CHAPTER III

Environmental and Archaeological Setting
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ENVIRONMENTAL AND ARCHAEOLOGICAL SETTING

A. ENVIRONMENT AND GEOGRAPHY

Environment played a major role in the growth and development of ancient civilizations. To study these civilizations and their settlement pattern, knowledge of the environment they confronted and the adjustments done accordingly have to be understood thoroughly. The macrobotanical analysis at Rangpur indicates that the climate during the Harappan times must not have been much different from that of the present day (Ghosh and Lal 1963: 173-74). A brief description of the present-day environment and geography is presented here as a background for the interpretation of the archaeological remains.

The state of Gujarat comprises an area of approximately 20,000 sq. km. and is enclosed within the North Latitudes 20°10' to 24°50' and East Longitudes 68°40' to 74°40'. It furnishes an interesting example of a terrain endowed with geological, physiographical and climatic diversity (Mehr 1995: 1).

The geomorphic diversity is a reflection of the various combinations of geological and climatic factors. The long coastline, the extensive alluvial plains, the vast saline wasteland, the rocky tablelands and the hill ranges, all have their own distinct geographic characteristics.
Physiographically, the state of Gujarat comprises of three distinct zones: Mainland Gujarat, Saurashtra and Kutch.

The first is the Mainland Gujarat, which is divided into northern and southern Gujarat by Mahi river. The north Gujarat plain is characterized by the sandier loams whereas the southern Gujarat is characterized by rich deposit of clay.

South Gujarat is bounded on the east and south by the hills of Satpura and Sahayadari, reaching heights of 1000m. (Patel 1977: 17). Towards the west are the Gulf of Cambay and the Arabian sea. The region is drained by the rivers Mahi, Narmada, Kim and Tapi. Soils are of high quality in the central zone but are saline to the west and thin on the eastern slopes. The soil mainly consists of black cotton soil and possesses favourable properties of moisture retention, which makes it ideal for dry farming (Randhawa 1980: 15). The boundaries of the Gulf of Khambat are locally known as Bhal or Bhalbaru (Bhan 1989: 219). The soils are sandy and salty, and the ground water is brackish. Large portions of these tracts are pasture and grasslands. The area of Bhalbaru is relieved by a number of relict sand dunes. Near the blow out hollows on the slope of these sand dunes the monsoon runoff accumulates, giving rise to medium and large sized ponds such as the one at Kanewal (Momin 1979: 354). North Gujarat in contrast is a sandier and more arid plain. The north Gujarat area has been dealt with in detail in the later part of this chapter.

The second region is Saurashtra, which is connected to the mainland by a neck of low-lying land of the Districts of Ahmedabad and Surendranagar. The central part of Saurashtra is made up of an irregular plateau, bisected by two
dominant peaks, one near Chotila in Surendranagar District and the other at Girnar in Junagadh District (Gazetteer, Bombay Presidency 1884: 2). A clayey black cotton soil derived from weathered basalt is predominant in the soils of Saurashtra.

The third physiographic division of Gujarat is Kutch. The geology of Kutch is generally different than that of mainland Gujarat. The soils of Kutch are mixed as a result of the parent rock from which they are formed. The outcrops of Kutch face the sea to the southwest, while in other directions they are bordered by desolate salt flats known as the Ranns. The Ranns of Kutch, originally shallow bays, have been gradually filled with clay and sand carried down by the minor rivers of Rajasthan, as well as the western Nara of Sindh (Bombay Presidency 1884: 3; Patel 1977: 20; Gupta 1977a: 205).

Each of these zones is marked by its own characteristic coastline. Geologically and geomorphologically, the coastline of Gujarat is quite distinct from the rest of the west coast. About 1600 km. long and overlooking the Arabian Sea, its various segments provide evidences of the role played by eustasy and coastal processes operating during the quaternary period. Reflecting a strong structural control, the coastline shows much variation in its trend, shoreline feature and near and offshore conditions. It is divisible into the following segments.

Kutch

1) Jakhau - Kandla

Saurashtra

2) Jamnagar - Okha
3) Dwarka - Diu
4) Diu - Bhavnagar
The climate of the state falls under the subtropical climatic zone as Gujarat is located on the tropic of cancer and a large part of the state lies between 35°C and 45°C isotherms. The rainfall in the state is moderate. It forms a transitional zones between the heavy monsoon area of Konkan in the south and the arid areas of Rajasthan in the north. Climatic conditions vary greatly in the state.

The state of Gujarat has three types of tropical climate. In the extreme north, an arid climate dominates Kutch District, the western parts of Banaskantha and Mehsana Districts, the northern fringe of the Saurashtra peninsula and the extreme western part of Jamnagar District. Here the annual rainfall ranges from 40 to 60cm. Isolated patches of tropical thorn forests and large grasslands support numerous camels (Leshnik 1968: 298). The extreme south has a sub-humid climate. In Valsad and Dangs Districts, annual rainfall ranges from 60 to 150cm. These Districts have relatively good vegetation cover and tropical dry forests can be found in the hills near Baroda and Broach (Rissman 1985: 58). The rest of Gujarat has a semi-arid climate and the rainfall over the region ranges from 60 to 80cm. Cultivation extends over much of the land and the few forested area consists of the dry deciduous type (Patel 1977: 25).

