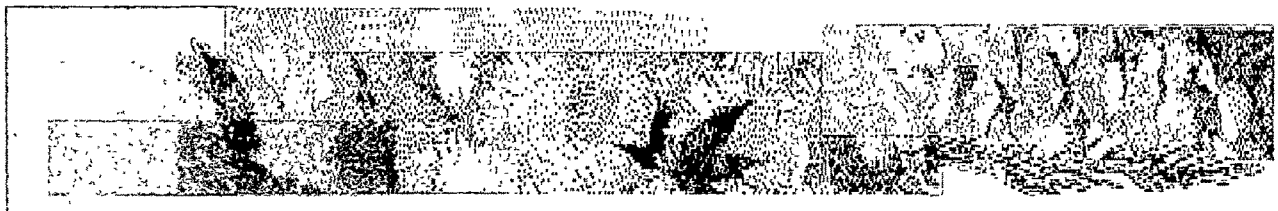


INTRODUCTION

INTRODUCTION

Though the study of ethnobotany is primarly a part of taxonomy and floristic studies, the present day studies on tribal medicines has advanced much and has developed into many sub-disciplines. Therefore the introduction part has been divided and discussed into focusing upon the relevance and importance of both traditional taxonomy and ethnobotany seperately.

IMPORTANCE OF FLORISTIC STUDIES

In the ebb and tide of times new uses for plant products arise. If we trace the history of man, we would find, that ever since his origin on earth, he has depended on plant products in some way or other for his primary needs like food, shelter and clothing. The civilization of a country depends on the intimate relationship of man with plants.

The area of India is estimated to be 324 million square kilometers. In this vast area with its varied climatic and geographic conditions, almost every natural plant family on the world is represented. From the time immemorial some of these plants have been used in the treatment and control of diseases, but detailed studies on their medicinal properties are still necessary. For their proper utilization, it is of utmost importance that we have a complete knowledge of their occurrence, frequency and phenology. Information on this data is inadequate in our Indian floras. The revision of the flora of India is, therefore very necessary (a project already in progress under the auspices of the Botanical Survey of India), but it can be more efficient only after careful, intensive and extensive field explorations of various parts of the country.

It is also essential to have a detailed knowledge of the plant wealth of the country and therefore, the flora of small regions of the states and within it the flora of smaller districts should be prepared. Morever, if we have to derive benefit from our plants by the study of their useful properties, we need more precise information on their exact distribution and frequency, flowering and fruiting time etc. Detailed floristic studies will greatly help in the economic development of an over populated country like ours.

Discussing the relevance of the floristic and various interconnected or rather sub-disciplines of the floristic works in understanding biodiversity conservation has remained one of the main domain in the different agendas

putforward. Taxonomy has been the focal point of biology since time immemorial. In fact, human civilization and scientific advancement can be directly co-related to the systematic understanding of various aspects of man and his association with nature.

The Hooker's flora of British India (1875-1897) compiled during the last decade provides the culmination of floristic and taxonomic researches of a team of dedicated scientists. The flora proved a useful tool all these years and accelerated the preparation of many floras like the Flora of Madras Presidency (1915-1936), Flora of Bombay Presidency (1958, Reprinted), Flora of Upper Gangetic Plains (1973, Reprinted) etc. Since taxonomical research have advanced much thereafter, it was necessary to revise the Hooker's flora on modern lines (The Project already launched by the Botanical Survey of India and many floras has been published).

Looking to the historical sketch on the floristics and taxonomical work in Gujarat, almost 10 floras and 54 Ph. D., thesis have been published, of which 13 thesis and 01 flora has been prepared for the region of Central Gujarat (Anonymous, 2002). The Chhota-udepur forests division, which is one of the major forest area in Central Gujarat was explored by Karatela (1973) and Thaker (1974). This works were complied 30 years back and since then no sincere efforts has been made to further explore the area floristically to see the present status of the vegetation. Also out of the 8 ranges into which the division have been divided administratively, the ethnobotanical information on only one range (Kawant) is available. Hence the remaining 07 ranges have remained devoid of any ethnobotanical investigation and so the present study was taken up.

IMPORTANCE OF ETHNOBOTANICAL STUDIES

> The best ethnobotanists would be a member of an ethnic minority who, trained in both botany and anthropology, would study the traditional knowledge, cultural significance, management and the uses of the flora. And it would be even better- for him and his people-if his study could result in economic and cultural benefits for his own community._____ A. Barrera (In Martin, 1995).

The term ethnobotany was first coined by Harshberger (1896). Different authors have since defined it variously. Schultes (1962) defined ethnobotany as the study of relationship that exists between people of primitive societies and their surrounding plant environment. According to Powers (1873:, In : Castteter (1944)

cited by Cotton, (1997), the term ethnobotany is derived from the word "Aboriginal Botany", means the study of all forms of vegetation which aborigines used for commodities such as medicine, food, textiles and ornaments. According to Krauss (1974), the term ethnobotany is derived from ethnology which means the study of man and botany i.e., the study of the importance of plants to primitive people. Jain (1981) defined it to be the relationship between human society and plants. Many other workers viz., Robbins et al., (1916) cited by Cotton (1997); Gilmour (1932); Jones (1941); Ford (1978); Wickens (1990) and Martin (1995) have expressed their views on the concepts of Ethnobotany.

The importance of the ethnobotanical studies as mentioned by Harshberger (1896) is as follows.

Ethnobotanical studies help in elucidating the cultural position of the tribes, who uses the plants for food, shelter and clothing.

It throws light upon the past distribution of plants.

It helps us to understand as to what were the then existing ancient trade routes.

Ethnobotany is useful in suggesting new lines of manufacture.

The utility of all the wild plants for various purposes was not recognized in a day or in a century, but it is a result of the progressive development of human civilization and culture. The socio-economic development of man reveals that man, soon after his ascent from apes, about 2,50,000 years ago, and after attaining the brain capacity of about 13,000 cc (averaging the modern man), continued for fairly long duration as a hunter, gatherer and fisherman. It was several thousand years later that he became a sedentary agriculturist, but his old traits continued alongside. In the earlier stage he manufactured stone tools and subsequently he became potter. In the course of his cultural and metallic evolution he moved from rock shelters to huts, then to mud and brick structures, and from stone to metal. Besides there was progressive increase in population and technological development, not only in his old traits of hunting, gathering and fishing but also in the acquired occupation as agriculture. The society now consisted of several socio-economic professions. Many of the professions directly or indirectly were dependent on wild plants. It was during this time many more wild plants were brought into use.

Like the wild animals living in forests, human beings too in the days of their primitiveness used the plant resources for food, shelter and even curing their

maladies and thereby kept their health in perfect state of fitness and lived a long life unlike the human folk of the present day trouble-ridden world. With the progress of civilization from the dim past even before the present century various herbal charms played a vital role in human life, society and activities.

Nevertheless, the folklores, superstitious traditions, various rituals tribal practices in vogue then and even to the present day, bear ample proof of the great influence that the herbal charms exerted and still exert over not only the illiterates but also over the so called highly civilized men and women such as wearing of amulets, performance of rituals, witchcraft and chanting of "Mantras" connected with the curing of diseases, betterment of the conditions of the individuals, families and localities and changing of fortunes in one's favour; all these are still followed by the men and women of the West and East, not to speak of the different tribes living in the isolated different parts of the country.

In Egypt, India and China, tones of information are available in the old literature, folklore, mythological stories, epic poems, medicinal treatises, thousands of years old manuscripts, copper plates, palm leaves and similar other records, many of which are preserved even to the present day.

