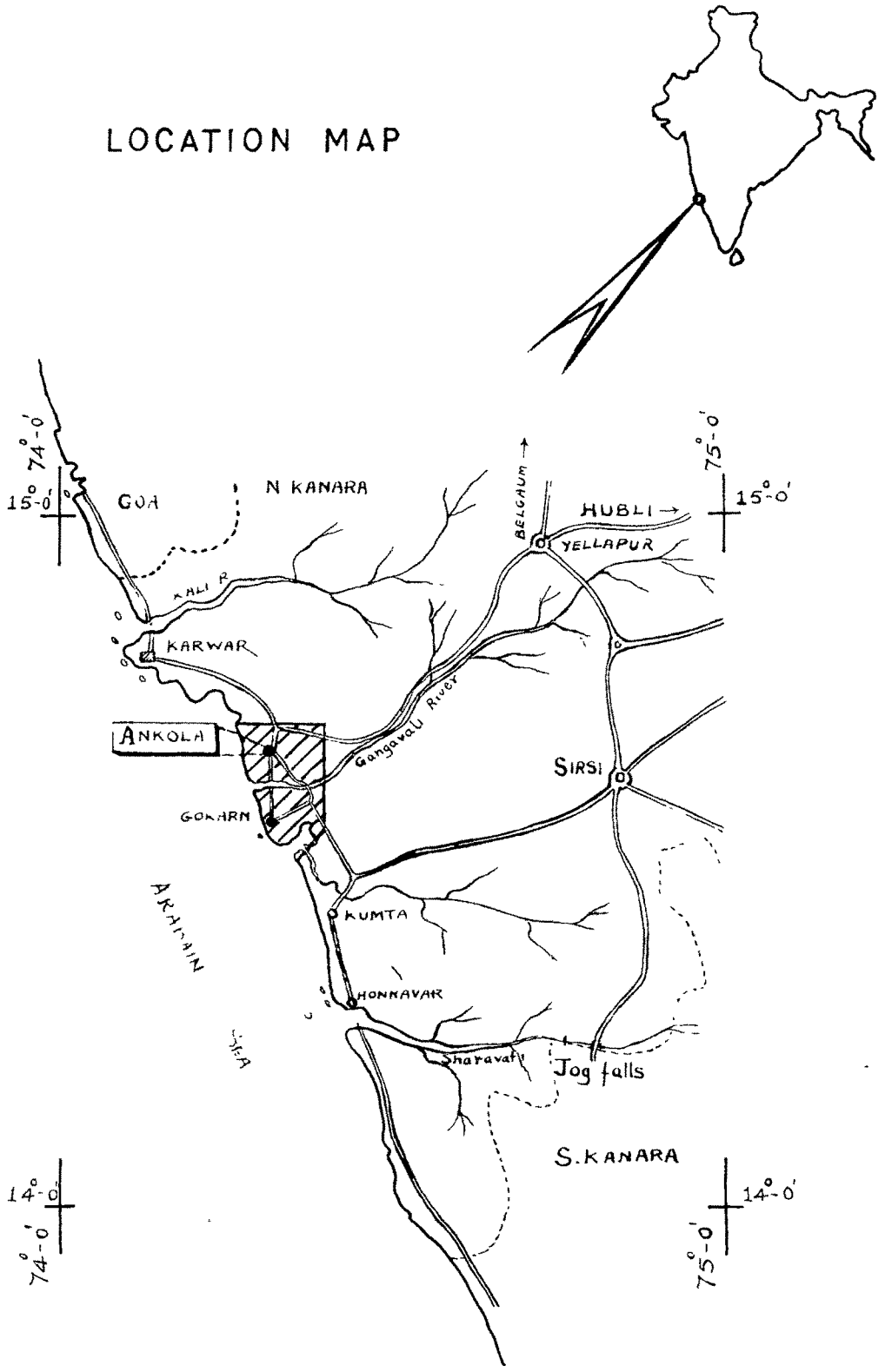
CHAPTER I

I N T R O D U C T I O N

This geological study dwells on the Ankola-Gokarn Area which lies along the west coast of Indian Peninsula. Ankola is a Taluka Place of about 10,000 population in North-Kanara District (Karwar) of Mysore State. The study area comprises about 160 sq. km. bounded between 74°-16' E. and 74°-25' E. longitudes, and 14°-30' N. and 14°-40' N. latitudes (Fig. 1).