The various season of the year are a) Monsoon (June to October) b) Winter (November to February) and c) Summer (March to June). From March onwards the temperature starts rising till it reaches the maximum, as high as
45°C. January is the coldest month of the year with minimum temperature of 8°C to 10°C.

Generally speaking, the agriculture of Gujarat is characterized by dry farming. Eighty five percent of agriculture is rainfed. The great majority of crop production occurs in the monsoon season and is harvested in the autumn (kharif) (Bhan 1989: 220). Subsistence crops of Gujarat are dominated by millets, bajra and jowar. Bajra or pearl millet is cultivated under more acreage than any other crops (Patel 1977: 47). Bajra is the mainstay of the semi-arid and arid regions of Gujarat because it has a short maturation period of 85-90 days, the shortest among the common cereals (Patel 1977: 40).

Another part of the subsistence of rural Gujarat is animal husbandry, with cattle, sheep/goat and buffaloes being the major species. A distinctive feature of the nomadic or semi-nomadic communities is that they make a living primarily by animal breeding and related activities. These groups are distributed all over Gujarat, but larger numbers are present in the Districts of Mehsana and Ahmedabad in north Gujarat, Saurashtra and Kutch (Patel 1977: 6).

ENVIRONMENT AND GEOGRAPHY OF NORTH GUJARAT

Since the present work essentially deals with the area of north Gujarat, the Geographical and Environmental factors of this region are studied in detail.

To understand the Chalcolithic community and their settlement pattern, one has
to know about the environment, which this community inhabited. There is a
great debate among the scholars about the climate during the fourth millennium
B.C. Aurel Stein made archaeological observations that led him to believe that
there has been a significant decrease in the rainfall of Baluchistan since
prehistoric times due to a change in climate (Stein 1931). Few scholars like
Singh (Singh et.al. 1974) and Agrawal and Sood (1982) claimed the climate to
be wetter during 5000 BP to 3500 BP. There was a phase of severe aridity
between 3000 and 2000 BP. After 2000 BP, according to Singh, the climate
acquired its present character. The downfall of the Harappan culture was
ascribed to the severe aridity and some tectonic activity, which led to the
drying up, or changes of course of many major rivers like the Indus, Ghaggar,
Sutlej etc.

There are yet another set of scholars who do not generally agree with the above
and others believe that the climate during the last 10,000 years would not have
been much different from the present day environment. Chowdhury and Ghosh
(1951) examined the plant remains from Harappa and declared that “these
wood remains do not support the theory that a moist tropical forest prevailed
in the neighbourhood of Harappa”. Regarding the faunal evidence, Fairservis
(1967) suggested that the Harappan fauna was without exception dependent
upon grassland and open forest country.

Thus, the true nature of the environment during the Harappan time still does
not stand on a common ground. Allchin and Goudie (1974) draw the picture
of Harappan climate
“... under the present rainfall conditions, but relieved of the pressure of deforestation and overgrazing, much of the dry zone would carry a much richer vegetation such as we see today in certain forest reserves. 'Open woodland and dry savanna with plentiful freshwater during and after the monsoon and adequate supply throughout the year in certain areas would provide an ideal environment for *nilgai* and other game'. These conditions established in the early Holocene times, prevailed with modifications throughout the Mesolithic and the period of Chalcolithic and early Iron Age settlements. From then on the effects of man upon the environment must have become increasingly widespread and decisive”.

The region of north Gujarat forms the northern part of mainland Gujarat and mainly comprises Banaskantha, Mehsana, eastern part of Sabarkantha and northern parts of Ahmedabad and Surendranagar Districts, though the division is arbitrary.

The region is bounded on the north by southern Rajputana and towards the east by the Aravallis, which rises upto 900m at certain places and on the north-east by discontinuous hills that reach upto 100m AMSL (Patel 1977). It is bounded on the west by salt desert and the neck of the Saurashtra peninsula. The western section of north Gujarat borders the Little Rann of Kutch.

The eastern part of this region, which has a thick vegetation cover and marked by the extension of the Aravallis, is dotted with many Mesolithic sites but are devoid of any Chalcolithic settlements. The Harappan and the contemporary settlements are rich on the western section, on the eastern margin of the Little Rann of Kutch and on either side of the narrow creek-like depression that
connects the Little and Great Rann, found many a times along with the Mesolithic settlements.

**PHYSIOGRAPHY**

North Gujarat, upto the Aravalli foot hills, is a gently sloping open plain composed of a sandy soil overlying an older alluvium. The only redeeming feature which diversify the general flat surface of the country are the fossil sand dunes which rises on an average not more than 18m (Gazetteer, Mehsana District 1979). These blown hills are scattered widely over the plains of the region. As a whole, the area is an undulating sandy plain doted with sand dunes and the interdunal area filled with black clayey soils.

Towards the east, the country is undulating and well wooded. Towards the north and northeast, where it borders on Sirohi, it is extremely difficult, most wild and picturesque, covered with rocks and forest clad hill ranges, outliers from the Abu and Jasor hills. West towards the Rann and south to Jhinjhuvada it is one sandy plain, slightly wooded in the centre, but treeless both in the north and south and towards the west gradually falling away into a salt waste (Gazetteer, Bombay Presidency 1880).

