

# THE SEMSA : A POPULATION GENETICAL STUDY

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## INTRODUCTION

Like any other scientific discipline, physical anthropology has been undergoing changes since its inception. Initially, the physical anthropologists were mainly interested in taxonomic classifications of human population. They used mostly anthropometric and anthroposcopic techniques in classifying populations, and such types of researches continued till the middle of the present century.

With the advent of science of genetics, the physical anthropologists have become more interested in genetical study of human populations. They have been trying to understand the genetic basis of human variations and the various processes of microevolution. Kirk (1973) has very rightly pointed out that the main purpose of physical anthropology today is to understand the nature and extent of human variations at both micro and macro levels of evolution. Even before Kirk made this observation, Washburn (1953), Laughlin (1960) and some others have also suggested that the physical anthropologists should look into the biological variabilities in populations since such variabi-

lities are due to the cumulative effect of various evolutionary forces. So, since the middle of this century, the physical anthropologists have diverted their attentions to the study of the population genetics. Kirk (1978) is of the opinion that population genetics have become the backbone of physical anthropology in recent time. Long back Wright (1931) suggested that evolution of the present populations is referred to as the changes in gene frequencies in subsequent generations due to various evolutionary forces like selection, drift, mutation, etc.

After the recommendations, made by the scientific groups of the World Health Organization (1964, 1968), the physical anthropologists, all over the world, have become more interested in studying the small and isolated population groups from genetical points of view. Dobzhansky (1951) has referred to such small groups as 'Mendelian Populations', which mean that the members of such a population share a common gene pool. Keith (1950) has called such breeding isolated communities as 'evolutionary units', which, in contemporary world, may certainly reveal various important facts, regarding the mechanisms and processes of human evolution.

To study human populations, various models have been suggested. Wright (1943) has proposed the 'Island

Model' and 'Isolation by distance model' for studying populations. "In Island Model every population exchanges genes equally with every other and there is no effect of distance between populations" (Cavalli-Sforza and Bodmer, 1971), whereas under the model of Isolation by distance there are two ways of expressing the geographic variations in gene frequency. Cavalli-Sforza and Bodmer (1971) say, "One expression of the geographic variation is the variance between clusters in the discontinuous model, or between samples taken from different neighbouring locations in the continuous model" and "The other is the correlation between clusters or between samples at a given distance." However, in either case, formulae can be derived in terms of the kinship coefficient or variances in gene frequencies. Under the isolation by distance model, two types of theoretical suggestions can be made: i) a continuous one - in which population density is constant at any point (Wright, 1943), and ii) a discontinuous one - in which a population is clustered at the nodes of a lattice (Malecot, 1950). Both types exist in two versions: i) linear one, and ii) two dimensional one. For the linear one, there is approximately one dimensional distribution of population. For the two dimensional one, it is a representative of the more usual

population distributions found in the areas, where there are no barriers against dispersion in any direction. However, Kimura and Weiss (1964) have called the discontinuous one as "Stepping Stone Model". The stepping stone model can be represented in the form of one and two dimensional lattices. In the first one, a number of individuals should be same in each cluster and migration takes place equally in both directions, whereas in the second one each cluster contributes equally to every neighbouring cluster. However, Cavalli-Sforza and Bodmer (1971) are of the opinion that the stepping stone model is only a theoretical possibility. Since most of the tribal populations in India, specially in the North-Eastern region, are fully or partially isolated and are, therefore, liable to evolve, to some extent, independently. So, the island model is the best suited model to study such isolated populations. In the present study, we have essentially relied on the island model.

In the present study, we shall deal with the population genetics of the Semsá, which includes both genetic and demographic structures. Harrison and Boyce (1972) define genetic structure as "the way genes are organised into genotypes in human populations" and "the extent to which individuals share a common gene pool", which shows

"the degree of biological relatedness" among the members. They define demographic structure as "Patterns of fertility and mortality, emigration and immigration and the effects of these on age and sex composition". The relationship between genetic and demographic structures is very well known and needs no further elaboration.

As mentioned earlier, population genetical studies are gaining interest in physical anthropology, and studies on racial origin and history are no more at the centre-stage. Even the expert groups of the World Health Organisation (1964 and 1968) have suggested that population genetical research among the primitive communities of the world should be taken up urgently in the view of the fact that the culture of most of such groups is gradually disintegrating due to increasing contact with civilisation, and such disintegration will have far reaching biological consequences. Now the question is which population should be considered as "Primitive"? To our mind, the term "Primitive" is a relative one. So, it is better to consider the relatively isolated populations for such studies, since such populations, in the contemporary world, may reveal many important facts, concerning the mechanisms and processes of human evolution.

With this idea Roberts (1956) has published his article on the Dinka of southern Sudan. He has taken into consideration many demographic parameters with a view to finding out various evolutionary forces that are acting on this population and their magnitudes. Sutter (1963) has worked on the relationship between human population genetics and demography. Bonne (1963) has made an interesting study on demographic aspects of the Samaritans in order to estimate the effect of random drift for determining the biological characteristics of this small and isolated population. The most extensive and intensive work on population genetics has been carried out on the Xavante Indian by Neel et al. (1964). They have been taken into consideration not only all possible demographic parameters, but also anthropometry, blood groups, red cell enzymes, etc. to make out how the evolutionary forces are acting on this population. Kuchemann et al. (1967) have carried out a population genetic study, based on demographic parameters in a Oxfordshire village. They have suggested that evolutionary forces such as selection, mutation, drift and geneflow determine the genetic structure of a population through demographic parameters like population size, fertility, mortality and mating patterns. Neel (1967), while discussing on the genetic structure of primitive human population, has