Application of various recipes of herbs and charms that are most interesting and in some cases highly effective for curing many diseases seemed to have been in practice accompanied with chanting of spells as early as 4000 B.C. The earliest reference to the use of medicinal herbs as a remedy for diseases is found in the manuscript of "Eber Papyrus", which dates back to 1500 B.C. (Schultes, 1960 and Aikman, 1974). In India the sacred Vedas dating back between 3500 B.C., and 800 B.C., give many references of medicinal plants. One of the remotest work on traditional herbal medicine is "Vrikshayurveda" compiled by Parsara even before the beginning of Christian era, formed the base of medical studies in ancient India. The "Rigveda" dating between 3500 B.C., to 1800 B.C. seems to be the earliest record available on medicinal plants. More detailed accounts are in "Atharvaveda" whose compilation occurred sometimes around 800 B.C. Later came the "Ayurveda" the practice of which was recorded in Sanskrit by legendry figures of Indian Medicine-Charaka, Sushruta, Nagarjuna, Atreya etc. Two memorable works "Charak Samhita" and "Sushruta Samhita" appeared between 400 A.D. to 500 A.D., said to be the 'golden age' of Indian culture. Charak Samhita mentions-"The Goat-herds, cowhards, shepherds and the tribals are acquainted with identification of

medicinal herbs". Sushruta Samhita recalls-"Know the men, cowherds, hermits, huntsmen, forest-dwellers who cull the fruits and roots of forests, know them for they have the knowledge of medicinal herbs (Sinha, 1996). The uses of poppy, castor oil, squills, aloes etc., are recorded in the valuable ancient works. Thus the science and art of herbal drugs and efficacy of vegetable drugs are recognized from time immemorial, although the oldest science of medicine is still wrapped up in mystery.

The oldest mention of botanical-lore was found in Assyrian and Egyptian inscriptions. In Tomb abd Thebes a wall painting was found which represents a botanical garden and this is the earliest mention of the cultivation of the exotic plants. In Sardanapal's library (650 B.C.) were figured plants and plant parts used in medicine that were stated to be copied from inscriptions between 4000 and 5000 B.C.

The mysticism of the herbal medicines is also mentioned in the Atharva and Rigvedas. The works of Charaka and Sushruta in the treatment of maladies in human beings and animal's are monumental works and outstanding contributions in the field of science and art of healing. Lot of information about herbals, surgery, anatomy and other allied subjects, contained in these two ancient books are extremely valuable and provide nutrition for thought and problems for investigation even to the modern medicinal man. However, no concentrated efforts have been made to identify these plants correctly, whose importance medicinal or otherwise is par excellence. It is rather an unfortunate situation that a plant known in the literature may belong to two or more plants in present system of classification and may be wholly unrelated. A typical example for the problem is the correct identity of Soma (Ephedra spp.,) and Safed-Musli (Chlorophytum spp.); the divine plants of old ayurvedic texts.

Rich knowledge of plant wealth has been passed on by word of mouth and by tradition from generation to generation, in different parts of the world. Modern researches have often borne out of efficacy of many of the crude plant drugs used by the aborigines. A good example of this is provided by the discovery during the past fifty years of a succession of so called "Wonder drugs" from plants with rich ethnobotanical and ethnopharmaceutical histories in aboriginal societies. The green revolution unearthed the unbelievable muscle relaxants from South American arrow poisons or curares; rulin from a number of species with ethnobotanical lores;

cortisone from sapogenin plants employed by aborigines in Central America and Africa etc. The development of a folk medicine into therapeutic importance is exemplified by Rauvolfia serpentina (Linn.) Benth. ex Kurz., The root of this plant has been used for centuries in Indian medicine as cure for insanity, epilepsy and high blood pressure.

India has over 38 million tribals inhabiting varied geographical regions and climatic zones. The total number of tribal communities is around 550, living in complete harmony with nature they have acquired unique knowledge about the uses of natural resources that could benefit the so-called civilized societies. The tribal people are the repository of knowledge of indigenous flora and fauna. They have developed their own cultures, customs, religious rites, taboos, legends and myths, folk-tales and songs, witchcrafts, food and medicinal practices. Living close with the nature the tribals are familiar with thousands of wild plants and animals and by empirical reasoning, by trial and error have screened and developed a highly complex and very specific knowledge of their local flora and fauna on which until quite recently many of them depended for most of their requirements. They have their own methods of conserving many species of plants and animals which they felt are at the verge of extinction.

Sacred groves are excellent examples of preservation of flora and fauna on religious grounds. Such pockets are located in remote tribal areas along the Western Ghats in India and in some Northeastern states. The forest patches preserved on religious grounds are the true indicators of the type of forests once existed along the hilly terrains, long before the dawn of civilization. The existence of such undisturbed pockets is mostly due to certain taboos, strong beliefs supplemented by mystic folklores (Sebastian, 1983).

In ancient India forests were generally not feared but looked upon as providers of timber, food and medicines. They were retreat for penance and prayer. Sanctuaries called as "Abhyayaranya" were established way back in 4^{th} century B.C. The essential benefits of vegetation were recognized and soon it found its place in religion. The trees became the abode of the spirit, "the Vanadevatas".

Worship of trees is practiced through the ages in India. References to trees and flowers are found profusely in folk songs. There are a number of folk songs related to worship of the peepal tree. Folk songs in worship of peepal are sung in U.P., and in Kerala for lord Vishnu, in Bhojpur for the sun and in Rajasthan for

Kubair, the diety of wealth. Folk songs in praise of Sal, Aak, Mango, Aonla, Bamboo, Neem, Ashok, Basil and Amaltas are sung, believing that these plants are the abode of several gods and goddesses (Ahuja et al., 2001).

Certain tribals regard plants and animals as the ancestors of the human race. This is known as "totemism". There are tribes who claim to have been descended from plants. Such tribals could not use plants that were 'totem' to them. Among the red maize clan of Omahas (North American Indians) the red maize was considered to be their totem or ancestor, and members of the tribe may not eat red maize.

Ethnobotany, a multidisciplinary science comprises of many interesting and useful aspects of plant science, history, anthropology, culture and literature. It has the potential to unearth the numerous uses of plants and various aspects of tribal life.

From a different perspective the study of ethnobiology has great economic possibilities which may lead to new information on unexplored or unexploited natural resources and new uses of existing resources as source of food, medicine, fibre and fodder. It now assumes vital significance in the light of changing conditions brought about by the rapid depletion of the so-called non-renewable resources and the limits of agricultural production. Many plants used in the traditional medicines of tribals and other such communities are important sources of pharmacological active compounds. Primitive cultivars or wild plants used by tribals may hold the genetic key to many important agricultural breakthroughs. For example in 1973 American scientists trying to develop high protein Sorghum examined over 9000 varieties from all over the world before they discovered in the fields of Ethiopian tribals, two obscure strains with qualities they sought.

Many tribal communities still continue to grow or know innumerable plant and animal species of great economic utility that presently is being threatened by changes in the lifestyle of these communities. All these valuable informations can be gathered, documented and rather put to a database through ethnobotanical explorations.

JUSTIFICATION FOR PRESENT STUDY AND OBJECTIVES

The Chhota-udepur forests division falls under the Vadodara district of Central Gujarat and has a rich floristic diversity. There are 7 different tribal communities present in the area, which is about 80 % of the total population. These tribals are mainly dependent on the forests for their livelihood. The area has been surveyed for floristic study by Thaker (1974). From 1974, the area is subjected to the pressure of a number of developmental activities namely construction of dam and roads, mining of quartz, dolomite etc. Since there is no detailed information available on the present status of floristic composition and ethnobotany of the area, the present work has been undertaken with a view to :

Preparing a thorough floristic inventory.

Documenting floristic diversity.

Studying seasonal variation in the vegetation.

Documenting ethnobotanical data.

Studying impact of biotic pressure on the vegetation of the area.

Preparing management plans for the conservation of flora.

THE STUDY AREA

LOCATION

The Chhota-udepur forest division surveyed for the present study is situated in the hilly ranges of Vadodara district of the State of Gujarat (Western India) (**MAP 1**). The entire study area lies between 22 °–11'and 22 °–30'N latitude and 73 °–52' and 74 ° –15'E longitude. The forest division is *ca* 746.68 square Kilometers (Anonymous, 1997) in area, surrounded by Baria taluka of Panchmahals district on North, Alirajpur tahsil of Jhabau district of Madhya Pradesh on its East, on the West by Pavi-jetpur and Narmada district on the South and by the state of Maharashtra on Southeast.