This part of the country seems to have been greatly changed since 1830, when, according to Sir A. Burnes, there was no town or places of any size on the banks of the Rann and few places were more wild and deserted than its neighbourhood (Gazetteer, Bombay Presidency 1880).
Hills

In the northeastern part of the region are some hills of considerable height, outliers from the Aravalli range. Of these, the chief is Jasor, about 30km. north of Palanpur, a hill of gneiss with outbursts of granite. This, about 1050m. high, is a long hogback mountain, except that its water supply is scanty, well suited for a sanitarium. The whole hill is covered with thick forest, on the top chiefly bamboo. All the year round, in three or four gorges, small pools of water are found.

The other chief hills are beginning about 1.5km. to the south of the Jasor range and stretching eastward, the Chiklodar Mata's hill, taking its name from a small shrine on the highest peak that rises about 750m. above the sea. Near Karimabad is another hill of about equal height. Both are covered with thick forest.

The conical hills called the Rani Tunk or the Queen's Peak, at the western end of the Surbakri hills and about 2.5km. from the town of Dantiwada, is a marked feature in the Deesa landscape.

RIVERS AND DRAINAGE SYSTEM

The region of north Gujarat is drained by the rivers Banas, Saraswati, Rupen, Sabarmati and their tributary systems (Figure 3.1). Except the Sabarmati, which flows into the Gulf of Cambay, all the other rivers flow into the Little Rann of Kutch. The river Sabarmati flowing on the eastern margin of the region is the only perennial river. The rivers are entirely dependent on
NORTH GUJARAT:
DRAINAGE PATTERN

FIGURE 3.1 DRAINAGE PATTERN OF NORTH GUJARAT
monsoon, when they drain a large amount of water into the Little Rann and dry up in hot weather. The Banas and the Saraswati, which flow in the northern part of the region, are heavily silted and have a broad and shallow channel. Silting is not so evident in the Rupen which, on the other hand, forms deep channels by cutting the alluvium. At places, the river section has a height of 6 to 8m indicating a deep entrenchment of the river channel.

**The Sabarmati River:** The river Sabarmati rises from the Aravalli hills and flows for over 300kms. The Talukas through which the river passes are Danta in Banaskantha District and Kheralu, Vijapur and Kalol Talukas of Mehsana District flowing southwards to join the Gulf of Cambay.

**The Banas River:** The river Banas including all its tributaries has its origin in the Dhebar Lake among the Udepur hills in the Rajasthan State and flows westwards entering Gujarat near the Awal of Palanpur Taluka of Banaskantha District. It enters into the Little Rann of Kutch by two mouths, near Gokhatar in Santhalpur Taluka and Agichana Village in Radhanpur Taluka. The chief tributaries of Banas are the Sipu and the Balaram.

**The Saraswati River:** The river Saraswati rises from the hills of Menagar in Aravalli near Koteshwar. It has a total length of 161kms. and flows through Danta and Vadgam Talukas of Banaskantha District and Sidhpur, Patan and Sami Talukas of Mehsana District before disappearing in the Little Rann of Kutch near village Pirojpur of the Sami Taluka. The main tributaries of the river are the Wao, Umardasi and Moyan rivers.

**The Rupen River:** The river Rupen rises from the Taranga hills in the Kheralu Taluka of the Mehsana District. It flows through Kheralu, Visnagar, Mehsana,
Chanasma and Sami Talukas and disappears into the Little Rann of Kutch near village Taranagar of Sami Taluka. Its main tributaries are the Pushmavati and Khari rivers.

**CLIMATE AND RAINFALL**

The climate of this region is characterized by a hot summer and general dryness in the major part of the year. The year may be divided into four seasons. The cold season is from December to February, the hot season from March to the middle of June and is followed by the southwest monsoon season, which continues upto the end of September. October and November constitute the post-monsoon or transitional period.

After mid-March, there is a rapid increase in the temperature. May is the hottest month with the mean daily maximum temperature being 41.7°C and mean daily minimum at 23.3°C. After the onset of monsoon in the later half of June, there is appreciable drop in the day temperature but nights during the monsoon are as warm as the summer season. After October both the day and night temperatures decrease at a rapid rate. January is the coldest month with the mean daily maximum temperature at 28.4°C and the mean daily minimum at 10.7°C.

The rainfall is not evenly distributed in the region and there is a general decrease from east towards the west. About 95 percent of the annual rainfall in the region are received during the southwest monsoon months, June to September, the rainiest month being July. On an average, there are 31 rainy days in a year. The increase in the rainfall from northwest towards the southeast varies from 507.6mm to 750.7mm. The average rainfall of the region
is about 610mm.

**SOIL AND MINERAL RESOURCES**

The soils of the region can be classified into three categories, viz. alluvial sandy soil, sandy loams (*Goradu*) and black soils. Though, 90 percent of the soil in this region is sandy.