suggested that differences in gene frequencies between small and even larger ethnic groups may be due to non-deterministic factors. Roberts (1967) has dealt with development of inbreeding in the population of Tristan da Cunha and suggested that inbreeding has developed in this island population due to its small size. Salzano et al. (1967) have made a further demographic-genetic study on the Xavante Indian of Brazil. Neel and Weiss (1975) have extensively used various demographic parameters to study the genetic structure of the Yanomama Indian of southern Venezuela and Northern Brazil whereas Chagnon (1975) has considered demographic, social and genetic parameters to understand the micro differentiations at both cultural and biological levels, that are taking place among them due to constant inter-village rivalries. Roberts and Bear (1980) studied the measures of genetic change in an evolving population. Barbujani and Sokal (1991a, b) have reported the association of cultural barriers with differences in gene frequencies among the Italian populations. O'Rourke et al. (1992) have studied the genetic variations in the Native Americans taking into consideration various blood group systems.

Fix and Lie-Injo (1975) have described the genetic micro differentiation in the Semai Senori of Malaysia

taking into consideration the genetic, demographic and cultural parameters. They have suggested that genetic micro differentiation among the Semai is due to founder effect. Perez-Diez and Salzano (1978) have studied the evolutionary implications of ethnography and demography among the Ayoreo Indians of southern Bolivia and northern Paraguay. On the basis of this study, they have suggested that though the historical evidence shows that there is a demographic stability among the Ayoreo Indians, their ecological adaptation and social organization indicate the existence of a high acculturation process among them with population disruption. They have also found that the index of opportunity for selection is highest, so far reported for many human populations.

Tripp-Reimer (1980) has made a historical-demographic-anthropological study on an urban Greek Community in Columbus (Ohio). He has suggested that the gene flow is the major evolutionary force, operating in this community.

Sanghvi et al. (1971) have studied the genetic distance among Australian aborigines whereby they attempted to apply the genetic analysis to find out the local and regional differentiations and to examine the distance values, obtained in relation to geographic separation and

linguistic differences. Fernando et al. (1974) have compared gene frequencies and anthropometric distance matrices among the four Indian tribes and proposed that the environmental factors are very important for influencing the phenotypes. Friedl and Ellis (1974) have studied inbreeding, isonomy and isolation in a Swiss community, where both ethnographic and demographic data have been combined to examine the genetic structure and its potential for the evolution of an isolate. Chakravarty et al. (1976) have studied genetic variability of the Chilean Indian populations and its association with geography, language and culture. In the same year, Reid (1976) has studied the effect of consanguineous marriages and inbreeding on couple fertility and offspring mortality in Sri Lanka. Swedlund et al. (1976) have made a population study in the Connecticut Valley, considering demographic evolution of human populations. Nurse et al. (1976) have undertaken a serogenetic study among the Dama of South-West Africa. It is found that the Dama have received very little genetic contribution from the other negroid populations like the Khoikhoi and Sam (Bushman). Salzano and Jacques (1979) have studied the four Brazilian Indians, taking into consideration demographic and genetic parameters. In analysing their data, they have made an attempt to relate the demo-

graphic findings with the genetic results with a view to understanding the microevolutionary processes. Ferak et al. (1980) have reported the genetic distances and migrations between four villages of a single region in Slovakia. Jorde (1980) has reviewed the genetic structures of subdivided human populations of Slovakia. Kobyliansky et al. (1982) have studied genetic similarities and differences among the Jewish populations of the world. Koertvelyessy (1983) has made a study on demography in the light of microevolution in a Hungarian settlement in Louisiana (U.S.A.). Douglas (1985) has examined the demographic structure and the changing opportunity for selection in a small, agricultural community in Central Pennsylvania and pointed out that both fertility and mortality components of the opportunity for selection tends to decrease in this population, and gene flow is more important component of evolution than selection in Halfmoon Township. Relethford (1986) has reported the effect of population size on marital migration distance. He has suggested that small populations draw mates from relatively local gene pools, whereas larger populations draw mates from relatively larger gene pools.

Relethford (1991) while working on Irish populations, has reported that a change in population size always leads to a new equilibrium, but the speed at which this new

equilibrium is reached, depends on migration and time depth, and a decline in population size in one generation always leads to an immediate increase in the degree of microdifferentiation. He (1991) has further observed to what extent genetic drift, local, migration and admixture may influence the demographic-genetic structures of the Irish populations. Williams (1993) has carried out a study on the origin and structure of the Icelanders, and explained the genetic differences from other northern European countries on the basis of Founder Principle.

In India, several studies have been carried out on population genetics, taking into considerations both demographic and biological parameters. Basu (1969) has made a population genetic study on the Pahira of Ajodhya and Dalma hills of eastern India. He has not only described the genetical and demographic characteristics of the population, but also adequately dealt with the problem of fission and fusion in this population. Das et al. (1982) have dealt with a population genetic study on two isolated mountain village populations of northern Sikkim. They have considered both demographic as well as genetic parameters in the study.

Ghosh (1970, 1972, 1973, 1976) and Ghosh et al.