TOPOGRAPHY

The entire forest division is hilly with the hills ranging in height between 150 and 325 mt. The hills form discontinuous ranges with plain plateaus in between and hills are mainly the extensions of Satpura mountain ranges. There are two main rivers viz., Narmada and Orsang, which traverse the entire forest division.

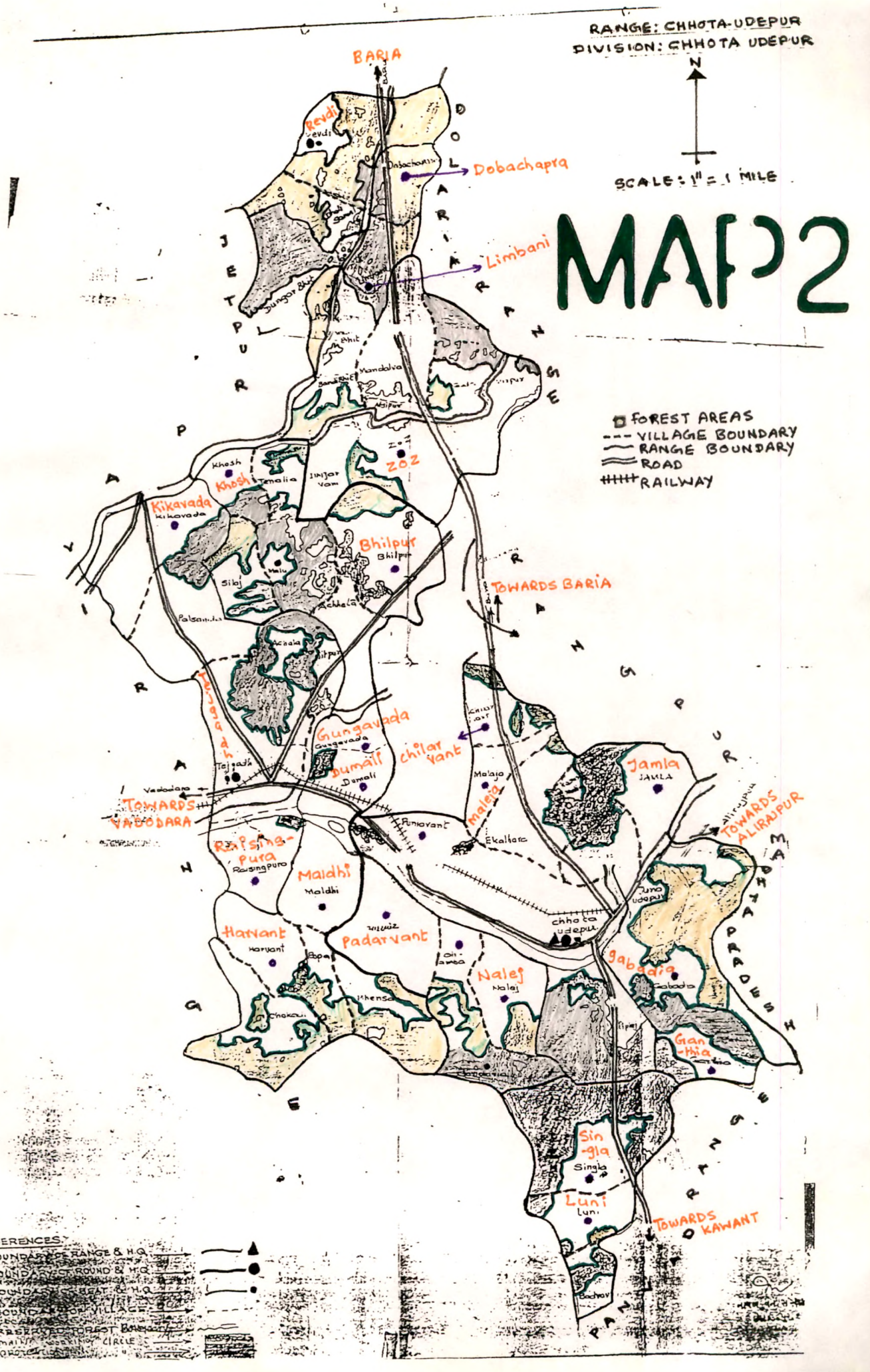
RIVER NARMADA- This river and its tributaries flow East to West on the Southern boundary of Kawant range.

RIVER ORSANG- This river traverse three ranges of the division namely Chhota-udepur, Pavi-jetpur and Naswadi.

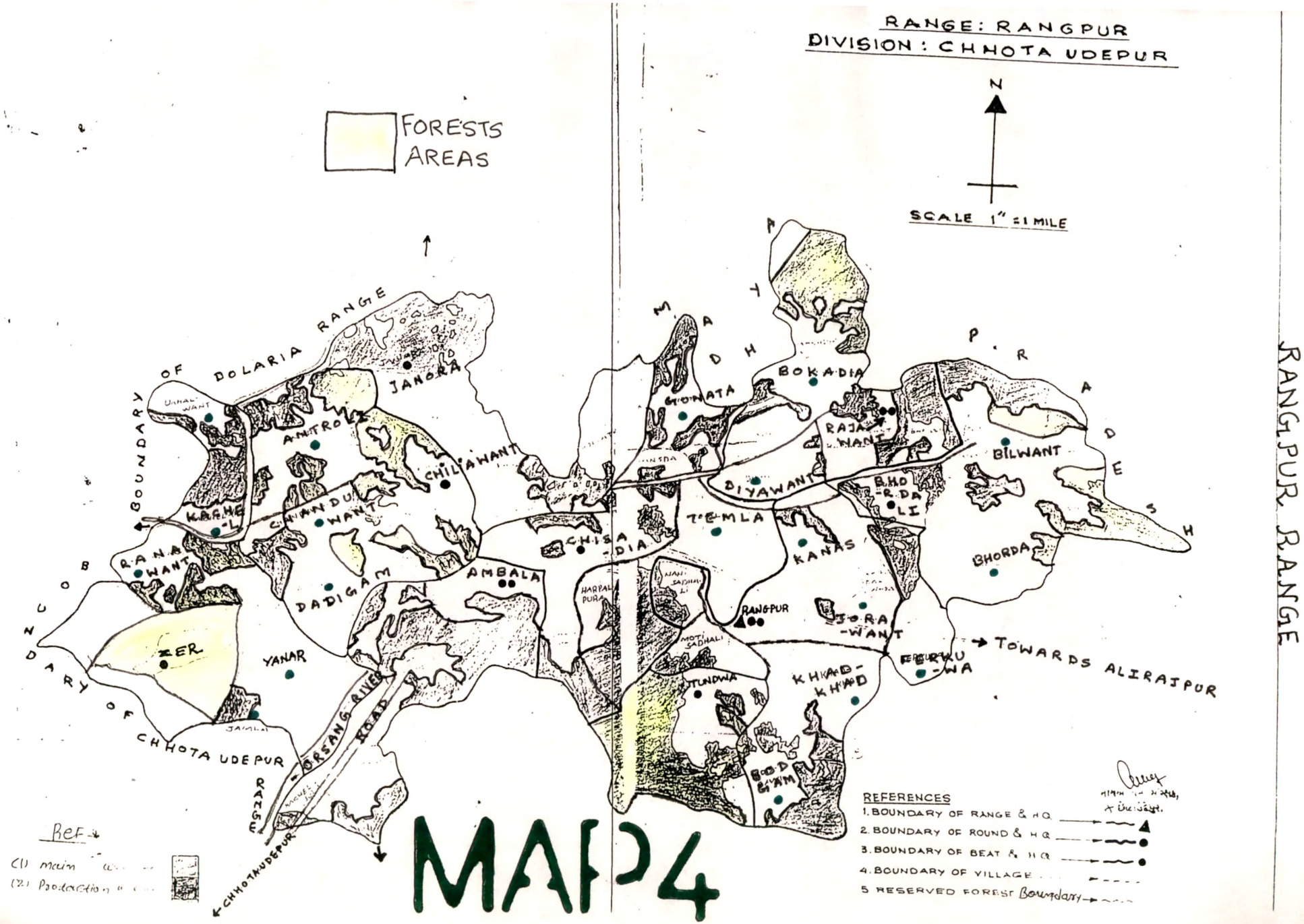
In the past (1970-85) the area was divided under 6 ranges for administrative purposes viz., Chhota-udepur, Kawant, Jambughoda, Pavi-jetpur, Naswadi and Halol. After that the area of Jambughoda was notified as Wildlife Sanctuary in May 1990 under Gazette Notification. Halol range was separated from the region and is now a forest division in Panchmahals district. Kawant has been separated into a taluka along with Chhota-udepur, Naswadi, Pavi-jetpur and Sankheda of Vadodara district. At present for the convenience the entire division has been divided into 8 ranges viz., Chhota-udepur, Dolariya, Rangpur, Panvad, Kawant, Jetpur-Pavi, Boriyad and Naswadi. (**MAP 2 TO 7**).

