ETHNOZOOLOGICAL STUDY OF NYISHI, MONPA AND APATANI TRIBES OF ARUNACHAL PRADESH

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DECLARATION

I, Pavitra Chutia, hereby declare that the subject matter of this thesis entitled **"Ethnozoological Study of Nyishi, Monpa and Apatani Tribes of Arunachal Pradesh"** is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University or institute.

This is being submitted to the North-Eastern Hill University, Shillong for the award of the degree of Doctor of Philosophy in Environmental Science.

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PREFACE

The work recorded in this thesis is the outcome of the study undertaken during 2002-2005 on "*Ethnozoological study of Nyishi, Monpa and Apatani tribes of Arunachal Pradesh*". The Arunachal Pradesh (83,743 km^2) is located between latitude 26°28′ to 29°30′ N and longitude 91°51′ to 97°30′ E. The topography of the area is undulating with hilly terrain. The vegetation of the area varies from tropical to alpine with evergreen and conifers pine forests.

The thesis explains the manner and technique of extraction of different animal resources with special reference to birds and mammals, their utilization in various socio-cultural, magical and religious ceremonies and in traditional medicine system being practiced by different tribal groups in the state. Rate of the disappearance of animals, hence the loss of faunal diversity during the study period is recorded in the thesis.

The data pertaining to following aspects are included in this thesis:

(a) Inventory of animal categories being used by different tribes

(b) Mode of extraction of different animal categories

(c) Frequency of extraction of animals

(d) Purpose and mode of use of animals

The thesis begins with the General Introduction followed by Review of Literature and description the Study area. Extraction of animals and its impacts on biodiversity, animals used in therapeutics, socio-cultural, magical and religious practices have been described in following chapters. The results of the entire study have been synthesized and discussed in an integrated manner under General Discussion followed by Summary of the work. The thesis ends with the list of literature cited presented in References.

The results obtained during this study have been analyzed and the inferences drawn in relation to the various animal groups are discussed. Some conservational strategies are also proposed for the protection of threatened categories of animals.

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CHAPTER 1

GENERAL INTRODUCTION

Ethnozoology is a discipline that deals with the animals and their uses through the indigenous knowledge system by the ethnic groups that has inherited in their culture. In other words, the traditional knowledge and customs of the people are based on the animals (Burchifield 1972). Different authors have defined ethnozoology differently. Jamir and Lal (2004) have defined it as a science that deals with role of commercially important animals in life and socio-cultural aspects of tribal people. Martin (1995) has defined it as 'the local knowledge and use of animals'. It has relation with the other branches of science like ethnobotany, anthropology, linguistics, agriculture, archaeology, ecology, and geography and helps in understanding the cultural and biological factors that has been associated with the development of relationship and dependence of indigenous people on animals (Anon 1994a). Thus, the ethnozoology highlights the utility of animals and animal parts as food, pet, medicine, decorative items or ornaments, their role in cultural activities, rights and rituals, taboos, myths, beliefs and faiths, and other cultural relations coupled with them. Early human societies recognized the role of wildlife in human survival. For instance, the Stone Age had rock paintings depicting hunting scenes and the species important for food and other uses. Wildlife had been a great contributor since ages to human welfare not only to primitive hunter-gatherer societies but also to the modern ones. Wild species of animals and plants have been the source of food, medicine,

construction material, fuel and other products. Thus, the survival of wildlife and people are closely linked. Socio-economic conditions of ethnic groups are often dependent on good management of wildlife and other natural resources as well as the survival of many animal species on better understanding of use and their management (Bennett and Robinson 2000).

The animal population has been severely affected by the current extinction crisis and around a quarter of existing species is considered under the threatened categories with extinction (Hilton-Taylor 2000). The ecological processes in nature create the situation in which some species are prevented to grow and some others are encouraged to multiply faster. These may help to predict future growth pattern of species and their population and decide the degree of conservation efforts to be initiated for the species on priority. The underlying causes that are leading to the decline of animal species in recent times are the growth of human population and other associated factors such as habitat loss, hunting, and the rate of invasion by exotic species, etc. These activities vary in intensity across the surface of the earth. The species that inhabit in more heavily impacted regions are expected to have higher risk of extinction (Forester and Machilis 1996; Woodroffe 2000; Brashares *et al.* 2001; Harcourt and Parks 2001; Harcourt *et al.* 2001; McKinney 2001; Ceballos and Ehrlich 2002; Parks and Harcourt 2002 and Cardillo *et al.* 2004). The category and the degree of threat decide the rate of extinction of species and the biology of species determines how well it is equipped to withstand the threats. Biological traits that confer ecological flexibility and allow population to recover rapidly from depletion may offer some