(1977) have worked on the Kota of Nilgiri Hills. They have considered demographic, genetic and morphological traits to explain the population structure of the Kota in terms of 'Founder Principle'. Malhotra (1978) has made a very interesting study on four groups of the Nandiwalla of Maharashtra. He has based his study on demographic, genetic, dermatoglyphics and some morphological characters. With these data he has shown the intensity of natural selection and the founder effect on these four Mendelian populations. Deka (1980) has reported selection potential among the Sonowal Cachari of Upper Assam. Mukhopadhyay (1981) has made a comparative microdemographic study on two occupationally distinguished caste communities of Balaramchak and Bamanchak in the Midnapore district, West Bengal. He has extensively used various demographic parameters in order to assess the selection pressure on these populations. Basu et al. (1980) have reported the demographic structure of a very small population of Mirpur of Midnapore district, West Bengal and discussed about the possible relationship between high fertility, malnutrition and high parasitic loads. They have also made an attempt to assess the magnitude of selection and drift in this population. Barua (1982) has reported the demographic structure of the Hajong of West Garo Hills, Meghalaya and has suggested that in this population, selection is acting

moderately. Sirajuddin and Basu (1984) have discussed the population structure of the Chenchu of Andhra Pradesh. In this connection, one may recall the work of Sirajuddin (1993) on the Chenchu. He has comprehensively dealt with demographic, morphological and genetical parameters in this population and applied various statistical methods with a view to assessing the phylogenetic relationship of the Chenchu with other populations. Das (1985) has reported the fertility and mortality among the Khamyang and Turung populations of Jorhat district of Assam. Deka (1989) has reported that among the Jaintia of Sa-Phai village in Meghalaya, fertility is high and infant mortality low, but selection acts with moderate intensity. Guha and Mukherjee (1990) have discussed the influences of cultural tradition and social movement on the genetic structure of the Boro Kachari population of Upper Assam. Khongsdier (1990) has also reported selection intensity among the Pnar of Sutnga and Moopala village. Khongsdier (1993) has reported fertility differentials among the various religious groups in the War Khasi of Meghalaya. Sirajuddin et al. (1994) has extensively discussed on population structure of the Chenchu and other south Indian tribal groups. They have tried to find out the relationship between genetic, anthropometric, dermatoglyphics, geographic and linguistic

distances. Singh (1994) have worked out on Bathudi and Sounti tribes of Orissa. He has studied demographic, morphometric and genetic characters in these two populations and has made an extensive comparison with other populations. He has also dealt with the fission and fusion problem as well as the nature of migration in these two populations to explain their demographic-genetic structures. Das et al. (1985a, 1985b, 1986a, 1986b, 1986c) and Heidi Danker-Hopfe et al. (1988) have made some important studies on five mongoloid population groups, six Muslim population groups, three Brahmin groups, five regional groups of the Kalita and four caste groups (Jogis, Hiras, Kumars and Koibratas) of Assam. They have mostly dealt with anthropometric, anthroposcopic and dermatoglyphic traits as well as some genetic markers to show genetic distances among these populations.

Recently, Khongsdier and Ghosh (1996) have suggested, on the basis of a population genetic study among the War Khasi of Meghalaya, that the demographic structure of a population should be taken into consideration before making any population genetical study since many of the populations in this country are not, in general sense, "Mendelian Populations;" but comprising of several demes. Sengupta and

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Kalita (1996) have reported intensity of selection among the Sonowal of Assam. Buzurbaruah and Rizvi (1996) have made a biodemographic study among the Garia's of Assam.

We have never tried to make here any exhaustive review of the work so far done on population genetics on Indian and non-Indian populations. We are aware of the fact that we must have certainly missed out many papers. Our main purpose is to show the trend and development of researches in human population genetics.

It is also true that long before the people started working on intensive population genetic studies, taking into consideration the demographic parameters, many researchers, all over the world, did population genetical studies with limited number of genetical, morphological and behavioural traits, and even today plenty of such studies are regularly being carried out in all countries. Very recently Bhasin, Walter and Danker-Hopfe (1992) have compiled all data on genetic, morphological and behavioural traits, published upto 1991, on the populations of India, Pakistan, Bangladesh, Bhutan, Sri Lanka, Nepal and Maldive Islands. So, we shall not venture to deal with such studies, so far carried out in India, separately. However, it may be pointed out here that no thorough population

genetic study, taking into consideration demographic, genetic, dermatoglyphic, anthropometric and anthroposcopic data, on any population of North-East India has so far been carried out.

1972) With this end in view, we propose to undertake a population genetic study on a small-isolated population known as the Semsá, which is confined only in one village, known as 'Semkhor' in the North Cachar Hills District of Assam with the following objectives:

1. To describe the demographic structure and mating patterns of the Semsá;
2. To describe the genetic composition of the population;
3. To find out how the evolutionary forces like selection, drift, etc. are acting on this population;
4. Finally, to compare the present findings with those existing on other populations, particularly with those reported for the populations of Assam and Meghalaya.

here) The United Mikir and North Cachar Hills District, was created within Assam on 17th November, 1951, with some parts of Nowgong, Sibsagar, Cachar and United Khasi and

Jaintia Hills Districts with a total area of 5,883 square miles (15,237 square kilometres). It was comprising two subdivisions namely, Mikir Hills and North Cachar Hills (District Handbook of United Mikir and North Cachar Hills, 1972).

On 2nd February, 1970, these two subdivisions formed two separate districts - Karbi Anglong and North Cachar Hills. According to the 1972 Statistical Handbook, the North Cachar Hills District covers 4,890 square kilometres. Haflong is the district headquarters of the North Cachar Hills District. This district is bounded on the West by Meghalaya state and a part of the Karbi Anglong district, on the east by Nagaland and Manipur and a part of the Karbi Anglong district, on the north by the Nowgong district and on the south by the Cachar district. (Fig. 1).

The North Cachar Hills region is constituted with the eastern flanks of the Jaintia Hills and the northern flanks of the Barail range. The hills of this region are steeper, more rocky and rugged. There are of course gentle slopes towards Lumding. Some small tracts of plains lie here and there between the ridges.