MAP 1

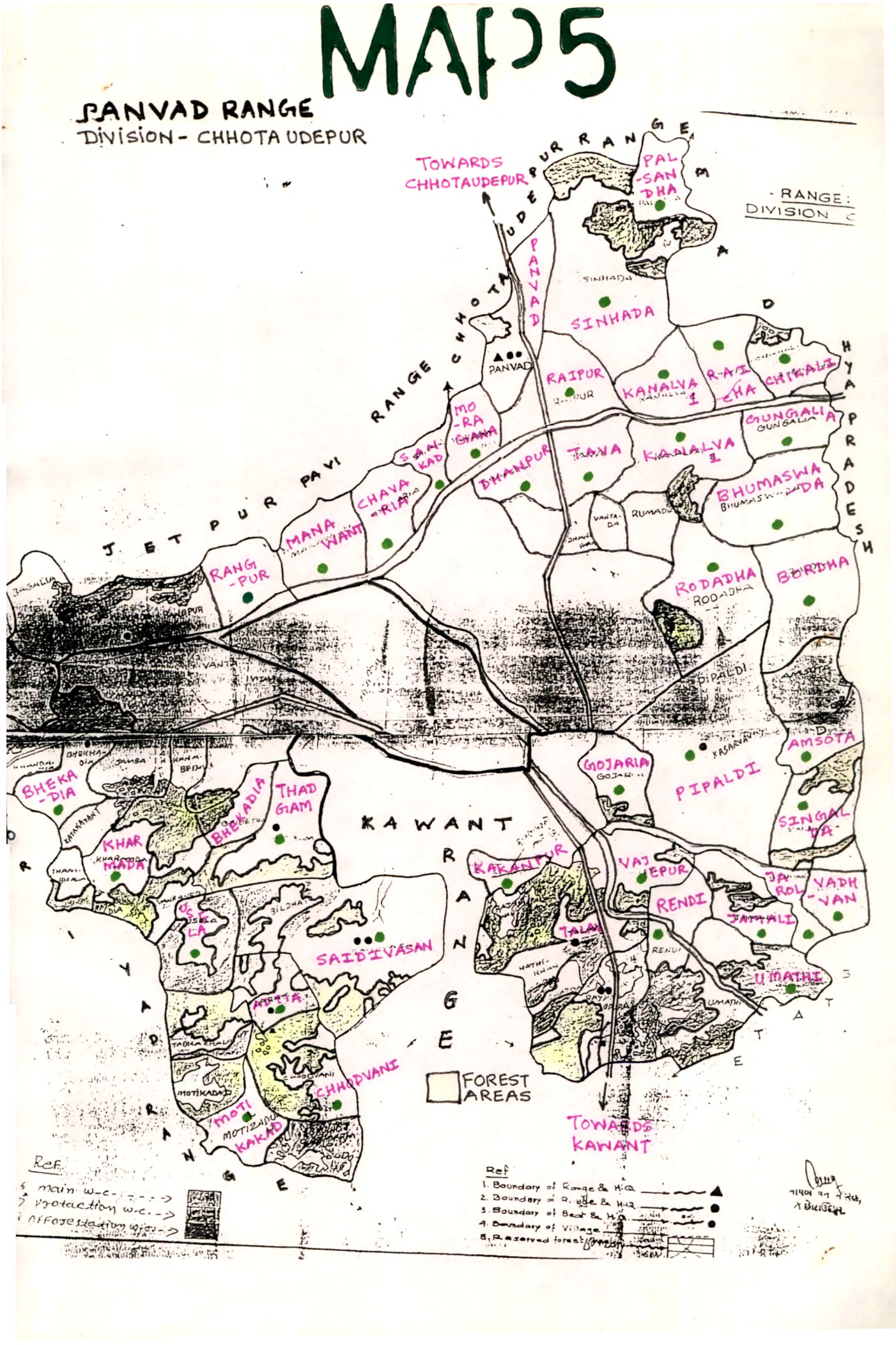

VADODARA
N
Scale 1cm= 7.5 kms
D E F G
1
2
3
4
5
Limkheda
Usra
Piplod
To Dahod
Sampa
GODHRA
Bhamiya
CHMAHAL
Gollav
Devgadh Baria
Abhlod
Garbada
Vejalpur
DAHOD
Dhanpur
Delol
Panam
Kanpur
Ringola
Sagtala
Mithibore
Polchhoti
Halol
Kevdi
Jharan
Kadiyal
Shivrajpur
Sukhi
Zoz
Kikawada
Jambughoda
Jetpur Pavi
Tejgam
Furkywa
Suskal
Puniyavant
Alirajpur
Chhota Udaipur
Jabugam
Rustampura
Jetwa
Bodeli
Sorwa
DODARA
Bordha
Sinhada
MADHYA PRADESH
Orsang
Mankani
Panvad
Umrali
Bahadarpur
Kanalva
Kadachala
Sajava
Hiran
Sankheda
Bhatpur
Jhad
Koshindra
Chalama
Kavant
Aritha
Padvan
Rajvasana
Sondwa
Ghantoli
Chandpur
Saidivasan
Aswan
Nasvadi
Bakhatgarh
Sandhia
Mathwad
Bujetha
Kadipani
Men
Ambadungar
Hanf
Hanfeshwar
Anakhala
Tilakwada
Narmada
RAJPIPLA
Gadher
Garudeshwar
Gora Colony
Kevadia Colony
Navgam
Sardar Sarovar Yojna
Narmada Dam
Surpaneshwar
MAHARASHTRA
RMADA


RANGE: CHHOTA-UDEPUR
DIVISION: CHHOTA UDEPUR
N
SCALE: 1" = 1 MILE
MAP 2
BARIA
Revdi
Dobachapra
Limbani
DOLARIA RANGE
JEETPUR
Mandolva
FOREST AREAS
VILLAGE BOUNDARY
RANGE BOUNDARY
ROAD
RAILWAY
Khesh
Kikavada
Bhilpur
TOWARDS BARIA
Tejgadh
Gungavada
Dumali
Chilar Vant
Jamla
Malaja
Malaja
TOWARDS VADODARA
TOWARDS ALIRAJPUR
Ramavant
Ekalbara
Rajpipla-pura
Maldhi
Harvant
Padarvant
Chhota Udepur
Gabadia
Nalej
Gan-thia
Sin-gla
Luni
TOWARDS KAWANT
GUJARAT
MADHYA PRADESH
REFERENCES
1. BOUNDARIES RANGE & H.Q.
2. BOUNDARIES ROUND & H.Q.
3. BOUNDARIES BEAT & H.Q.
4. BOUNDARIES VILLAGE
5. RESERVED FOREST Boundary
6. MALIYA WORKING CIRCLE
7. PROTECTED