degree of protection from external threats. A number of recent studies have linked with the amount of extinction risk or the rate of decline of species (Gaston and Blackburn 1995; Bennett and Owens 1997; Owens and Bennett 2000; Cardillo 2003; Fisher *et al.* 2003; Jones *et al.* 2003). Indeed, the biology of the species accounts for over a third of the variations with extinction risk among carnivores and primate species (Purvis *et al.* 2000). Here it presents a regional level analysis of biological and external factors that may lead to extinction of the mammals, birds and some species of reptiles as well as some keystone species such as the tiger (*Panthera tigris*), leopard (*P. paradus*), Himalayan black bear (*Selanactos thibetanus*), four species of hornbills (*Buceros bicornis*, *Anthracoceros malabaricus*, *Aceros undulates* and *A. nipalensis*). They are in general a good model taxon for the development of a predictive science of conservation. All impacts on wild animals are necessarily associated with high density of human population, increasing habitat loss and also the effect of hunting.

Bushmeat hunting threatens the survival of larger animals in general and mammals and birds species in preference. Indigenous people across the continents have been observing their unique socio-cultural and religious practices. The role of bushmeat hunting in the household economy is very crucial that has received very little attention in quantitative term (de Merode *et al.* 2004). However, the recommendations for the management of bushmeat hunting and the success of policies for management are dependent on the impacts that control the measures imposed on the hunting and farming of wild animals. The preventive measures for bushmeat hunting may include altering bushmeat prices, penalties for hunting of

threatened species, or raising agricultural prices. However, the bushmeat price of various category of bushmeat and economic status of bushmeat country are different. For instance, 100% indigenous people of Canada's North West Territories and in US $ 4700/household/year (Roe et al. 2000) have consumed 200 kg/year of wild meat. In Cote d'Ivoire, an estimated 100000 tones per year of wild meat were harvested (Caspary *et al.* 2001). A recent TRAFIC study noted that 80% of rural Kenyan households depend on wild meat for meat protein (Barnett 2000).

Hunting in western or eastern ranges of Himalayas, which has traditionally been for subsistence, is continued now for trading. Although Wildlife (Protection) Act, 1972 has apparently succeeded in curbing open trade of animals and their body parts but the subsistence hunting continues at an unknown scale (Kaul *et al.* 2004). Therefore, the extent of hunting, the species hunted, the quantity extracted, and the possible reasons for hunt need are to be addressed. The international trade in bushmeat illustrates the importance that international markets for wildlife products can have for rural livelihoods. Meat is considered the most important commercial Non-Timber Forest Products (NTFP) for socio-economically weakened people in South East Asia (de Beer and Mc Dermott 1996). It is also the most important wildlife product in international trade in terms of economic value other than timber and fish (Fui and Noor 1994). In addition to the food and commercial value, the wildlife and their products also have social and cultural significance in indigenous communities. Sacred groves, the socially protected forests with spiritual, cultural and religious values, are found in many parts of the

world (Kothari *et al.* 2000) including India. Wildlife present therein reaffirms kinship ties within the community and with the land that indicates socio-cultural significance, which is deeply rooted in their traditions, cultures and religions (Bennett and Robinson 2000).

Certain indigenous groups of people in the world protect certain categories of animals through their cultural and religious beliefs. These animals in the particular habitat are regarded as sacred. Different tribes value the category of animals differently in particular sacred grooves. Indigenous tribal communities in African countries are also strongly influenced by their association with wildlife. The deer hunting festival in Winneba, Ghana act as a social fabric that holds the community together. It draws the natives of Winneba back home for the celebration, which involve the capturing of the bushbuck, *Tragelaphus scriptus* with their bare hand (Ntiamoa-Baidu 1997). Such practices in tribal groups facilitate conservation of biological resources in order to keep their social traditions alive.

Various ethnic groups in the north-eastern region of India have preserved and protected the several forest patches and even individual trees and animals due to their belief and the worship of Mother Nature. However, some taboos are also associated with meat eating habits in some of the Naga tribes in north eastern region of India (Jamir and Lal 2005). The Anaal Naga in Manipur do not consume turtle or tortoise meat, the Maram Naga do not eat pork and Thangkhul Naga do not eat meat of any species of the cat family. Contrary to the belief, certain forces

are influencing the traditional communities to discard the community-oriented protection to this Himalayan region and they are now exploiting certain threatened animal species such as Himalayan black bear, musk deer and hornbills in eastern Himalayan region (Kalita 2004; Choudhury 1997a; Datta 1998, 1999, 2000).