Physiographically, the district can be divided into three main divisions - (a) the low lying areas, i.e., the

# LOCATION OF SEMKHOR VILLAGE IN NORTH CACHAR HILLS DISTRICT.

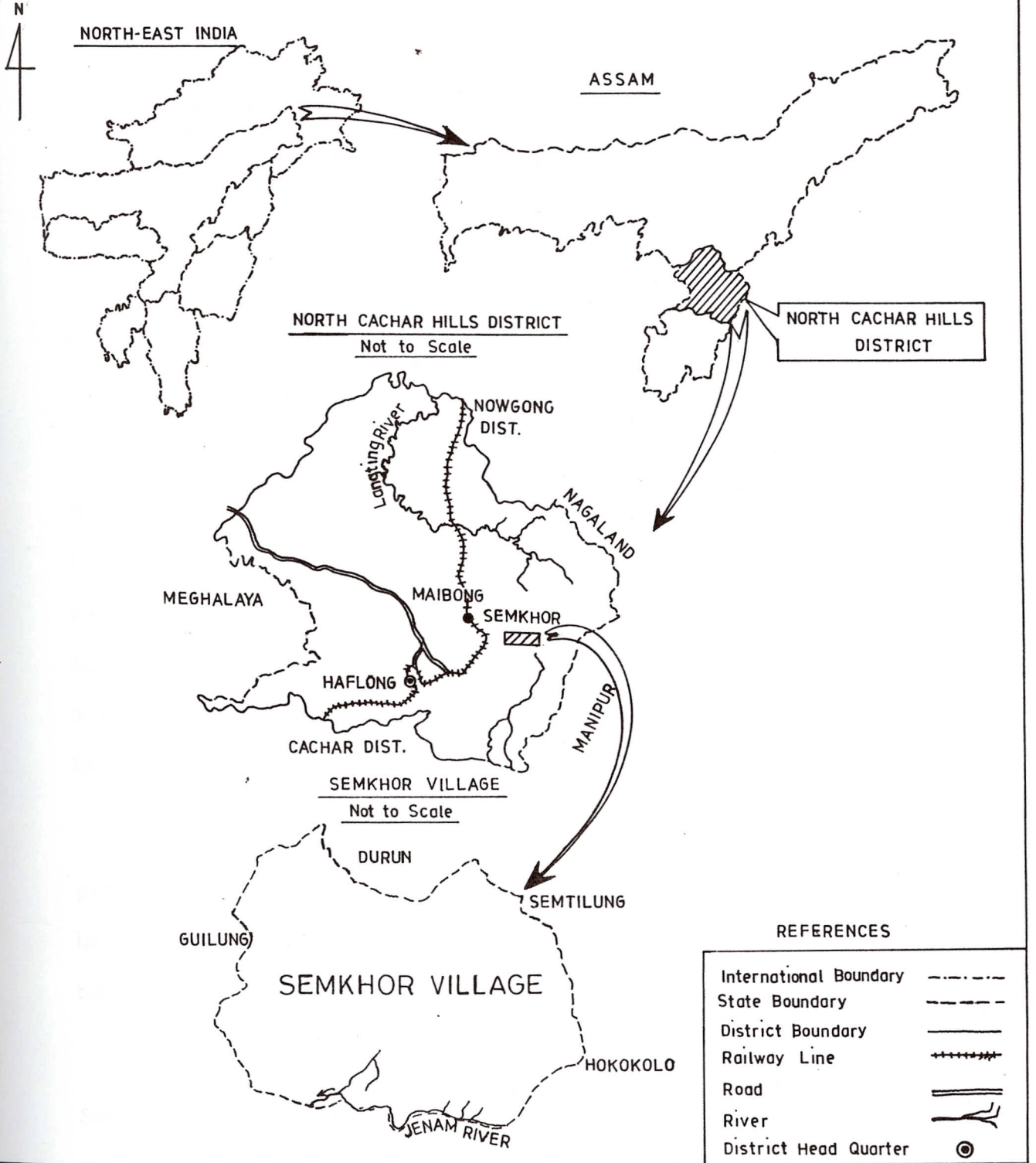


FIG. No. 1

valleys of the rivers namely, Diyung, Langting, Mahur and Jatinga, (b) the high hills of the Barail range covering the eastern and southern positions. The highest peak of this range is Hemptenpet, a plateau of Gungung Khorongma and Garampani areas with an average height of 762 m, (c) the plateau of Gungung Khorongma and Garampani areas with an average height of 762 m. (Statistical Handbook, North Cachar Hills District, 1976).

The main rivers of the area are Diyung and Jatinga. The soil in the district vary from sandy loam to clayey loam in texture, usually acidic in reaction, somewhat deficit in potash, but rich in Nitrogen and organic matters. Owing to porosity of soil in most of the hill areas, the capacity to retain water is less. (Statistical Handbook, North Cachar Hills District, 1976).

The climatic condition of the district differs from place to place. The district falls within the temperate heat zone. During summer atmosphere becomes very sultry being near to the Tropic of Cancer.

Rainfall is very heavy during the months from May to September but is not evenly distributed throughout the district. The average mean maximum temperature is 27°C

(80'60°F) and the mean minimum temperature is 17'2°C (62'96°F). The annual rainfall ranges from 1424 to 2160 millimeters (District Handbook of United Mikir and North Cachar Hills, 1972).

Topographically the North Cachar Hills District has a blend of hills and plains. As such the varying climatic atmosphere in the district is associated with a variety of flora and fauna. (District Handbook of United Mikir and North Cachar Hills, 1972).

Sufficient rainfall has helped tropical vegetation to grow abundantly throughout the district. The forest is chiefly of miscellaneous type. A greater part of the hilly region of the district abounds in various types of bamboo and tall grass. (Statistical Handbook, North Cachar Hills District, 1976).