RANGE. DOLARIYA
DIVISION : CHHOTA UDEPUR
BARIA DIVISION
KAKAD KUND
SINGALA
RINCHH VEL
DHOR KUVA
GADOLA
GADOLA
MITHIBOR
MITHIBOR
MARCHI PANI
MARCHI PANI
KHOTHA
DUN
DUN
MAL
MAL
VADHAVAN
VADHAVAN
RANI KHEDA
RANI KHEDA
JAMLI
JAMLI
DOLARIA
NAYA GAM
KUMBH ANI
DHADAGAM
DHADAGAM
LAGANI
GHIC GPHA DEV
KOLI
KHODVANIA
OZADI
BAROJ
ODE
POTIA
VALODA
KHAJURIA
SCALE: 1"=1 MILE
વર્ષવાર વાવેતર
સમજૂતિ
1996-97
1997-98
1998-99
PLANTATION PLOTS.
MAP 3


RANGE: RANGPUR
DIVISION : CHHOTA UDEPUR
FORESTS AREAS
N
SCALE 1" = 1 MILE
BOUNDARY OF DOLARIA RANGE
BOUNDARY OF CHHOTA UDEPUR
MADHYA PRADESH
JANORA
ANTROL
CHILAWANT
KARHE-L
CHHANDUWANT
RANAWANT
DADIGAM
AMBALA
CHISADIA
TEMLA
BOKADIA
GIONATA
RAJAWANT
DIYAWANT
BHODRALI
BILWANT
KANAS
BHORDA
RANGPUR
JORA-WANT
FERKU-WA
TOWARDS ALIRAJPUR
KHAD-KHAD
TUNDWA
GODAGAM
ZER
YANAR
JAMLI
ORSANG RIVER
ROAD
CHHOTAUDEPUR
HARPALPURA
MOTI SADHALI
NANI SADHALI
REFERENCES
1. BOUNDARY OF RANGE & H.Q.
2. BOUNDARY OF ROUND & H.Q.
3. BOUNDARY OF BEAT & H.Q.
4. BOUNDARY OF VILLAGE
5 RESERVED FOREST Boundary
Ref
(1) Main
(2) Protection
MAP 4
RANGPUR RANGE

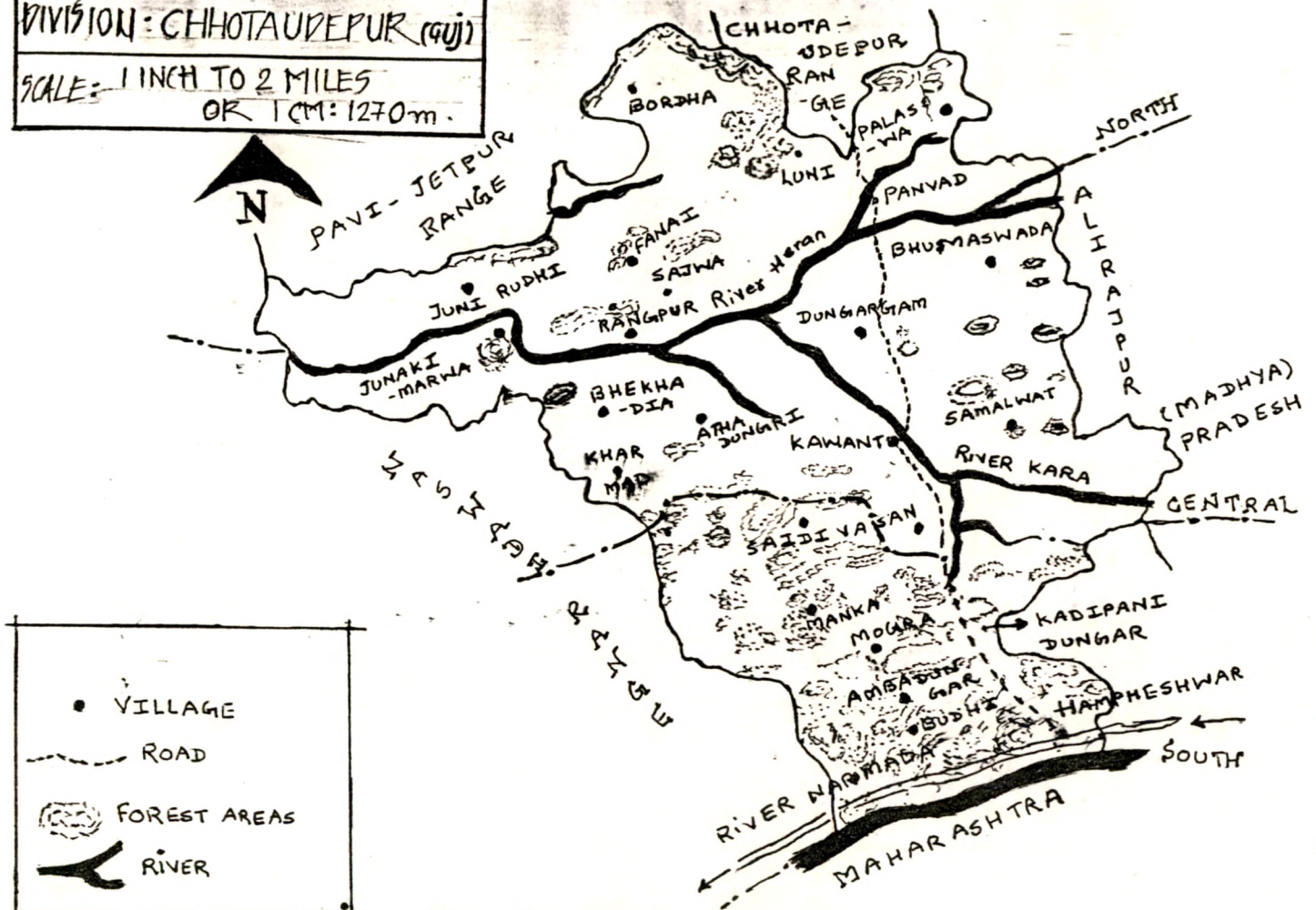
MAPS


PANVAD RANGE
DIVISION - CHHOTA UDEPUR
TOWARDS CHHOTAUDEPUR
PAL-SANDHA
SINHADA
PANVAD
RAIPUR
KANALVA 1
RAICHA
CHIKALI
GUNGALIA
KANALVA 2
BHUMASWANDA
DHANPUR
TAVA
MORAGAMA
SANKAD
CHAVARIA
MANAWANT
RANGPUR
RODADHA
BORIDHA
PIPALDI
GOJARIA
AMSOTA
SINGALVA
BHEKADIA
KHARMADA
THADGAM
KAWANT
KAKANPUR
VAJEPUR
RENDI
JAMBHOL-VADHVAN
JAMALI
UMATHI
SAIDIVASAN
CHHODVANI
MOTIKAKAD
FOREST AREAS
TOWARDS KAWANT
JETPUR PAVI RANGE
CHHOTAUDEPUR RANGE
PANVAD RANGE
KAWANT RANGE
Ref
1. Boundary of Range & H.Q
2. Boundary of R. Sub & H.Q
3. Boundary of Beat & H.Q
4. Boundary of Village
5. Reserved forest

