CHAPTER ONE

INTRODUCTION

1.1. GENERAL

Pre-Champaner Gneisses which occupy the southeastern part of Gujarat have not been investigated adequately to understand its stratigraphic position, deformational styles and metamorphic evolution vis-à-vis overall tectonic evolution so far. Heron (1934) Gupta and Mukherjee (1934) both from the Geological Survey of India were two of the early workers who have made significant contribution in this area. Subsequently Gopinath et al. (1977) have mapped this are while Gupta et al.(1992) have produced regional map of this terrain. All of them failed to specify the stratigraphic status of this region comprehensively with adequate structural evidences and geochronological data. Although the Precambrians of Rajasthan were studied in details in terms of structure, tectonics and metamorphism, but in Gujarat, particularly the southern most areas was not paid much attention in recent times. Thus, quantitative refinement of studies is desired in present state. Many questions remained unanswered to assign the structural style and stratigraphic details of this region.

1.2. THE STUDY AREA: TOPOGRAPHY AND DRAINAGE

Southern part of the Precambrian terrain of Gujarat contains three physiographic divisions (Gupta et al, 1992). These are structural units, denudation units and fluvial units. The area mapped constitutes a Precambrian hilly terrain and forms the southern continuation of the Aravalli Supergroup of rocks (Lunavada Group). The area comprises denuded hills of Malwa region, much-eroded pediplain, few structural hills and fluvial landforms. The polygonal sector taken for studies occupies an area over 350 sq km, falling in the topographic sheets no. 46F/15, 46F/16,46J/3 and 46 J/4; lying within the latitudes 22°12' - 22°27'N and longitudes 73°48'-74°09'E. The location map is shown in **Fig.1.1**. The southern and eastern part of the area is occupied by hilly tracks, elevations varying from 80m to 450m MSL. Coalescing colluvial fans on the western slopes of the denudated and structural hills have produced narrow elongated piedmont zones. The piedmont zones are seen to have developed into vast pediplain to the east and west of the mapped area. The eastern pediplain is characterised by flat areas occupied by gneisses, schist and dolomitic crystalline limestones and a general westerly slope is developed in the area. In the east and in the south the granite

gneiss forms elongated irregular ridges and streams originating from these lands flows towards west and northwest respectively.