The reserve forest area of the district is 63,333 hectares. The main forest reserves are (1) Langting Mupa, (2) Khurungming, and (3) Barail part. In addition to the area under reserved forests, the tract bears an extensive area of unclassified state forests.

## Flora and Fauna

The important flora of the district are sam (Artocarpus chaplasha), sonaru (Cassia fistula), amari (Amoora wallichii), champa (Michelia champaca), gonseroi (Cinnamomum cecicodaphne), peepal (Ficus) etc.

The district was the original home of the famous one horned rhinos (Rhinocerus unicornis). Wild animals like elephant (Elephas india), tiger (Felis tigris), deer (Cervus), bear (Ursus), buffalo (Syncerus), leopard (Felis pardus), monkey (Macaca), flying fox (Galeopithecus), black buck (Antilope cervicapra), wild pig (Sus) are found in the district. Various types of reptiles and birds are seen. Jatinga, a place in the North Cachar Hills District, is famous since it is known that many birds come from different parts of the world to commit suicide there.

## General populations of the district

The Dimasa is the major population of North Cachar Hills District. Besides, there are numerous other small groups of tribal population, residing in different pockets in this district. The Zemi Naga, Kuki, Hmar, Khasi and Jaintia, Mizo, etc. are found here.

The present study has been carried out among the Samsa of Semkhor village in the North Cachar Hills District of Assam.

### The Semkhor Village

The Semkhor village (Fig. 1) is situated in the hills of Barail range. It covers an area of 406 hectares and lies between  $93^{\circ}15'E$  and  $93^{\circ}22'6"E$  latitude and  $25^{\circ}20'N$  and  $25^{\circ}15'27"N$  longitude. The village is bounded by hills and rivers from all sides. The main rivers of the village is the Langting, which has many tributaries, such as Seling, Phara, Wami, Samphari, Sakroma, Laikrima, Dimbram etc. (District Handbook of United Mikir and North Cachar Hills, 1972).

In this village there were five saline pits (Semdi-khor), but at present there are only three in usable condition. The name of village has been derived from these natural saline pits. It happens to be one of the oldest villages in the district (Danda and Ghatak, 1985).

It is said that the people from nearer villages came to the Semkhor and settled there. There is another view that a section of the Dimasa people took shelter in this village during the Cachari King's encounter with the Ahom (Danda and Ghatak, 1985). However, this village is bounded by hills on all sides, and consequently the inhabitants of the village still maintain a relative cultural isolation. The population of this village are called as Semsas, after the name of the village Semkhor.

### The Semsá

The Semsá is an off-shoot of the Dimasa. This population is restricted only in the Semkhor village, as mentioned earlier. They have been maintaining their cultural isolation for more than two hundred years (Danda and Ghatak, 1985). The Semsá are still having traditional cultural traits, including the language of the Dimasa tribe. Marriage rule among the Semsá is strictly guided by the principle of double descent system. As well they strictly follow village endogamy. Initially there were seven patrilineal clans among the Semsá. But at present they are having only five patrilineal clans. Danda and Ghatak (1985) have mentioned that at present, the Semsá of Semkhor village still have 16 matrilineal clans. At the time of marriage a man is not allowed to take a bride from his own patrilineal clan and it is also a rule that a man should not marry a girl, who belongs to the same matrilineal clan (Danda and Ghatak, 1985). However, cross-cousin marriage, though not being practised, is not prohibited among the Semsá. But they are very particular about maintaining the village endogamy. No one is supposed to marry outside the village. Sometime in the past a stray instance of marriage between a Semsá boy and a Dimasa girl took place. But the boy was forced to leave the Semkhor village, and he is no more considered as a Semsá.

Ghosh and Dasgupta (1991) are of the opinion that in order to safeguard the ecological advantage (the use of saline pits) the Semsas gave up all relations with their parental group i.e., the Dimasas. The Semsas also have no culture contact with any of the surrounding populations like Zemi Naga, Hmar and others for about last two hundred years. Whatever it may be, the Semsas of Semkhor village is an isolated population, having no contact, till today, with other populations including the Dimasas.

The occupation of the Semsas is mostly shifting and settled cultivation. However, they also earn their livelihood through various types of activities like weaving, basket making, rearing of domestic animals, etc. The Semsas are largely dependent on forest for their survival.

The Semsas do not distinguish between man and woman labour. To them no work is superior or inferior. Both sexes take equal responsibility in productive system, and there is no differential treatment in terms of payment between males and females.

The entire community forest among the Semsas is divided among the different patrilines, and the Semsas are aware of the fact that which part of the village belongs to which clan.

vill The Semsas food habit is very simple and that is why they need very little things to buy from the market. So, the Semsas do not feel the need to produce more than what they require. They are primarily rice eaters. They usually take food thrice in a day i.e., in the morning, mid-day and evening.

The Semsas are also fond of taking meat, particularly buffalo meat. Rice beer is also their favourite drink. The literacy level among the Semsas is very poor. It is true that the village has a primary school, but rarely any student attends that school. To the Semsas, the formal education appears meaningless.

In the Semkhor village, there is no medical facility. For medical treatment, they have to go to Maibang hospital, which is almost 30 Km away from Semkhor village. The Semsas people hardly visit the hospital. However, generally the health condition of the people is not good. (Danda and Ghatak, 1985).

According to the District Handbook of the United Mikir and North Cachar Hills District, there were 118 households in the Semkhor village with a total population of 558 souls, of which 297 were males and 261 females. Danda and Ghatak (1985) have reported that the Semkhor

village consists of 187 households with a total population of 692 of which 336 are males and 356 females.

With this brief introduction we shall present our findings on the Semsu in the subsequent chapters.