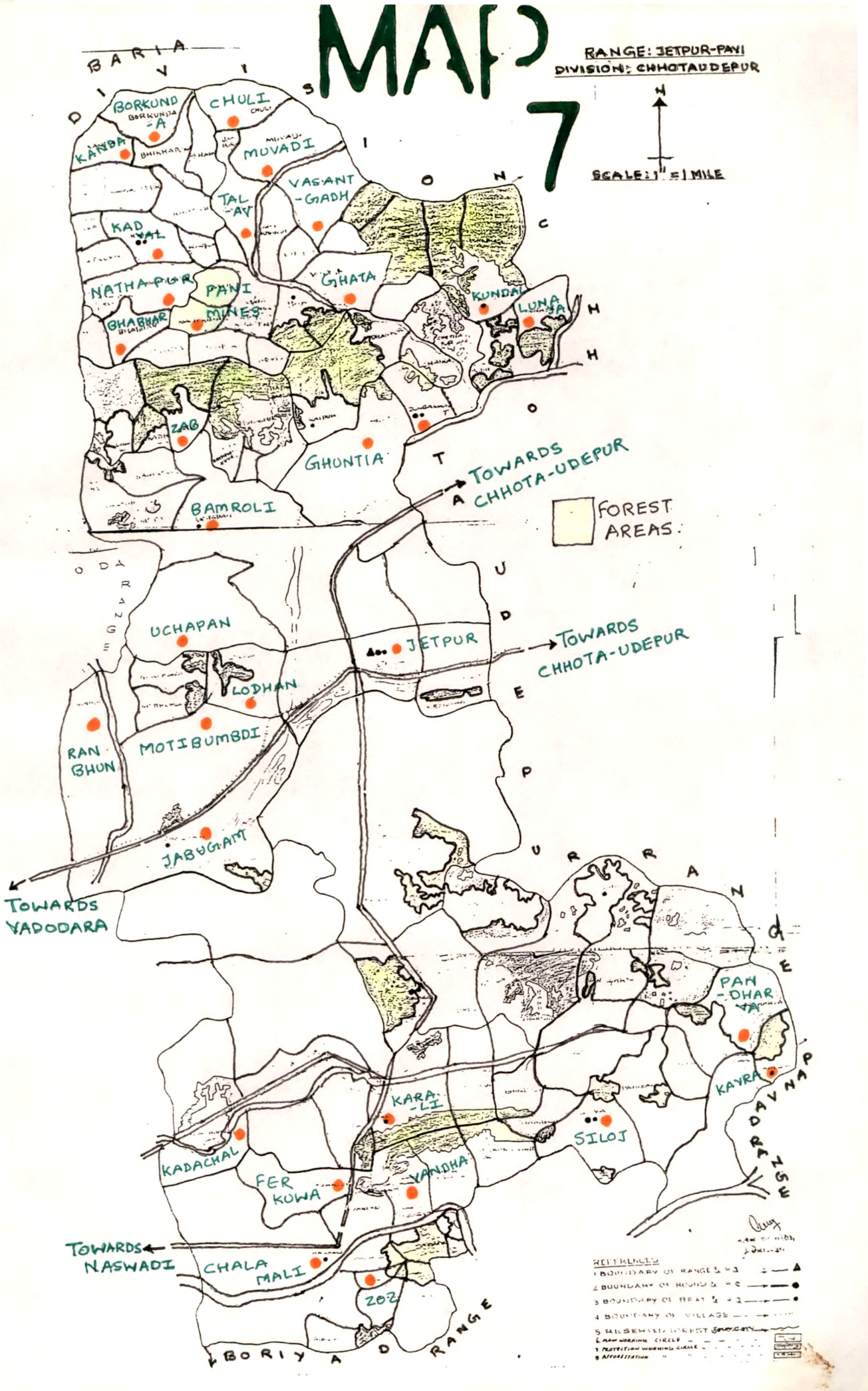
MAP OF KAWANT RANGE

DIVISION : CHHOTAUDEPUR (Guj)

SCALE : 1 INCH TO 2 MILES
OR 1 CM : 1270 m.



MAP 6


MAP 7
RANGE: JETPUR-PAVI
DIVISION: CHHOTAUDEPUR
SCALE: 1" = 1 MILE
N
BARIA
DIVISION
BORKUND-A
CHULI
KANDA
MUVADI
VASANT-GADH
TAL-AV
KAD
NATHAPUR
PAVI
MINES
GHATA
KUNDAL
LUNA
GHABHAR
ZAB
GHUNTIA
BAMROLI
TOWARDS CHHOTA-UDEPUR
FOREST AREAS
UCHAPAN
JETPUR
TOWARDS CHHOTA-UDEPUR
LODHAN
RAN BHUN
MOTI BUMBDI
JABUGAM
TOWARDS VADODARA
PAN-DHAR-VA
KAYRA
KARA-LI
SILOJ
KADACHAL
FER KUWA
VANDHA
TOWARDS NASWADI
CHALA
MALI
ZOZ
DAVNAP RANGE
BORIYAD RANGE
REFERENCES
1 BOUNDARY OF RANGE & HQ
2 BOUNDARY OF ROUND & HQ
3 BOUNDARY OF BEAT & HQ
4 BOUNDARY OF VILLAGE
5 RESERVED FOREST
6 PAN WORKING CIRCLE
7 PROTECTION WORKING CIRCLE
8 AFFORESTATION

CLIMATE

Seasonal variation in temperature is very wide. The range of minimum and maximum temperatures recorded is 8-15 ° C and 40-45 ° C respectively. Monsoon is irregular and erratic. Bulk of the annual rainfall is received in a short period of 8 to 9 weeks from early July to middle September. The normal rainfall is 600-1000 mm, whereas the average rainfall in the last ten years (1992-2001) is about 800 mm. Relative humidity is maximum between the months of July and September (82 % - 87 %). It decreases slowly to its minimum during the months of March and April, when it is 50 % to 55 %. Table # 1(A) shows the rainfall, table # 1 (B) shows the relative humidity of the area and table # 1 (C) shows the temperature recorded in the area (1992-2001) collected from the Taluka Panchayat Office, Chhota-udepur.

TABLE 1 (A): RAINFALL DATA OF CHHOTA-UDEPUR FOREST DIVISION

SR. NO.	YEAR	RAINFALL IN mm.	RAINFALL IN inch
1	1992	694.6	27.36
2	1993	682.1	26.87
3	1994	858.8	33.83
4	1995	1198.8	47.23
5	1996	698.5	27.52
6	1997	1046.8	41.24
7	1998	1160.7	45.73
8	1999	1060.2	41.77
9	2000	301.9	11.89
10	2001	330.6	13.02
Average		**803.3**	**31.64**

Maximum rainfall was recorded in the year 1995 i.e., 1198.8 mm (47.23 inch) and Minimum rainfall was recorded in the Year 2000. and 2001 i.e., 301.9 and 330.6 mm respectively (11.89 and 13.10 inch). Conversion 1mm = 0.0394 inch. It is clear from the table 1(A) that the area has not received sufficient rainfall thus indicating the drought condition in the area.

TABLE 1 (B): RELATIVE HUMIDITY % (8.30 A.M) RECORDED DURING LAST TEN YEARS (1992-2001) CHHOTA-UDEPUR FOREST DIVISION

YEAR	MONTHS											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1992	69	67	53	58	62	72	82	91	86	73	75	71
1993	67	63	50	51	55	70	83	85	83	66	77	79
1994	68	60	53	54	67	72	85	87	80	65	63	60
1995	68	53	57	58	70	75	83	84	80	74	55	62
1996	58	50	52	64	69	72	86	87	83	66	63	61
1997	57	60	50	51	65	71	83	86	76	65	54	53
1998	50	54	48	51	60	77	81	92	79	69	59	50
1999	56	55	53	45	63	73	82	87	80	74	55	64
2000.	69	64	56	61	71	72	82	92	77	72	59	60
2001	64	65	54	61	62	71	84	86	80	66	58	64
MEAN	62	59	**52**	**55**	64	72	**83**	**87**	80	69	61	62

Maximum Relative humidity recorded: 91 % in 1992 and 92 % in 1998. Mean: 83 %-87 % during July and August. Minimum Relative humidity recorded: 45 % in 1999, 48 % and 50 % in 1998 and 1993 during March to April. Mean: 52 % - 55 % during March and April.