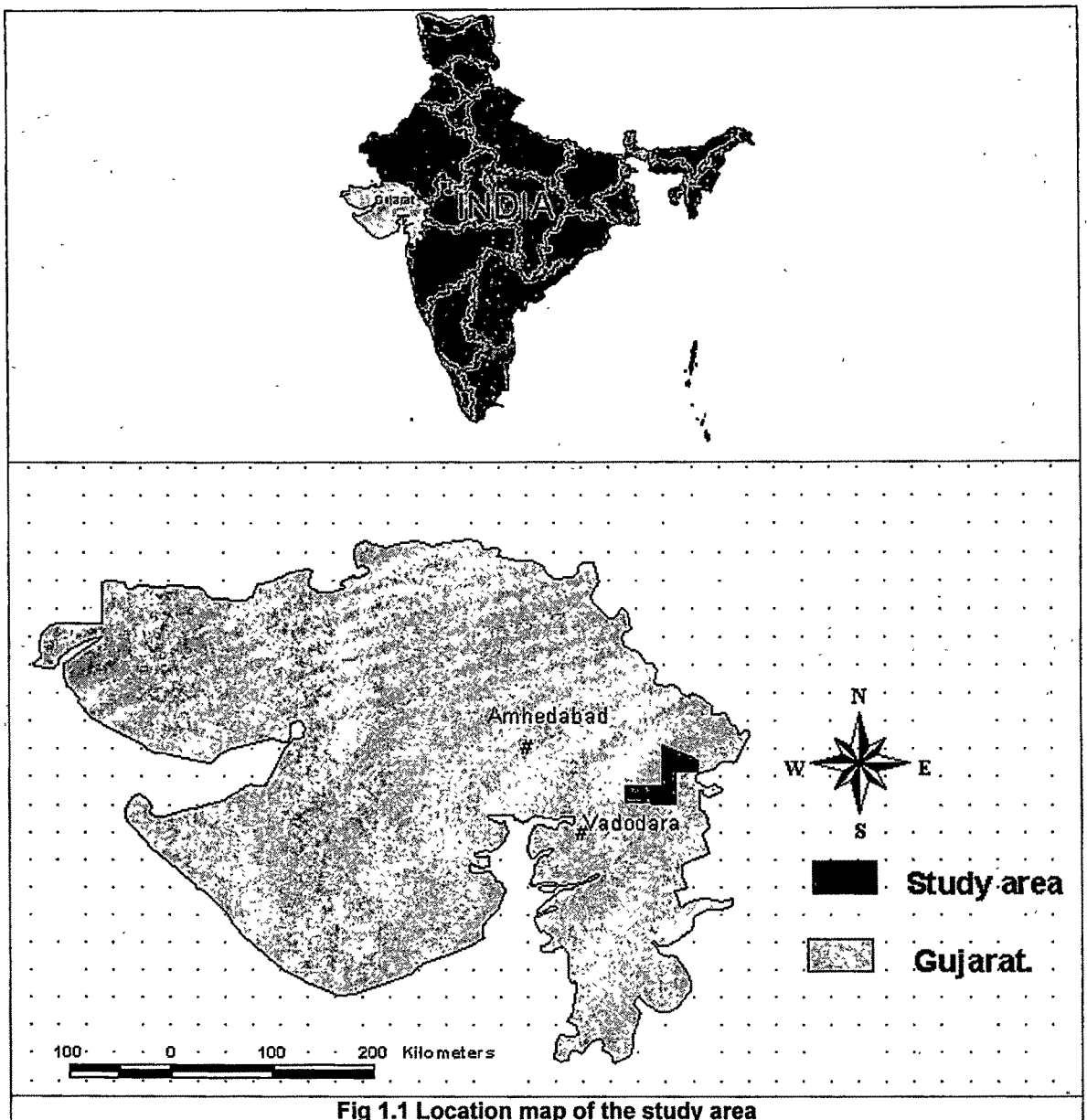

Fig 1.1 Location map of the study area

Orsang is the main river of the study area and shows a dendritic drainage pattern. Orsong River, with its tributaries, flows towards southwest, within the denuded hills and pediplain and covers an area of about 500 sq km. The main tributaries are Ani, Sukhi and Heron, Merwa River. Orsong originates from the gneissic hilly terrain in the area north of Moti Sadli (Malwa Plateau), Madhya Pradesh and initially flows towards west and then towards south from Kathiwara to Chhota Udepur through Deohat, Ambala, Jamli villages

where it takes a westward turn and then cut across the granitic country and from Jetpur to further down stream it has south-westerly trend as its eventually meets River Narmada. Ani River originates from the granitic terrain near Mithibor (M.P – Gujarat border) and flows towards south, cutting across the crystalline dolomitic terrain and Pre-Champaner Gneiss at several places such as Dhakapura, Ukhalwant, Baroj, Chowania. Its flow- direction is controlled by the structures of the lithounits. In the mapped area the Orsong Valley covers an area of 400 sq km almost flat low-lying area with thin veneer of soil. Rest of the area exposes hard rocks with soil developed of varying thickness of 10cm to 1m. The drainage density (drainage length/area) is very high in the eastern and southern part of the study area within gneissic terrain and low in the north-western part, which is mostly covered by crystalline dolomitic limestone. Tectonic control of drainage is recorded in the eastern part (Runwad area) where the 2nd and 3rd order drainage flow more or less in WNW direction.

1.3. POPULATION

The area is inhabited mainly by tribal group of people who are dependent mainly on the agriculture in the valley region and are partially dependent on forest and mineral resources. The tribes are known as Rathwas and Bhils. Literacy percentage is very low (39%). Chhota Udepur is the taluka headquarters and all industrial and commercial activities are concentrated around it.

1.4. COMMUNICATION

The area is well connected with roads and railway line. Important road connecting Vadodara and Alirajpur of Madhya Pradesh passes through Chhota Udepur. Chhota Udepur is connected by meter gauge railway line from Miyagam-Karjan of Vadodara District. Chhota Udepur town is the easternmost town in Gujarat and is well known for the mineral based industries, such quarrying of dolomitic limestone and low grade manganese ore.