The alluvial soils are found in the western parts of the region. They are deep sandy with very little organic content. The sand is coarse at places and does not retain moisture. These soils contain yellowish brown and structureless sands. This tract receives very low rainfall. These soils are also basically saline and can yield crops only under optimum rainfall conditions. The sub-soil water is highly saline.

The soil of the central zone is sandy loam type, popularly known as *Goradu*. These are yellowish to yellow-brown in colour, quite deep and produce excellent crops, especially tuber crops.

The black soils of the eastern zone are extremely susceptible to erosion and are very poor in soil contents. They occupy a very small area in the region.

Some important economic minerals occur in the region in the pre-Cambrian rocks. Workable base metal deposits occur at Ambaji. It contains copper-lead-zinc deposits. These metals are of great importance today. These deposits had been worked some centuries back and the extensive slag heaps and dumps spread at and near Ambaji indicate that the mining and metallurgical industry was of a appreciable magnitude (Gazetteer, Banaskantha 49).
District 1981). The souvenir of Indian Science Congress states that "existence of ancient copper working in Biotite Schists have also been reported from Ambaji". An approximate reserve of 6.5 million tones of multi-mineral ore with an average of 13.46% metal content (lead 5.5%, zinc 6% and copper nearly 2%) has been estimated recently.

Besides, the region is endowed with good deposits of limestone, marble, wollastonite and china clay.

**FLORA**

This region is deprived of a good forest resources. The present deplorable condition of the forest can be attributed to lack of management of forests on scientific basis, unabated cutting of the forest and overgrazing.

The flora of the region can be divided into following categories for the sake of convenience:

1) Cultivated Crops
2) Wild Vegetation

1) **Cultivated Crops**: *Bajri, jowar, mag, math, tal*, rapeseed are the principle kharif crops of the region. Wheat is the main rabi crop. In the eastern parts, crops like paddy, sugarcane, tobacco, vegetables, wheat, barley, mustard, gram, *isabgul*, rapeseed, cumin etc. are grown due to fairly good irrigation facilities. The western part has meagre irrigation facilities and the main crop cultivated in these parts is *bajri*. The Taluka of Radhanpur and Santhalpur constitute the chief wheat growing area. In good rainy season, potatoes are grown in river
The pattern of cropping has not changed much over the years except that cultivation of cash crops like groundnut, cotton etc. has now increased. The principle crops now grown include, in order of importance bajri, jowar, wheat and paddy among food crops and cotton, groundnut, rapeseed, mustard and castor among cash crops.

2) Wild Vegetation : The wild vegetation of the region can be divided into i) Fruit trees, ii) Timber trees, iii) Shade trees, iv) Flowering trees and v) Miscellaneous trees.

i) Fruit Trees: The principle fruit trees are the bel, bili (Aegle marmelos); the mhowa, mahuda (Bassia latifolia); the timru, timbarva (Diospyros montana); the amla, avla (Phyllanthus emblica); the jambudo (Eugenia jambolana); the wood apple, koth or kothi (Feronia elephantum); the Mango, amba (Magifera indica); the ran or ryan (Minussops indica); the tamarind, amli (Tamarindus indica); and the jujube, bordi (Zizyphus jujuba).

ii) Timber Trees: Principle timber trees are the babul, baval (Acacia arabica); the blackwood, sisam (Dalbergia siso); the khijro or khijdo (Prosopis spicigera) and the arjan or sadado (Terminalia arjuna).

iii) Shade Trees: The shade trees of the region are the aduso (Ailanthus excelsa); the nim or limbdo (Melia azadirachta); the gundi (Cordia rothii); the gular or umbarda (Ficus glomerata); the vad (Ficus bengalensis); the piplo (Ficus religiosa); the pipad (Ficus tsicla); the karanj (Pongamia glabra) and the kadai (Sterculia urens).
iv) **Flowering Trees**: The flowering trees are the *simla* (*Bombax malabaricum*); the *garmala* (*Cassia fistula*); the *gagrio khakhro* (*Erythrina suberosa*); the *champa* (*Michelia champaca*); the *borsali* (*Mimusops elengi*) and the *alri* (*Morinda exserta*).

v) **Miscellaneous Trees**: The miscellaneous trees are catechu, *kher* (*Acacia catechu*); the hornco (*Acacia leucophloea*); the *ekal kantha* (*Alangium lamarkii*); the *singoria* (*Balanites roxburghii*); the *kachnar* (*Bauhinia racemosa*); the bastard teak, *khakhro* (*Butea frondosa*); the *pardesi* (*Erythrina indica*); the *ambada* (*Spondias magnefera*); the bastard cypress (*Tamarix indica*) and the *bangali badam* (*Terminalia catappa*) (Gazetteer, Banaskantha District 1979; Gazetteer, Mehsana District 1981).

**FAUNA**

The fauna of the area can be studied in two different categories:

1) Domestic Animals
2) Wild Animals

1) **Domestic Animals**: The climate of the area is conducive for cattle breeding. Hence, the breeds available are found to be very sturdy, healthy and useful as draught animals in cultivation.