TABLE 1 (C): TEMPERATURE ^{O}C (8.30 AM) RECORDED DURING LAST 10 YEARS (1992-2001) CHHOTA-UDEPUR FOREST DIVISION

Year	MONTHS											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1992	34.2	35.8	38.8	42.2	43.0	39.6	38.0	37.7	38.0	38.4	36.4	31.4
	15.0	10.8	15.0	19.4	28.2	26.0	25.3	25.3	25.0	20.0	15.5	14.5
1993	32.2	33.9	38.9	44.4	45.0	39.4	37.8	37.2	37.2	37.2	31.2	31.7
	15.6	12.2	15.6	20.0	26.7	25.6	25.6	23.3	23.9	20.6	16.7	15.0
1994	33.2	34.3	38.0	42.0	43.3	40.6	38.2	38.0	38.0	35.5	30.7	31.8
	15.2	15.0	15.8	22.8	26.3	25.2	25.0	25.1	24.0	17.0	15.5	13.4
1995	32.2	38.9	40.6	42.2	45.6	42.2	35.0	31.1	36.7	37.8	33.3	31.7
	10.6	14.4	17.2	22.2	25.6	25.6	23.9	24.4	23.3	20.0	16.7	11.1
1996	31.0	34.6	39.6	41.9	41.1	41.0	39.6	37.8	35.0	35.3	34.6	33.1
	10.4	11.0	16.2	24.0	28.2	25.3	25.0	25.2	24.3	20.5	15.5	15.0
1997	31.1	36.7	40.0	43.9	45.0	42.2	35.0	31.1	36.7	37.8	33.3	31.7
	10.0	11.4	17.8	20.0	26.7	23.9	23.9	22.2	22.0	20.2	16.7	15.6
1998	33.1	35.3	41.1	42.2	43.8	41.1	38.0	35.3	35.0	37.7	35.0	30.3
	10.4	13.0	15.0	23.4	25.3	26.6	24.6	24.6	23.0	20.2	15.5	14.5
1999	31.3	34.2	40.4	42.2	44.1	41.1	36.4	37.5	35.0	37.9	32.2	30.4
	11.6	13.5	17.3	22.7	28.1	25.9	23.3	23.0	27.1	21.2	16.6	14.3

2000	32.2	35.6	42.2	42.8	42.2	40.0	35.3	35.6	37.2	37.0	35.0	30.0
	10.9	16.7	17.8	22.2	25.6	23.3	23.8	22.2	23.7	21.7	19.4	13.9
2001	30.4	35.6	40.8	43.9	43.3	39.7	35.3	33.3	37.8	34.4	32.3	31.0
	10.0	12.6	17.3	23.3	25.0	26.3	23.3	23.0	22.2	21.6	17.8	14.2
Mean	**32.0**	**35.4**	**40.0**	**42.7**	**43.6**	**40.6**	**36.8**	**35.4**	**36.6**	**36.9**	**33.4**	**31.1**
	11.9	**13.0**	**16.5**	**22.0**	**26.5**	**25.3**	**24.3**	**23.8**	**23.8**	**20.3**	**16.5**	**14.1**

Max- Maximum; Min- Minimum. Maximum temperature: In May in 1993, 1995, 1997 and 1999 – 44.4 ° C to 45.6 ° C; hottest months as April-May. Minimum temperature: In January in 1997 and 2000. – 10 ° C; coldest months are December-January.

GEOLOGY AND SOIL

Major portion of the forest division comprises of alluvium, which is of recent formation. At some places, alluvium has been intruded by granite and other intrussives of Erinpura age, i.e. post Dharwar system. The intrussive rocks are granites, quartz veins, pegmatite, granitoid, gneiss etc. At places, there are metamorphic interbedded exposes belonging to Champaner series of Dharwar age. The largest deposit of flourspur found in pure form is in Ambadungar area of Kawant range. The main rocks of the area belong to Deccan trap overlaying pre-cambrain metamorphics. There are formations of Cretaceous marine transgressions called as "Bagh Beds". Most of the hilly forests areas are rich in dolomite marbles, dolomite limestones and quartz. Large quantities of dolomitic marbles available are used in chemical industry. Dolomitic limestones are used as chips in the manufacture of tiles. Ores of Manganese and calicite also occur in the area, but in small quantities. Recently three minerals viz., Wollastonite, Calcite and Talc were spotted near Chhota-udepur. All these minerals are important as far as their finished produce in industries are concerned. Wollastonite is used in making high quality glass; Calcite is used in the glass industry, especially in making prisms used in microscopes. Talc is used to prepare talcum powder. Hence this area already known for its minerals such as dolomite, fluoride and quartz is rich in other minerals also.

Soil in general is sandy with varying proportion of loam. In the hilly areas, it is generally very shallow and poor and in extreme cases even the parent rocks are exposed. In valleys and pockets, soil is comparatively deep and fertile. Black cotton

soil occurs in patches throughout the forests. In some patches, the sub-soil is impervious during monsoon. At many places, the soil is reddish brown, shallow and infertile. Quite often it is murrammy (Merh, 1995).

PREVIOUS WORKS UNDERTAKEN

The information regarding the vegetation and flora of Central Gujarat is confined to the works of Chavan and Oza (1962-66); Sabnis (1966); Bedi (1968); Deshpande (1968); Bedi and Sabnis (1970); Padate (1973); Karatela (1973); Thaker (1974); Bhatt (1975); Patil (1980) and Pandya and Oza (1998). In all these studies floristic as well as phytosociological studies were given due considerations.

As far as ethnobotanical work is concerned, only Ratanmahal hills and Kawant range were thoroughly investigated. There is a lacuna in our understanding on the impact of developmental activities on the status of the vegetation and the ethnobotany of the area as it is a major tribal inhabited one. In Gujarat some scanty information on local uses of plants are available in the works of Thaker (1910, 1926); Bambdai (1940, 1951, 1952); Chavan et al., (1963); Vaidya (1965); Parikh (1966) and Bedi (1979). Some other relevant works on ethnobotany includes the works of Thaker (1974); Joshi, Patel and Mehta (1980); Joshi and Audichya (1981); Shah, Menon and Gopal (1981); Shah and Gopal (1982, 1985, 1986, 1989); Joshi (1983); Bhatt and Sabnis (1987); Mac and Parabia (1989) and Reddy (1989). Some recent works on this aspect was published by Dabas et al., (1990); Maheshwari, Sikarwar and Painauli (1994); Pandit et al., (1996); Punjani (1997 and 1998 a and b); Bhatt, et al. (1999a and 1999b); Jadeja (1999) and Bhatt, et al. (2001a and b). Looking to the above data, it is evident that very little work has been done on the tribal pockets of Central Gujarat (Panchmahals, Vadodara and Dahod districts).

PRESENT STUDY

The present study has been launched to bring out a detailed floristic and ethnobotanical survey of the plants of Chhota-udepur forest division to fill up the existing lacunae.

METHODOLOGY

The survey work started in the month of December 1998 and continued till May 2001. Different localities were visited regularly as mentioned in table # 2. Frequent tours were undertaken between June and November when maximum number of short-lived ephemerals and annuals come up. Usually the tour lasted for

5-10 days. Sometimes even shorter tours were also conducted depending on the season and area. The area being fairly larged, sincere efforts were made to cover different localities to procure representative collections. (**MAP- 8**) shows the area explored for the present study.

The colored indications in the map shows the area selected and surveyed during the present study.