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CHAPTER II

## SUMMARY

Since the middle of the present century, the physical anthropologists have been changing their emphasis from taxonomic research to population genetic research. Consequently, micro-evolutionary studies in physical anthropology are gaining interest with a view to finding out the impact of various natural forces like selection, drift, etc. on human populations.

The scientific groups of World Health Organisation (1964, 1968) have suggested that there is an urgent need to study the culturally isolated population groups since most of these groups are constantly under the threat of cultural disintegration owing to constant contact with more advanced societies. They have further suggested that such changes will have far reaching biological consequences.

Keith (1950) has referred to such isolated group as "evolutionary units" since the genetic endowment of man has been shaped by the action of various evolutionary forces at this cultural level. So, a study of such small culturally isolated groups may reveal various important facts, regarding the mechanisms and processes of human evolution.

With this end in view we have undertaken a study on the Semsā of Semkhor village in the North Cachar Hills district of Assam. The purposes of the present study are as follows:

1. To describe the demographic and genetic structure of the population ;
2. To find out the effects of evolutionary forces, acting on it;
3. To assess its relationship with other neighbouring mongoloid populations.

The Semsā is a small culturally isolated population, restricted in one village, known as Semkhor. Danda and Ghatak (1985) have suggested that though the Semsā is an offshoot of the Dimasa, they have been maintaining their cultural isolation for more than two hundred years.

Regarding the origin of the Semsā, there are two different versions:

1. Some of the Dimasa people from the nearby village came to Semkhor and by accident of their luck, they came across five saline pits and finally settled there.

2. A section of the Dimasa people took shelter in this village during the Cachari King's encounter with the Ahom King and finally settled there.

Ghosh and Dasgupta (1991), however, have suggested that the Semsá people gave up all their relations with their parental group i.e., the Dimasa, in order to protect their ecological interest. They never wanted to share those saline pits with any other person and that eventually led to complete fission.

Whatever may be the reasons for the Semsá to get themselves separated from their parental group Dimasa, it is true that at present the Semsá is a culturally isolated endogamous group, restricted in a single village.

The marriage rule among the Semsá is strictly guided by the principle of double descent system and village endogamy (Danda and Ghatak, 1985). Among the Semsá, initially, they had seven patrilineal clans but now they are having only five patrilineal clans, along with sixteen matrilineal clans.

The Semsá, though having no marital relation with the Dimasa, are still having traditional cultural traits of the Dimasa tribe, including the language, which belongs to the Tibeto-Burman linguistic family (Danda, 1978).

The Semsá people mostly practise shifting and settled cultivation. They also earn their livelihood through various types of other activities like weaving, basket making, etc. In fact, the Semsá are largely dependent on forest for their survival.

As per the classification of populations by Perez-Diez and Salzano (1978), the Semsá belong to the stage B, which is represented by more advanced agriculturalists and fishers.

The structure of any population in stage B could be better described by using the 'island model' of Wright (1943). So in the present study we have relied on Wright's island model.

The findings of the present study may be briefly summarized as follows:

1. According to the Sunberg's classification of population, the Semsá is of progressive type.
2. It is seen that nearly 20.41% of males and 19.33% of females belong to the age group 0-14 years whereas about 24.70% of males and 26.13% of females belong to the reproductive age group 15-49 years. In the post-reproductive age

group, i.e., 50+ years, 4.77% and 4.65% are males and females respectively.

3. The sex ratio among the Semsas is found to be 1:1.005. It shows that the number of females is slightly more than that of males. However, the sex ratio is very near to the ideal sex ratio of 1:1.
4. It is found that in the prereproductive age group i.e., 0-14 years, the sex-ratio is 1:0.95, which means that the number of males is slightly more than that of females. But in the reproductive age group (i.e., 15-49 years), the sex ratio (1:1.06) is tilted in favour of females, whereas in the post reproductive age group (i.e., 50+ years), the sex ratio (1:0.98) is again tilted in favour of males. It shows that the average longevity is slightly higher in males than in females.
5. The population pyramid shows the distribution of population by age groups. It depicts that in recent time, the base is quite shrunken. It may be due to the high infant mortality rate since the Semsas, till today, have not adopted any family planning method.

6. The mean age at marriage for males and females is found to be  $22.11 \pm 0.18$  years and  $18.42 \pm 0.17$  years, respectively.
7. The mean age at first child birth in the case of females is  $20.58 \pm 0.24$  years and that in the case of males  $24.59 \pm 0.29$  years. So, the mean age at first child birth, taking both males and females together, is 22.59 years.
8. Following the method, suggested by Glass (1956), we have taken 23 years as a generation length for the Semsā.
9. It is found that the frequency of multiple marriages in the third generation i.e., upto 23 years, is 5.56% for males and 2.94% for females, whereas in the second generation (i.e., 24-46 years), 12.29% of males and 8.77% of females have married more than once. In the first generation i.e., 47 + years, 19.23% of males and 20% of females have married more than once. So it shows that males have greater tendency to change their mates than their female counterparts.
10. The completed fertility size in the Semsā is found to be 7.52. The average number of surviving offspring per mother, aged 45 + years, is 4.76.
11. The child-woman ratio in the Semsā is found to be 50.23.

12. The overall average number of livebirths per mother is found to be 4.28.
13. It is found that the age-specific fertility rate in the Samsa increases from 0.3939 for the mothers, aged 15-19 years, to 1.3206 for the mothers, aged 30-34 years. Thereafter, it decreases from 1.0374 in the age group 35-39 years to 0.1228 in the age group 45 + years. The total fertility rate (TFR) is 6.0293, which is fairly high.
14. The overall child mortality rate (i.e., those who died before 15 years of age) is found to be 31.60% : 7.55% of the offspring died before completing one year, 13.09% of them died between 1 and 4 years, 8.96% of them died between 5 and 9 years and 2% of them died between 10 and 14 years. Probably this is the reason for the shrinking of the population base.
15. Among the Samsa, it is found that 3.52% of all marriages are consanguineous. Of these marriages, there is one case of marriage between half first cousins, three cases between first cousins, two cases between second cousins, two cases between second cousin once removed and one case between fourth cousins. The average coefficient of inbreeding (F) in this population is found to be 0.0296166.