The oxen of *Kankrej, Vav* and *Tharad* are very famous. They are fine, strong, well-built animals of good height and in colour generally white (Muzda). They are bred by cultivators and *Rabari* herdsmen from two kind of bulls, the *Palel* and the *Akhlo*. Sheep and goat, generally white or white and black, are bred by
Rabari herdsmen who sell their wool, milk and butter. Camels are reared by landholders and by Rabari and Sindhi herdsmen. These animals are used both for riding and for carrying baggage. Horses are bred in these parts by wealthy landlords, Talukdars and Jagirdars and by well-to-do cultivators and Banias. Ravals (Grain carriers) and Kumbhars (potters) rear ass and use them as beast of burden.

Besides the above, male and female buffaloes, hens, turkey, peafowl and guinea fowl are also found in this region.

2) Wild Animals: Formerly Lion was found in the region. Other animals still inhabiting this region are the Tiger, vagh (Felis tigris); the Panther, dipso (Felis leopardus); the Bear, rinchh (Ursus labiatus); the hunting Parad, chita (Felis jubata); the Hyaena, tarachh (Hyeana striata); the Wolf, varu (Canis pallipes); Stag, sabar (Rusa aristotelis); the Spotted Deer, chital (Axis maculatus); the Antelope (Antelope bezoartica); the Ravine Deer, butar; the Blue Bull, nilgai (Portax pictus); the Indian Gazelle, chinkara (Gazella benettii); the Wild Boar, suvar (Sus scrofa), the Wild Ass (Equus hamious) and the Hare, saslu (Lepus reficaudatus).

Birds: The bird-life of the region is not colourful and rich as there are no big forests and lakes. Different birds are seen in different seasons. Some important birds are Florican, karimor (Syphitides auritus); Bustard, goral; Patridges, titar, of two kinds, the painted and the grey; Quails, lavri, of two kinds, the grey (Conturnix communis) and the Rain (Conturnix coromandelica); Snipe, snap, of three kinds, the Common (Gallinago scolopacinus); the Jack (Gallinago gallinula) and the Painted (Rhyachoea bengalensis); the Wild Geese, jangli hans, and three kinds of Sand Grouse, batabat, the large or Ran
Grouse, the Common and the Painted Gazetteer, Bombay Presidency 1880: 286-87).
B. ARCHAEOLOGICAL BACKGROUND

POTENTIALITY OF THE AREA FOR SETTLEMENT

The settlement locations where growth takes place are those that best satisfies, or "average" a series of competing positive and negative forces. These forces are numerous, varied and not limited to things such as: routes of communication, subsistence base, resource location, defence, surrounding populations, geomorphology and biotic considerations (Possehl 1982: 19).

The region of north Gujarat is not very conducive for a large-scale settlement. The region falls under a semi-arid environmental zone having scanty and irregular rainfall averaging around 30 inches a year. The rivers flowing through this region including the Banas, Saraswati, Rupen and Sabarmati are fed by the monsoon rains and are ill suited for irrigation (Leshnik 1968). Even the ground water in this region is brackish and saline. With such adverse climate as a backdrop, probabilities are, therefore, higher that the selection of this area for settlement should have been other than agrarian. A brief look at the different potentials of this region may throw light on the alternative attraction for the Harappans to settle in this area.

Physiographically Rann is an important division of north Gujarat as the whole western edge of the region is covered by the Little Rann. The traditions of the Rann being an arm of the sea are both persistent and persuasive. This theory is based on a limited sedimentological studies carried out by Gupta (1977a) in some parts of the Little Rann. He postulated on the basis of radiocarbon dates
for sub-surface materials of the Rann that the Little Rann had been receiving sedimentation at the rate of 1.5 to 3mm per year. With the result, 2000 years ago, it should be 3 to 4m deeper than today and must be much more than that 4000 years ago. Elsewhere Gupta (1977b) as well as other scientists have, however, observed that the level of the sea was two to three meters higher, or even more, about five millennia ago. Tradition also maintains that Ranns were part of the sea. The ships of renowned merchant and philanthropist Jagdu Sha, carrying gold and miscellaneous provisions are said to be sailing from port to port in the Rann. Writing in his memories (1827-28), Alexander Burnes records an old story of a ship-wreck on Panchham (i.e. Khavda) and the travellers taking shelter in the island of Khadir (Bisht 1989: 270).

Even in the present situation, in the beginning of the summer, the sea water, aided by the strong southwesterly wind, starts encroaching upon the extensive mud flat of the Rann. The monsoon rivers further contribute a large volume of water and the entire tracts goes under a sheet of water which is generally 30 to 91cms deep although, at places it is deeper than 2m. From November to March, the Rann remains dry but for a few wet patches here and there.

It is therefore likely that there was a navigable sheet of water or deep meandering channels and the Harappans made full use of them avoiding trafficking on the high sea. The sea also might have provided the raw material for the shell industries as well as influenced the subsistence activity of the Harappans.

Another important factor, which can influence a settlement in north Gujarat, is that it offers a good grazing land. Today live stock raising is the mainstay of a large population of the rural economy in this region. Both the banks of
Rupen river, eastern border of Little Rann and large areas of waste land usually associated with almost all the archaeological sites in this region have an excellent growth of bokana (*Cressa cretica*), soma (*Echinochola colonum*), jinko-soma (*Panicum flaridum*), zinzvo (*Anoropogan pumils*) etc. (Bhan 1990).