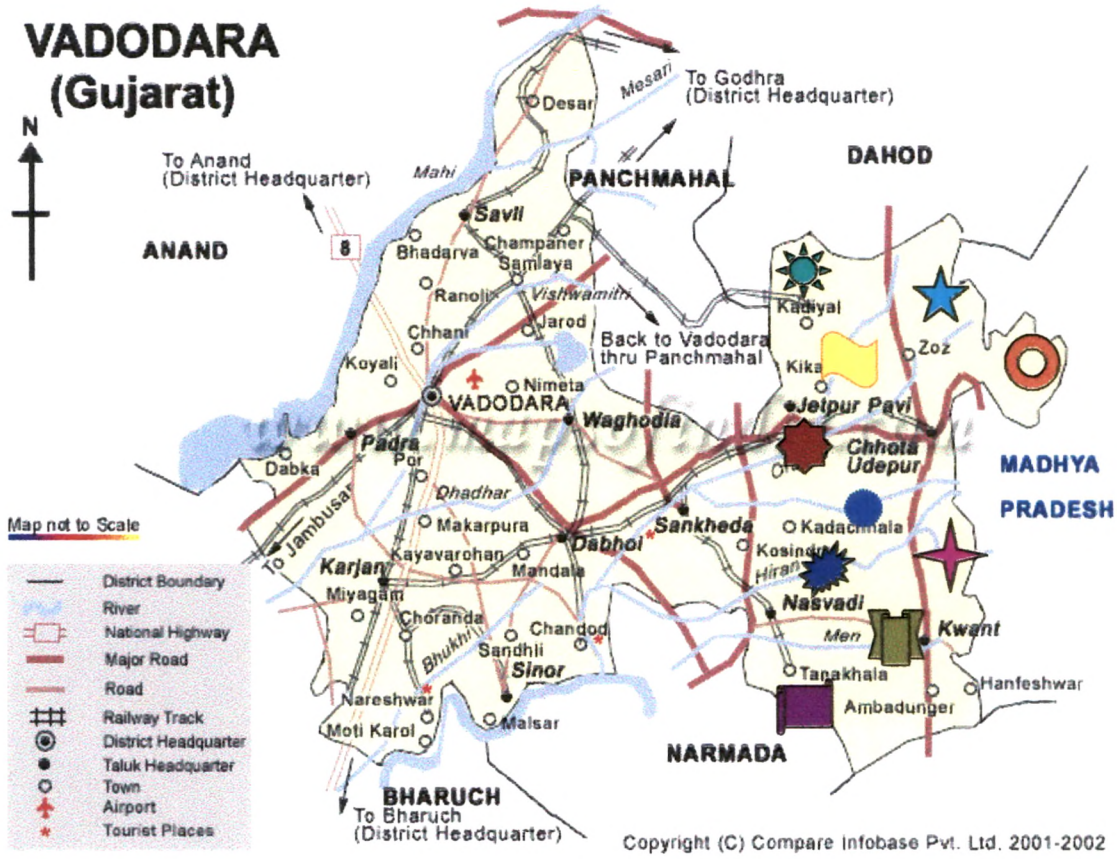


TABLE # 2: LOCALITIES SURVEYED DURING THE PRESENT STUDY

Sr. #	Name of the range in forest division	Locations (latitudes and longitudes)	Name of the places surveyed
1.	Chhota-udepur	22 ^{0}-00 to 22 ^{0}-15' N 73 ^{0}–45' to 74^{0}-15' E	Chhota-udepur, Vagasthal, Kevdi, Zoz, Limbani, Singla, Ganthia-gabadia, Tejgadh, Dhandoda, Ghelvant, Moti Dumali, Nani Dumali, Doba-chapra, Dholi –samal, Chilarwant, Puniyavant, Kikawada, Malu and its surroundings.
2.	Rangpur	22 ^{0}–15' to 22 ^{0}-30' N 73 ^{0}–45' to 74^{0}-00' E	Moti-sadhali, Nani-sadhali, Tundawa, Antroli, Zer, Chiliawant and Kanawant.
3.	Pavi-jetpur	21^{0}-55' to 22^{0}-30' N 73 ^{0}–45' to 74^{0}-00' E	Pavi-jetpur, Jabugam, Dungarvant, Raipur Kundal, Ghata, Sukhi dam, Satun, Vasantgadh, Chalamali and surroundings.
4.	Kawant	21^{0}-55' to 22^{0}-15' N 73 ^{0}–45' to 74^{0}-08' E	Mogra, Kadipani, Ambadungar, Turkheda, Adtia, Bordha and Hampheshwar.
5.	Boriyad	21^{0}-35' to 22^{0}-30' N 73 ^{0}–15' to 74^{0}-09' E	Vankala, Ramapalasdi, Borkhad, Patadia, Lavakui, Ranbor, Sakal, Sindhipani, Dharsimal, Kariabar and Talav villages.
6.	Panvad	22 ^{0}–18' to 22 ^{0}-04' N 73 ^{0}–23' to 74^{0}-07' E	Panvad, Ucheda, Sodhavad, Palsanda, Mughiavant, Bordha, Saidivasan, Chhodwani and Rajuwant areas.

7.	Dolariya	22 ^{0} –21' to 22 ^{0}-51' N 73 ^{0} –32' to 74^{0}-48' E	Dolariya, Mithibor, Richh-vel, Marchi-pani, Lagami, Jamli dam, Vadhavan, Gadola, Dhadagam, Kidi-ghoghadev, Dhorkuva, Mal and Dun villages.
8.	Naswadi	22 ^{0}-00 to 22 ^{0}-15' N 73 ^{0} –30' to 74^{0}-27' E	Naswadi, Dhamsia, Khendra, Pipalvani, Khokara, Vadia, Chosalpur, Ganiabari, Kadada, Jitnagar and surroundings.

The fieldwork consisted of collection of plant specimens for herbarium, observation on the habit, habitat, phenology and distribution (both in area explored and the State of Gujarat), collection of ethnobotanical uses. Ethnobotanical studies or uses of plants were recorded for the study area and also a note has been given on its uses in other parts of Gujarat state along with the tribe using particular plant for having a comparative outlook on the traditional customs and varied systems of healing diseases opted by different tribal communities of the state. In the enumeration, plants have been divided into Dicots and Monocots. The enumeration of plants has been done according to Bentham and Hooker's system of classification. It also includes Nomenclature, phenology, Sanskrit and local names (as and when available), ethnobotanical uses and description of plants. An attempt has been made to provide artificial taxonomic key for the plant families and important vegetative characters for few plants that can serve as an identification manual. Also brief note has been provided on nomenclature of plants. For the additional information on ethnobotanical uses of the plant a key note has been given on the uses mentioned by other workers through secondary literatures. Photographic documentation of different aspects of vegetation, floristics, ethnology of tribals, NTFP collection and ethnobotany has also been done. Information regarding the ethnobotanical uses was collected from local tribal medicine men called "Kochariyo badavo", and also through personal interviews with elder persons and sometimes through personal observations. The different uses were cross-checked with the relevant published work on ethnobotany and medicinal plants. Details regarding socio-economic status were procured from secondary sources

and also by preparing a detailed questionnaire presented as appendix at the end of the thesis.

The secondary data regarding tribal population, NTFP and other details regarding the forest statistics were procured from the Forest Division Office, Chhota-udepur and Taluka Panchayat Office, Chhota-udepur.

The plant specimens collected were processed and preserved following the methods mentioned by Santapau (1955) and Jain and Rao (1977) with necessary modifications as and when required.

Plants were identified mainly with the aid of standard floras by., Hooker (1872-97); Cooke (1958 Repr. ed. and 1908); Brandis (1911); Santapau (1957, 1962 and 1967); Shah (1978); Bhandari (1990); Singh and Shetty (1991); Verma, Balakrishnan and Dixit (1993); Samvatsar (1996); Sharma et al., (1996); Mudgal, Khanna and Hajra (1997); Karthikeyan (1999); Singh et al., (2000.); Singh. (2001) and other relevant publications. The plant name as well as author's name have been verified according to Bennett (1971 and 1987); Jain (1991, 1999), Naqshi (1993) and other references (mention in bibliography) dealing with nomenclature and revision of individual taxa and group. The ethnobotanical uses were cross-checked with the help of publications of Jain (1991, 1999); Pal and Jain (1998) and Singh and Pandey (1998) along with the literatures available on ethnobotanical studies of Gujarat state. The details regarding the tribal life-style, culture and other aspects were collected from Tribal research center (Tejgadh, taluka-Chhota-udepur), Shroff foundation (Rangpur, Taluka Chhota-udepur, Range Rangpur), Tribal Musuem (Chhota-udepur) and local books published on the inhabitant tribal community. The identifications of plant specimens were confirmed by matching with the authentic specimens at the herbaria of the department of Botany, The M. S. University of Baroda; Botanical Survey of India, Arid Zone Circle, Jodhpur, Rajasthan and Forest Research Institute, Dehradun.