16. Among the Samsa, the breeding size, effective population size, coefficient of breeding isolation and variance due to drift have been calculated on the basis of all these demographic information.
- 16(a). It is found that out of total population of 838 individuals, only 316 males (i.e., 37.71%) of them actually constitute the breeding size.
- 16(b). The effective population size is 205. It means that 24.46% of the total population, or 64.87% of the breeding size, constitute the effective population size.
- 16(c). It is found that among the Samsa there is no case of admixture with any other population. Consequently, the admixture rate has become zero.
- 16(d). According to Wright (1938, 1940, 1943) the differentiation due to drift depends upon the product of effective population size and the migration rate ( $Nem$ , where  $N_e$  = effective population size and  $m$  = migration). Among the Samsa, it is found that the coefficient of breeding isolation is zero. It indicates that changes due to genetic drift is very great.
- 16(e). According to the formula given by Wright (1940), the variance due to random genetic drift per

generation is found to be 0.0006098 with an initial gene frequency of 0.05.

17. Selection is one of the most powerful evolutionary forces, which brings about changes in the genetic make up of the population. The total selection intensity in the Samsa has been estimated by using the formula of Crow (1958) as well as the modified formula of Johnston and Kensinger (1971).
- 18(a). According to Crow's formula the total selection intensity ( $I$ ) is 0.6165 and its fertility component ( $I_f$ ) and mortality component ( $I_m$ ) are 0.0984 and 0.4717 respectively. So it shows that selection is operating more through differential mortality than through differential fertility. However, selection acts with moderate intensity, taking into consideration the range for Indian populations (Reddy and Chopra, 1990).
- 18(b). According to the Johnston and Kensinger's modified formula, the total selection intensity ( $I$ ) is 0.6779. Its fertility and mortality components ( $I_f$  and  $I_m$ ) are the same as found earlier. But its embryonic component ( $I_{me}$ ) is 0.0380. However, it still shows the selection is acting moderately on this population.

### Anthropometry

1. Altogether 13 anthropometric measurements have been taken on the adult Semsas males, aged between 21 years and 63 years. The detailed results of all these measurements and the indices have been given in the Chapter IV. On the basis of these anthropometric measurements, it is found that the Semsas males are generally short statured people with dolicocephalic head and mesorhine nose. They are medium chested with medium to very broad face.
2. On the basis of 8, out of 13 anthropometric measurements, the distances among the populations have been calculated, according to the method suggested by Rao (1952). It is found that the Semsas stand quite apart from the Dimasas and other tribes, though they come little closer to the three Khasi subgroups, namely, Khyntiam, War and Pnar.

### Genetic markers

In the present study, we have used four genetic markers viz., ABO and Rh blood groups, PTC-taste blindness and colour blindness.

1. It is found that in the Semsas the frequencies of A, B,

AB and O blood groups are 21.70%, 27.36%, 4.72% and 46.23%, respectively. The gene frequencies of p, q and r are 0.1424, 0.1760 and 0.6816 respectively. Both  $D/\delta$  and  $\chi^2$  values indicate that this population is in equilibrium.

2. The frequencies of  $Rh^+$  and  $Rh^-$  individuals among the Sema are 99.06% and 0.94% respectively. The frequencies of D and d genes are 0.9030 and 0.0970 respectively. The  $\chi^2$  value indicates that this population is in equilibrium.
3. The frequencies of tasters and non-tasters in this population are found to be 65.38% and 34.62% respectively. The frequencies of T and t genes are 0.412 and 0.588 respectively. The  $\chi^2$  value indicates that the population is in equilibrium.
4. It is found that nearly 7.56% of all males are colour blind. Of all the colour blind individuals, 55.56% are protan, 33.33% deutan and 11.11% total colour blind. The frequency of colour blind gene among the Sema males is 0.0756.
5. It is found that on the basis of ABO blood groups, about 42.47% of all matings are incompatible, which indicates the important role of selection in this population.

6. Since the frequency of  $Rh^-$  gene is less than 1%, incompatible matings in respect of Rh system, is insignificant in this population.
7. As per suggestion of Glass (1956) the intergeneration differences, in respect of both ABO blood groups and PTC taste blindness, have been worked out among the Samsa. It is found that there is no significant difference between generations. Under such circumstances, Glass (1956) has suggested that drift in a given population might have occurred more than three generations ago. It may, however, be noted that Roberts (1965) and Basu (1969) have contradicted the Glass's method, suggesting that any significant difference between any two generations cannot be attributed to drift alone. Other evolutionary forces should also be taken into consideration, while interpreting such variations between generations. Following Roberts' method (1965), as done by Basu (1969), it is found that in the Samsa the observed variations, excepting in case of between I and II generations in which difference is more than twice standard deviation, may be due to the operation of genetic drift. So, the action of drift in the Samsa cannot be ruled out.
8. Taking into consideration the three traits i.e., ABO

and Rh blood groups and PTC taste blindness, the Semsas have been compared with 8 other mongoloid populations of Assam and Meghalaya. The dendrogram, drawn according to the method of Sokal and Sneath (1963), shows that the Semsas come nearer to the Lalung and Koch, but stand quite apart from the Khasi, Garo and others.