The region supports an estimated 20,000 head of cattle and is the source for the famous Kankrej bread of bullocks (Patel 1977). The dry climate and sandy soil of the region is said to be suitable for making bullocks sturdy, fast moving and disease resistant.

The advanced technology developed by the Harappans in manufacturing stone tools as well as stone and shell ornaments and their exports to far off regions required a large amount of raw materials. Though the mineral resources are limited in north Gujarat, raw materials like shell, semi-precious stones, steatite, amazonite, copper and stones like quartzite, granite, lime stone, marble and china clay, which are available in this region, could have been of commercial and industrial use for the Harappans.

Gastropods like *Chicorus ramosus*, *Fasiolaria trapezium*, *Turbinella pyrum* and *Lambis truncata sebae* are found along the Gulf of Kutch (Kenoyer 1985: 301-307). Semi-precious stones like chert, agate, chalcedony etc. are found in Ratan Timba in Banaskantha District and Mardek Bet in the Little Rann of Kutch (Ajithprasad: personal communication). Significant deposits of seatite are reported from the Sabarkantha District (Gazetteer, Sabarkantha District 1974: 18). Rao (1985: 586) noted a source of amazonite at Palanpur in Mehsana District. The existence of copper mineralization in Gujarat has been discussed briefly in the Gujarat State Gazetteers. The known sources of copper in north Gujarat are Ambaji in Sabarkantha District and Chitrasani in Banaskantha District.
These mineral resources would have been an additional attraction to the inhabitants of the Chalcolithic period to settle in this region as a number of sites show the remains of industrial activities exploiting these natural resources.

The region of north Gujarat is an important area connecting Kutch with Saurashtra and mainland Gujarat. If the Harappans had come from Sind to Kutch via land route, this region might have been extensively used by the Harappans for their migration further south.

After critically examining the nature of sites in north Gujarat many reasons emerges which can influence, individually or holistically, the settlers to inhabit a particular site. The sites in this region are essentially small, majority being smaller than three hectares with the cultural deposit some times little over one meter. This indicates that the sites were not occupied for a prolonged period and the occupation depended on substance farming and live stock raising.

The unpredictability of the rainfall might have influenced the subsistence activity of the Harappans as it is at present. Bajri and cotton are the two important crops for the present day population. Some of the bigger sites might have been engaged in industrial activity as the agriculture only was not enough to sustain the economy.

Sites in north Gujarat are located very close to the eastern margin of Little Rann of Kutch and on either side of the narrow creek-like depression that connects the Little and the Great Rann. This area is covered by a thick deposit of sand loams and appears dead flat except for a few sand dunes and the attendant blow-outs. This region has a semi-arid climate with less seasonal
rainfall so the inhabitants choose these sand dunes as they were besides the inter-dunal depressions which accumulate rainwater and many a times, retain the water throughout the year. Since water in these village ponds remain potable, they are an important source of water for people as well as live stock (Ajithprasad & Sonawane 1993).

Location of the sites near the Little Rann might have some implication in itself. Those who live in small villages on the margin of the Ranns speak of ships sailing across their waters bringing goods from distant lands. Investigations of a purely scientific nature in the spheres of hydrology, archaeology and geology suggests that the Ranns were indeed under a permanent sheet of water at a time when the Harappan culture was flourishing (Chittalwala 1982: 199). Based on hydrological studies, S.K. Gupta maintains that "even as late as 2000 yr. ago Little Rann was about 4m deep (Gupta 1977a: 205). A study of eustasy suggests that there might have been a phase of regression in the level of the sea between 5000 and 3000 BP which corresponds with the eclipse of the Mature phase of the Harappan civilization (Agarwal & Guzder 1972: 216-22).

As mentioned earlier, the adverse climatic condition must have restricted an agricultural surplus, which has to be supported by some other economic activities. Thus, few sites of north Gujarat emerged out of a possible need to be set up as an industrial establishment during the mature phase of the Harappa culture, exploiting the rich local resource material. Here availability of required raw material and nearness to the sea for trade played a vital role in the development of settlement rather than its conducive environment factors.

As some of the sites in north Gujarat were industry based settlements, nearness of the sites to the Little Rann of Kutch, which was under the sea during this
time, ensured a sea borne trade of the finished products to the various Harappan centers. The shallow sea in the Rann catered to the demand of raw material for the shell industry at Nagwada and other sites as well. The aquatic fauna might also have played a major role in the subsistence pattern of the inhabitants, some time supplementing the agrarian products.

The region of north Gujarat is rich in pastoral land. There are few pockets of salty waste that are slightly low-lying, flat wastelands, generally marshy throughout the year and partially covered by a salt deposit with the onset of summer. Although they are unsuitable for agriculture, contiguous land around such deposit, however, forms good pastoral land for cattle and sheep, as they support many types of grass.

Keeping these potentials of the area in mind we will now glance at the settlement pattern of the Chalcolithic community in this region and try to understand the reason for them to settle in an area as arid and inhospitable as north Gujarat.