1.5.FLORA

The dissected hills of granite gneiss and paragneiss are having fairly thick vegetative cover, particularly in the area east of Chhota Udepur. The natural vegetation in the form of forest is one of the important natural resource of the sub-humid climatic zone. The forest is mixed deciduous type. Teak *(Tectona grandes)* is the most common commercially important tree seen in this region. Apart from teak the area is vegetated by Sadad (*Terminalia*

tomentosa), Shisham (*Dalbergia latifolia*), Dhabdo *(Angeisus latifoli* , Bili (Aegle marmelos) Mahuda*(Bassia latifolia*), Khair (Acacia cutechu), Timru (Diospyros melanoxylon), Khakher*(Butea monosperma*), Moina (Lania coromandelia). Some bushes like Kado (Holarrhena), antidycentrica), Awal (Cassia auriculata) , Bor(Zyzyphas mauritiana), Sadi (Nyctanthes arbortristis), Puwad(Cassia tora) are common. Bambo(*Dendrocalamous strictus*) is present in the northernmost part of the study area. Teak *(Tectona grandes*), and Morus indica are more common in the area east of Chhota Udepur and around Moti Sadli.

1.6. FAUNA

Due to the presence mixed deciduous forest, wild animals are present in this area. However, with the increased human population their number is decreasing drastically.

Oxen, buffaloes, goats, sheep are most common domestic animals in this region. The panther -(Panthera pardus linnaeus), diplo, blue-bull (*Boselaphus tragocamells*), wild boar (*Sus scrofa(Linnaeus*), Indian porcupine(Hystrics Indica) (Kerr), Indian hare*(Lepus nigricollis) (F.cuvier),* small Indian mongoose-herpestes auropunctatus (Hodgson), jackel (Canis aureus linnaeus) and chital or spotted deer are some of the common wild animals found in the area.

The region is known for various non-poisonous and poisonous snakes. Indian python (Python molurus), rat snake (Ptyas muesus) and common wolf snake, common blind snake - (Typhlops braminus) are some of the non-poisonous varieties and cobra- (Naja naja) common krait-(Bungarus caeriuleus) (Konotaro), Russell's viper-(Vipera russelli) are the poisonous varieties of snakes are found in this area.

Prominent birds are Central Indian redvented bulbul (Pycsonotus cafer humayuni), tailor bird (Orthotomus sutorius guzurata), grey jungle fowl (Gallus sonnerati),large Indian parakeet (Psittacula eupatria nipalensis), common hawk-cuckoo or brainfever bird (Cuculus varius varius), The grey hornbill (Tockus birostris), golden-beaked, woodpecker (Dinopium benghalense benghalense), pied kingfisher (Ceryle rudis leucomelanura), the Central Indian lora (Aegithina tiphia humei), the Indian magpie robin (Copsychus saularis saularis), Malabar racket-tailed (Drongo-Dicrurus paradiseus malabaricus)and Indian sarus crane (Grus antigone antigone).

1.7. AGRICULTURE

Maize, wheat, paddy, jowar, are the common cereals of this region. Tuver is the common gram, which grows in minimum irrigation. Castor and tomato are the cash crops cultivated more in recent time.

1.8 IRRIGATION

Irrigation is dependent on the monsoon received in the catchment-basin area. Small check dams are constructed at several places. Reservoir on Sukhi Nadi, however, is the main water source for irrigation in dry season. Open dug wells and tube wells are also used for irrigation at many places.

1.9. INDUSTRY

A few mineral based industries are seen in the in the study area. Quarries of dolomitic limestone are widely distributed around Chhota Udepur. Several crushing factories for different grades of crystalline limestones are located in this area. The crystalline limestone powders are used in refractory and pigment and soap industries whereas the calcsilicate varieties are sometimes used for road metals. Low-grade manganese ore is being mined in the western region.

1.10. SCOPE OF THE PRESENT STUDY

Scope of the present study is to carry out detailed field investigation in the following heads.

1) To identify the characters of different planar and linear diastrophic structures.
2) Structural analyses of the field data to determine total number of deformational episodes, the fold geometry, interference pattern of folds of different episodes. Analyses of fold geometry and deformed lineation to decipher probable mechanisms of folding tentatively.
3) Petrographic and microstructural studies to correlate the deformational episodes with the metamorphic events.
4) Study of mineral chemistry by EPMA and correlate them with the texture to understand the metamorphic pressure -temperature -time path.
5) Geochemical study of the granite gneiss to understand its probable mode of evolution and relation to tectonism.

6) Use of available gravity data to differentiate between the intrusive granite and granite gneiss of Pre Champaner Gneissic Complex.

6) Synthesis of tectonic and geochronological data for regional correlation.

It may be evident from the above discussion that major part of the present study is based on critical examination of the data generated by geological mapping, mineral chemistry and whole rock chemistry of specific mineral phases and rocks respectively. Apart from that synthesis of some pre-existing data on different aspects are used to ascertain the geological status of the study area.