The area is easily approachable by road and is connected to the surrounding cities by all-season asphalt roads. The district place, Karwar lies 32 km. north-west

FIG. 1


LOCATION MAP
74°-0'
15°-0'
GOA
N KANARA
KALI R
KARWAR
ANKOLA
GOKARN
ARABIAN SEA
KUMTA
HONNAVAR
Sharavati
Jog falls
S.KANARA
14°-0'
74°-0'
BELGAUM
HUBLI
YELLAPUR
75°-0'
15°-0'
Gangavali River
SIRSI
14°-0'
75°-0'

of Ankola whereas the commercial centres like Hubli and Belgaum are, each about 160 km. towards NE and NNE respectively. Ankola is also a small port, and country crafts regularly ply between Ankola and big ports like Karwar and Panjim on the North and Tadri and Mangalore towards South.

The coast line forms the western border of the area, while Hubli-Karwar road, running almost east-west (about 5 km. NE of Ankola) forms the northern limit. Towards east the limit of the area extends upto 10 km. from the coast, and the river Aghanashini forms the natural limit towards south west. The eastern side consists of the foot-hills of Western Ghats and is thickly forested. The Karwar-Kumta road runs almost parallel to the west-coast touching Ankola and Madangeri on the way and Gokarn at the coast, about 8 km. west of the main road.

PHYSIOGRAPHY

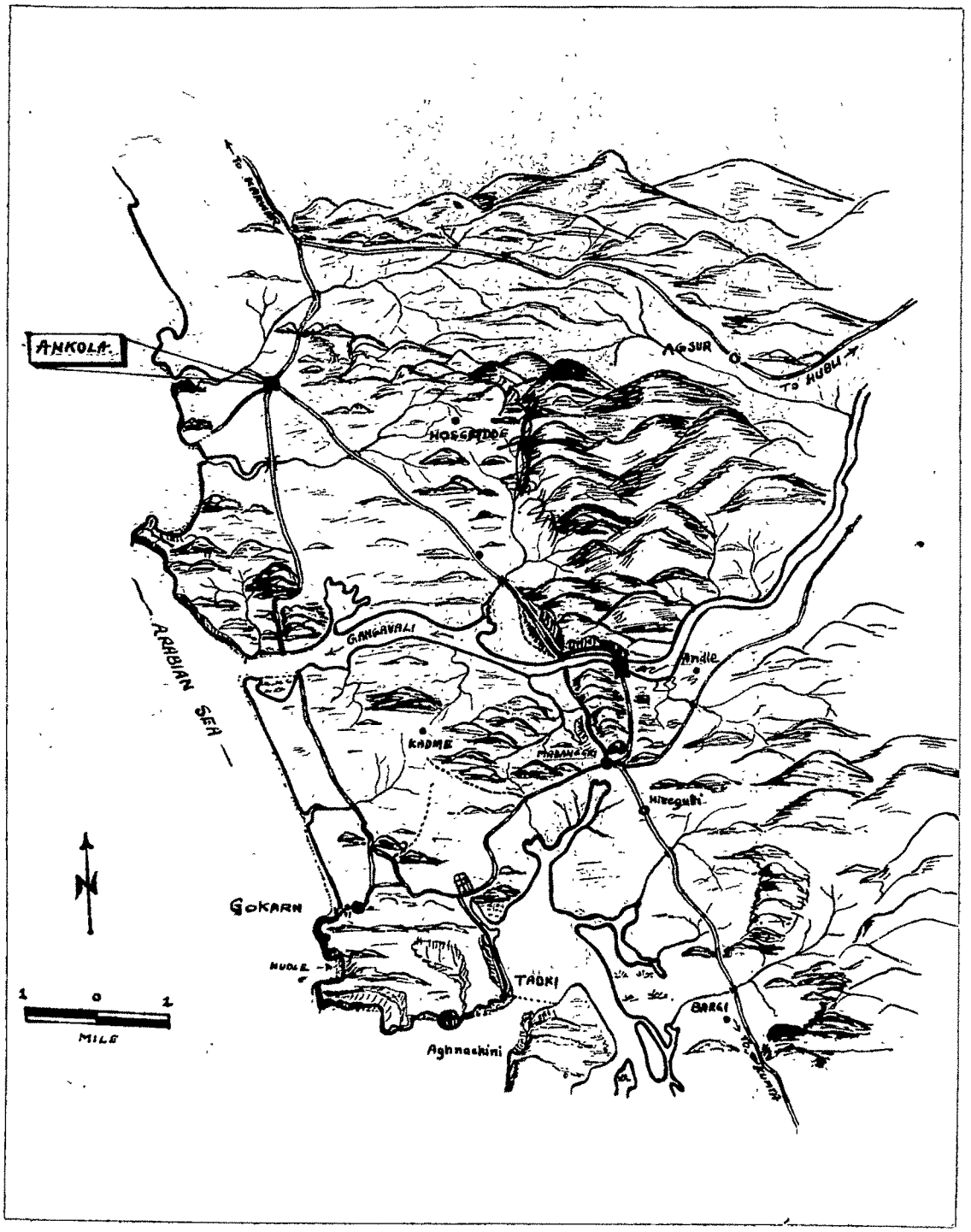
Physiography of the area is typical to that commonly found along the west coast. Part of the area adjacent to the coast, forming a strip of about 6 to 8 km. width comprises a low-lying undulating plain with a few hillocks. The eastern portion however, is rugged and hilly consisting of numerous irregular hills separated by valleys. The