9. Taking only ABO and Rh blood groups into consideration, the findings among the Semsas have been compared with those for the 9 mongoloid populations of Assam and Meghalaya. The dendrogram shows that the Semsas come closer to the Khamyang, Lalung, Chutia, Koch, Ahom and Mikir, but they stand apart from the Garo and Khasi.
10. It may be noted that with the exception of ABO blood groups no data are available for the Dimasas. In respect of ABO blood groups, it is found that the Semsas differ significantly from the Dimasas.

### Dermatoglyphics

1. Combining both hands together, it is found that the frequencies of loop, whorl and arch are 56.05%, 36.15% and 7.80% in males and 52.06%, 40.50% and 7.44% in females respectively.

2. In the Semsá the Furuhata's index, Dankmeijer's index and pattern intensity index are found to be 64.51, 21.58, 12.84 in males and 77.83, 18.35, 13.31 in females, respectively.
3. Combining both hands together, it is found that the frequencies of the mainline formulae 11-9-7, 9-7-5 and 7-5-5 are 18.64%, 13.87%, 17.58% in males and 15.38%, 29.49%, 21.79% in females respectively.
4. The axial triradius 't' is found to occur in the highest frequency on both hands of both sexes. It is followed by t', t" and tt". It is seen that tt" is absent in females.
5. The occurrence of ulnar termination of 'c' line is most common on both hands of both sexes.
6. The mean atd angle on right and left hands of males is  $41.11 \pm 0.43$  and  $41.08 \pm 0.51$  respectively and that in the case of females  $44.49 \pm 0.86$  and  $44.26 \pm 0.93$  respectively.
7. Combining both sexes together, the genetic distance matrix, calculated according to the method proposed by Sanghvi (1953), shows that the Semsá stand closer to the Mikir, Mishing and Rabha, but the Semsá stand apart from the Moran and Deuri and the other popula-

tions come in between. The dendrogram, drawn by the method of Sokal and Sneath (1963), shows that the Ahom, Khamyang, War, Pnar and Khyntiam come closer to the Semsas, whereas the Semsas stand separated from all other populations.

### Morphological and Behavioural Traits

#### Arm-folding

1. The frequencies of L>R and R>L among the Semsas are found to be 51.30% and 48.70% respectively.
2. There is no significant difference, in respect of this morphological trait, between generations.

#### Hand-Clasping

1. It is found that the frequencies of L>R and R>L are 46.10% and 53.90% respectively among the Semsas.
2. It is seen that there is no significant difference, in respect of hand clasping, between generations.

#### Ear-lobe

1. It is found that among the Semsas the frequency of free ear-lobe is 63.64% and that of attached ear-lobe 36.36%.
2. It is further observed that there is no significant difference, in respect of this morphological trait, between generations.

### Tonge-rolling

1. It is found that among the Semsas 58.44% of all individuals can roll their tongues, whereas 41.56% cannot do so.
2. It is observed that there is no significant difference between generations.

### Mid-phalangeal hair

1. The frequencies of affected and non-affected individuals with mid-phalangeal hair are 20.13% and 79.87% respectively.
2. It is seen that there is no significant difference between generations in respect of this morphological trait.

On the basis of all these morphological traits, it is found that the Semsas, by and large, differ from all other neighbouring mongoloid populations.

In the present study, we have described the population genetic structure of the Semsas of Semkhor village, taking into consideration the demographic parameters, anthropometric characters, genetic markers, dermatoglyphics, morphological and behavioural traits. It is found that the Semsas do not resemble any of the mongoloid populations of Assam and Meghalaya. Interestingly, the Semsas do

not show any resemblance with the Dimasa, though the Semsas is thought to be an offshoot of the Dimasa.

Now questions are (i) how has the genetic structure of the Semsas been shaped? and (ii) why don't the Semsas show any resemblance with the Dimasa, in spite of the fact that the Semsas is an offshoot of the Dimasa?

To answer these two questions, we can reasonably presume that a group of Dimasa people, which initially settled in the Semkhor village, just could not be taken as a random sample of the then larger Dimasa population. Consequently, it can be well presumed that the initial settlers of Semkhor village might not have carried all genes with them in the same proportions that might have been present in the then Dimasa. So there is a possibility that the present day Semsas have been carrying those genes, by and large, in those proportions, which were present among the original splinter group, settled in Semkhor village. But if there is any change in those proportions, which might have occurred over the years, it might be mostly due to the effects of genetic drift and selection and due to non-random mating at village level as well as at consanguineous level. The reason is that for last two hundred years the Semsas have been living in isolation and

have not contracted any marriage with any other population, not even with the Dimasa. So the present genetic structure of the Semsas can only be explained in the light of the Founder Principle (Mayr, 1963). Finally, we suggest that the population genetic structure of the present day Semsas must have evolved from the genetic structure of the original splinter group.

In the present study, we have used a very limited number of markers through which we have tried to assess the genetic relationship of the Semsas with the other neighbouring mongoloid populations, particularly with the Dimasa. We have seen that with such limited traits it is extremely difficult to find out the exact phylogenetic relationship of the Semsas with the other populations. To examine any genetic relationship between and among populations, one needs to have sufficient infrastructural facilities to collect data on various genetic markers like red cell enzymes, serum protein, haemoglobin, etc., besides data on serological systems. Unfortunately, we don't have such infrastructural facilities at present. When such facilities will be made available, we shall be in a better position to examine further this problem of phylogenetic relationship. In fine, with our limited data on the Semsas we may say that the Semsas is a separate endogamous group, which has formed

a genetic isolate since they, till today, are not having any relationship with the Dimasa or any other neighbouring populations. The present genetic structure of the Semsas must have been shaped due to the effect of founder principle along with other evolutionary forces like selection, etc.

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