**SETTLEMENT PATTERN**

The credit for introducing the new paradigm called Settlement Pattern, in archaeology goes to Gordon V. Willey whose 'Settlement Patterns in the Viru Valley' constitutes the pioneering work. He defines the settlement pattern "as the way in which man disposed himself over the landscape on which he lived. It refers to dwellings, to their arrangement, and to the nature and disposition of other buildings pertaining to community life. These settlements reflect the natural environment, the level of technology on which the builders operated
and various institutions of social interaction and control that the culture maintained. Because settlement patterns are, to a large extent, directly shaped by widely held cultural needs, they offer a strategic starting point for the functional interpretation of archaeological cultures" (Willey 1953: 1).

Archaeological expeditions till the early 70’s by many scholars have failed to locate any Chalcolithic site in the region of north Gujarat (Rao 1963; Leshnik 1968). It was, then, thought that the region, which is known for its semi-arid condition and low rainfall, was neglected by the agricultural Harappans. On the contrary, these explorations led to the discovery of large number of microlithic sites spread all over north Gujarat.

Since late 70's, renewed exploration by a team of inspired archaeologists from M.S. University of Baroda brought back the region into the map of Harappan domain. Since then, more than 100 sites with different stages of Harappan affiliation have been located in this region (Annexure I). Of these eight sites have been excavated till date (Annexure II). The pattern of distribution of the Chalcolithic settlement shows that these sites were clustered on the fringes of the Little Rann of Kutch and were totally absent towards the eastern part, were the environment is more conducive for agriculture with higher rainfall and thick soil cover. Thus, the Chalcolithic people purposefully selected this wild environment zone for their settlement with a specific purpose, other than agriculture, which has been discussed earlier.

The Harappan occupation in this region has been represented right from the Early Harappan times till the Late/Post-Urban Harappan occupation, though the number of settlements during different phase of occupation differs considerably and falls in line with the trend seen in Saurashtra (Figure 3.2).
All the explored sites were periodized on the basis of Rangpur sequence. Another group of ceramics, which has a local origin and is non-Harappan in character was seen existing independently before the arrival of Harappans in this region. This group of ceramics is termed as Anarta Culture Pottery (Ajithprasad and Sonawane 1993).

Though no sites has so far been identified as representing the Early/Pre-Harappan culture in north Gujarat, the present author, after classifying the material designated as burial pottery, proposes them to belong to the Early Harappan culture.

Eleven sites belonging to this phase of Harappan culture has been located in north Gujarat. These deposits are in majority associated with the Mesolithic or Anarta culture. Though Panchasar III shows Rangpur IIC, III deposit, but the stratigraphic correlation of these two pottery types is difficult to ascertain. Mathutra show an independent existence of the Early Harappan pottery in this region.

Of the 100 plus Chalcolithic settlements discovered till now, only four sites belong to the Mature phase of Harappan occupation. The interesting thing to
NORTH GUJARAT: Chalcolithic Settlements

Figure 3.2 Harappan/Harappan Affiliated Chalcolithic Settlements in North Gujarat. (After J. Thapar and S. Sonawane 1998.)
be noted here is that all the four sites are associated with the Anarta tradition pottery. Except for the two mounds at Nagwada, which are close to each other, the other two mounds, Zekhada and Munjpur, are located quite at a distance. The mound at Munjpur has a very ephemeral deposit of Mature Harappan occupation. Excavation was conducted at the Mature Harappan site of Nagwada I, which revealed a habitation deposit of 1.5m. The ceramic assemblage consisted of both Anarta pottery as well as ceramics belonging to Mature Harappan period. Both mud bricks and rubble were used for constructing the structures.

Some 12 sites belonging to Period IIB and IIC of Rangpur sequence were explored in this region. The IIB and IIC sites are in majority found in association with the pottery assigned to Anarta Tradition. Though the size of the mounds in most cases are small, few mounds like the one at Mithagoda is as big as 250x200m. Most of the sites of this period are located in and around the Talukas of Santhalpur and Dasada of Banaskantha and Surendranagar Districts respectively.

There is an increase in the number of sites belonging to Period IIC. About 24 sites show material affiliated to this period. In this period also the sizes of the sites are small and are mostly associated with the Anarta culture.

About 31 sites represent the material belonging to Period IIC and III. Few of the sites of this period have a mound of bigger size but the materials are found in small clusters within the mound, which might be separated from each other temporally. There is a decrease in the number of sites having an association with Anarta Tradition. The biggest mound in this period is Ratanpura, having a size of 500x500m. The mound was put under excavation, which revealed
four separate localities. Of these, one concentration belonged to the Mesolithic culture showing microlithic tools. The other three concentrations revealed material belonging to Rangpur Period IIC-III and there is absence of Anarta pottery from the deposit. The structural remains at the site show evidences of circular huts with post-holes. Another site of this period was excavated at Datrana II. The occupation in the mound was patchy and was confined to one part only. Few pits were found during the excavation yielding large number of pottery, some of which might have functioned as pottery kilns. The pottery belonged to Period IIB, IIC and III as well as Anarta pottery, though the two types were found from different pits.