highest point in this region is 487 m., just about 5 km. east of Ankola. The hill forms a crescent shaped structure giving rise to an amphitheatre-like valley. Starting from 487 m. point one ridge slopes down towards Ankola and the other running about 10 km. towards south, ends near Madangeri. Apart from this there are a few scattered hillocks conspicuously seen at Devigadde, Vadibogri, Bargi and Tadri. The main ridges of the Western Ghat, lie about 48 km. east of the region. Therefore, these hills and hillocks could be considered as foot-hills of Western Ghat as they maintain continuity with it, with occasional structural gaps (Plate 1).

DRAINAGE

The river Gangavali flows through the region from east to west. The water-shed of this river is near Dharwar, from where it flows south-westerly for about 160 km. and then flows west before meeting the Arabian Sea, about 6 km. south of Ankola. A number of small streams join this river in its course. The river Gangavali has a water fall of about 20 m. near Magod, about 72 km. upstream from the mouth of the river. Except for this break as water fall, the river shows well developed graded curve of erosion. The tributaries joining this river have not developed graded

PLATE I



PHYSIOGRAPHY OF THE AREA

profiles and most of them are young streams having high gradients. During summer, all these tributaries, barring a few, become dry. The drainage on the whole being controlled by the underlying rocks, shows a dendritic pattern familier in granitic and similar crystaline terrains.

CLIMATE

The area being situated on the sea coast, has the typical coastal climate - warm and humid. But the westerly winds soothe the humid conditions and many a time, one gets spells of pleasant climate. During November to January the mercury shows temperatures between 19° - 21° C and during April and May it fluctuates between 26° - 28° C. Thus, on the whole the climate is warm or moderately warm. The climatic conditions are mainly controlled by the monsoon which begins by the first week of June and lasts for about four months till September end. Then comes winter from October to January, and is followed by summer, from February to May end. This climatic cycle has many seasonal 'breaks' of fine weather as well as some 'cyclonic storms'. The maximum rain-fall is during July and August, resulting in annual precipitation of about 330 cm. In general, the climate is healthy and enjoyable.

During summer months of April and May, however, one feels slightly exhausted due to excessive heat.

FLORA

As regards vegetation, the region has ample growth. In the coastal strip and in the gardens, fruit trees like cocoanut (Cocos nucifera), Mango (Mangifera Indica), Cashewnuts (Anacardium occidentale), Betelnut (Areca catechu), and Jack fruit (Artocarpus Integrefolia), are very common. But thorny shrubs and grass are equally abundant along the slopes of the hills. Interior towards east, in the hilly tracks and in valleys, the vegetation is thick and profuse with Teak (Tectona grandis), Nilgiri (Eucalyptus globulus), Nandi (Lagerstroemia lanceolata), Matti (Terminalia tomentosa), and such other trees. In recent years, plantations of Teak and Nilgiri have covered most of the slopes of the hills. Further east, the western slopes of the Western Ghats are thickly forested, crowded with above mentioned trees, bamboos and wild creepers. Flowering plants, on the whole are rare.

FAUNA

In the thickly forested areas, wild animals like Leopards (Felis jabuta), Panther (Felis paradus), Tiger (Felis tigris), Black bears (Virsustov quatus), Bison

(Bos gaurus), and sometimes even Elephants (Elephas Indica) are occasionally encountered. In addition to these, snakes of various types are also met with.

PEOPLE

The population comprises both Brahmin and non-Brahmin communities, the latter being in majority. In general, people speak Kanarese but a few Brahmin families have Konkani as their mother tounge.

LIVELIHOOD

Agriculture and fishing are the main sources of living. In plains and valleys, paddy (rice) is grown and is the main food of these people. Rice with varieties of fishes comprises the daily menu. With ample rice cultivation and few necessities, the local people lead a happy contented life.

The supply of water for irrigation is fairly adequate and on the whole satisfactory. The main source is that of south-west monsoon which lasts for about 4 to 5 months. Apart from this the river Gangavali and some perennial streams provide a fairly steady supply of fresh water to many villages in this part. Therefore, in some areas the farmers get two crops a year - the

second being that of rice, cereals, ground-nuts, sugar-canes or vegetables. There are practically no industries, hence the main source of livelihood is agriculture and fishing.

TOWNS

Ankola and Gokarn are the two important towns having population of about 10,000 each. Ankola owes its importance as a Taluka place, commercial centre and for a college. Gokarn is a famous pilgrimage centre for Hindus. It lies on the coast about 18 km. south of Ankola. The Mahabaleshwar temple at Gokarn is said to have the "ATMA-LINGA" (soul) of God Shiva. The sea coast along Gokarn, Tadri, Aghnashini and near the mouth of the Gangavali river has got considerable scenic beauty and can be developed as a tourist spot.

SCOPE OF THE PRESENT INVESTIGATION

The author was introduced to this area by Dr. R.V. Joshi, the then Head of the Department of Geology, Karnatak University, Dharwar, in connection with his M.Sc. work during 1954-1956. A preliminary geological survey was then carried out. Later on, with a view to prepare the present thesis a detailed and systematic geological survey was taken up from 1964, under the guidance of Prof. S.S. Merh,

Head of the Department of Geology, M.S. University of Baroda. A critical geological account of the rocks of the area, with special reference to their structural and metamorphic aspects therefore forms the subject matter of the thesis.

The investigations were carried out in an area of about 160 sq. km. as stated earlier. The mapping was done on 2" to 1 mile (approx. 1 cm = 320 m), enlarged from 1" = 1 mile, Survey of India toposheet No.48 J/6 and J/2.

The main field work was done during the months of October, 1964, April and May of the years 1965, 1966, 1967 and 1968. Totally about 40 weeks were spent in the field. In order to obtain data on the rocks of the entire area, an attempt was made to reach every individual outcrop, and, as far as possible, samples were collected from the various exposures at regular intervals.

The various lithological types and the structural elements were noted carefully. Changes in mineralogical and structural relations were carefully recorded and photographed wherever possible. In the areas where gradational changes were noticed, specimens were critically

studied microscopically and chemically. All the data collected in the field was studied and analysed in the Department of Geology, M.S. University of Baroda. About 800 specimens were totally collected. About 200 thin sections were studied for their petrographic characters. In order to study the structural characters, about 900 readings of foliations were taken and appropriate stereograms of the representative readings of different parts of the area were prepared. Readings of lineations, though a few only, also helped the author in correlating the structural features. The author's investigations have thrown considerable light on the petrological and structural aspect of the region, and a brief account of the salient features of the geology is given below to provide a suitable background.

BRIEF GEOLOGY

The rocks of the area could be arranged in the following order of sequence:

FORMATIONS		AGE
Soils and Laterite	...	Recent to Sub-Recent
Basic dykes	...	? Lower Cuddapah
Granitic and amphibolitic rocks with their numerous derivatives		Dharwar and Post Dharwar (Archaeans)

Major portion of the rocks of the area belong to the Pre-Cambrian formations. They consist of hornblendic rocks of various types (differentiated amphibolites) intimately mixed with the granitic matter. Broadly, the coastal areas in the west are occupied by hornblendic rocks while those in the eastern part are to a considerable extent granitic. Except at few places, the change of hornblendic rocks to granitic rocks appears to be gradual and in many cases it becomes difficult to demarcate these rocks into different categories. These crystalline rocks in turn are intruded by a large number of basic dykes. A considerable portion of these rocks is concealed by a lateritic capping, and hence their study was rendered somewhat difficult. In the present study more attention has been given to the amphibolitic and granitic rocks, and only a limited work was done on laterites and on the intrusive basic dykes.

The regional strike of foliation varies between NW-SE and E-W with high angle of dips towards NE or N. On a close scrutiny it is found that the hornblendic (amphibolitic) rocks and the associated granitic gneisses have been affected by at least 2 major episodes of folding. A systematic study of the foliation trends, linear and

planner structure in different parts of the area has revealed that the existing foliation trend is mainly due to a major tight isoclinal folding refolded in a (NW-SE to E-W) direction. Ample evidences are recorded and discussed in subsequent chapters to reveal this structural aspect.

There are ample evidences to suggest that the granitic rocks of this region have been formed by metasomatic replacement and granitisation of the pre-existing amphibolitic rocks. It appears that the granitisation processes synchronised with the first and second foldings and formed an integral part of the orogenic process of the Dharwarian geosyncline in this part of the area.