14 sites belonging to Period III was discovered from this region. The average size of the sites increases during this period. An interesting feature about this period is that there is no association of Anarta pottery with Period III sites. Most of the sites of this period are located in the Sami Taluka of Mehsana District.

Anarta tradition pottery has an independent existence in this region. About 9 sites with exclusive Anarta pottery were found from the exploration in this area. The sizes of the sites of this period are comparatively smaller. Of these excavations were conducted at three sites, Loteshwar I, Santhli I and Datrana IV.

Excavation at Loteshwar I yielded a Chalcolithic deposit overlying the Mesolithic deposit. The Chalcolithic deposit varies from 20cms to 80cms. The ceramic assemblage at the site belongs to the Anarta pottery tradition. Harappan ceramic is conspicuous by their absence. A lot of pits of this period were found which were filled with ashy soil, potsherds, animal bones and
other waste materials.

Santhli I also showed a similar type of habitation sequence found from Loteshwar I. Period I at the site belonged to Mesolithic culture and Period II to a Chalcolithic culture. The Chalcolithic occupation is represented by patchy and sparse deposit of 10-15cms. The deposit includes few sherds of pottery, shell bangles and stone and shell beads indicating an ephemeral habitation at the site.

Datrana IV also showed a habitation deposit belonging to two distinct cultural period, Mesolithic and Chalcolithic. The Chalcolithic period is represented by innumerable number of long blades, crested ridge blades, prismatic blade-cores and considerable quantity of lithic industry debitage. There is also evidence of the production of small disc and barrel or tubular beads of agate, carnelian and heated chalcedony in the form of bead preforms and unfinished ones and foliated and semi-cylindrical drill-bits of chalcedony and agate. Ceramic assemblage at the site includes a distinct type of ceramic comparable to the Pre-Prabhas ware in association with the Anarta and Early Harappan pottery. These artifacts are found in discrete clusters within the trench in association with heaps of animal bones. Many of these clusters include unworked nodules, hammer stones, fragments of copper tools and other artefacts which, therefore, seems to be the working area of individual stone knappers. A small copper punch, probably used for striking out lithic blades, was an important find from the site. Apart from these, no concrete evidence of structural remains of the occupants are unearthed at the site during excavation.
Summary

If one glance at the pattern of settlement of the Chalcolithic community at north Gujarat as a whole, a similar kind of picture emerges for the settlements belonging to different period of occupation. Almost all the Chalcolithic settlements in north Gujarat are situated on top of the fossilized sand dunes. These dunes are invariably associated with small depressions that accumulate monsoon run-off and carries water for at least seven to eight months.

Few of these Chalcolithic settlements show Mesolithic occupation on or nearby the mound. Excavations at few of these sites give evidence of Mesolithic deposit underlying the Chalcolithic occupation.

An interesting feature of the Chalcolithic settlement in north Gujarat is that most of the Harappa culture sites are associated with Anarta pottery, which had an independent existence prior to the Harappan occupation in this region. This association can be seen from Early Harappan times up to Period IIC. Period III occupation does not show any evidence of Anarta pottery that might be an indication to prove that Anarta culture might have worn off by this time. The intermingling of Anarta pottery with the Harappan pottery shows a peaceful co-existence of two different cultures for a long period of time.

Characteristic feature of the Chalcolithic settlements in this region is their small size. Most of the sites in this region measure less than 3 hectares. In general, the size varied from a minimum of 0.02 hectares at Gachi-no-bor (Munjpur) to 7 hectares at Harthar-no-timbo (Panchasar). Many of the
relatively large sites like Panchesar and Fatepura, in fact, show discrete cluster of artifacts, each one of which may be a little more than 0.10 hectares (Ajithprasad and Sonawane 1993). Even the habitation deposit of the settlements seems to be superficial. Excavations at Santhli, Datrana, Lotseshwar, Ratanpura, Nagwada etc. show a deposit varying from 0.15m to a little more than 1.00m.

The sites in this region are found in clusters located close to each other. These are located around the low-lying, flat wastelands, which are generally marshy throughout the year and are designated as salty waste. The area close to these depressions supports good grasslands. Fodder like bokana (Cressa critica), kharidhar (Aeluropus logopaides), soma (Echinochloa colonum), jinko soma (Panicum flavidum) and lapdi (Arijtida redacts) have an excellent growth here and help enhance higher milk production due to higher protein content which induces lactation in cattle (Bhan 1992). Sites around such depressions in the middle course of the Rupen river and near Vaghel show a close clustering during different periods of occupation. Clustering of sites could also be seen around Korda and Jhandada, on either side of a very large natural depression locally known as the Sandher. Besides these, a similar feature is observed in the margins of the eastward extension of the depression, which connects the Great and the Little Rann (Ajithprasad and Sonawane 1993).

The spread of the artifacts, thin habitation deposits and close clustering of the sites with very few permanent structural remains indicates that these were temporary settlements or pastoral camps, occupied seasonally. A large number of cattle and sheep bones collected from the sites indicate that they formed an important part in the economy of the Chalcolithic settlements. Even today, pastoralism is an important occupation of the people in this region. Though no
sites yielded evidence of cultivation in this region, agriculture, if at all practised, must have been carried out in small scale.