The state of Arunachal Pradesh in the north-eastern India is known for its ecologically distinctive and rich biological and cultural diversity. It being a part of the 'Hotspot' in Indo-Burma region embodies diverse endemic flora and fauna. Large-scale destruction of forests due to anthropogenic activities has altered the natural habitat, composition of species and bio-diversity of the region (Solanki 2002; Solanki *et al.* 2004), which has lead to a depletion of many species including rare and endemic ones. 26 major tribes and 110 sub tribes constitute the indigenous population in Arunachal Pradesh. The tribal population stays close to nature and depends upon forest for their daily need such as food, fuel, medicine, shelter and fodder for their live-stock. Animals have a distinct place in the life of the people of Arunachal Pradesh and it is more so in socio-cultural and religious festivity. Their knowledge about the availability and utility of animals is immense. The use of this knowledge for commercial purposes is posing serious threats to the wildlife resources *in-toto*. At the same time, this knowledge is not properly documented so far. Increasing trends in population and increasing level of education and acquaintance with the know-how of the modern weaponry have posed a serious threat on the total wild fauna. Considering the animal resources in the light of their scientific, ecological and utilitarian value, it has become

obligatory to adopt sustainable use pattern. Hence, the conservation of the faunal resources has become the need of the time.

Conservation biology draws attention on religious and philosophical traditions. The human outstrips all others in the complexity due to its variety of socio cultural and religious behaviors in different human populous across the world (Gadgil 1987). The traditional and applied disciplines of natural resource management alone were not comprehensive enough to address the critical threats to biological diversity. Hence, a strong need was felt to attract community participation in conservation policies by understanding people's own age-old special knowledge and skill of utilizing wild resources. Thus information on ethnozoological aspects can be applied to biological conservation and community development as well.

Entire tribal population of Arunachal Pradesh is divided into three cultural groups on the basis of socio-politico-religious identify. One group has faith in Buddhism, second group believes in magical and religious practices and the third group practices head hunting. All the tribes in this region are associated with these three groups on the basis of their closeness with the group. One dominating tribe from the group was chosen to represent the entire group for ethnozoological activities. The work recorded in this thesis has been conduced on three major tribes namely, the Nyishi, the Monpas, and the Apatanis. These tribal communities are distributed in different parts of Arunachal Pradesh and observe their unique traditional customs, beliefs and faiths in all walks of life. All three tribes have

been utilizing the different category of animal resources according to their socio-cultural traditions.

Therefore, information on ethnozoological aspects of the Nyishi, the Monpa and the Apatani tribes have been collected and collated in this study. Such information will facilitate the programmes on conservation of species and sustainability of animal resources. At the time of taking stock of the natural resources in the hilly states like Arunachal Pradesh, in Northeastern region of India, the wild faunal resources have not been given due considerations and often neglected. In spite of the ban on hunting, wild animals continue to be hunted for trading and consumption locally as well as globally. The domestic livestock is the major source of meat in the country as a whole and it is more so in north eastern region. Live stock meat production is estimated at 9.5 gram/head/day in India during 1999-2000 (Anon. 2000). The tribal people utilize wild plants and animals in majority of their socio-cultural, magical and religious and in traditional therapeutic practices. Wildlife (faunal resources) is the renewable resource and the quantity of meat consumed directly relates to the number of animals exploited and the faster rate of exploitation may lead to change the renewable character of wildlife into non-renewal characters that ultimately lead to extermination of species (Das 2000). Therefore, uncontrolled exploitation of wild resources has become a cause of concern for environmental protection and conservation of biodiversity in the region. These priorities at present need to be addressed with a well thought management plan to be implemented with the sole aim to conserve the wildlife (faunal resource). However, developing sustainable forms of faunal

resource management and finally choosing a specific approach involving the local population require adopting a rational utilization of faunal resources.

The focus of this study is to understand the use pattern of faunal resources in selected tribes of Arunachal Pradesh and to discuss on people's integration into the regional wildlife management programme. The 'jhum' cultivation system and arbitrary occupation of land by rural population have resulted in the fragmentation of natural habitats and loss of biodiversity in Arunachal Pradesh, which jeopardize conservation efforts and sustainable use of natural resources. Often left to cope on their own, the rural population tends to over-use the available natural resources. The reasons for wild animal exploitation by the rural population are: access to protein in diet, use of indigenous traditional medicine (folk medicine), and use of animal species in cultural and religious traditions. But the same does not hold appropriate for urban population. The effective wildlife management and rational utilization of resources may contribute to the alleviation of rural poverty and consolidation of development in rural area.

The concept of health in the tribal groups and their folk medical (therapeutic) system are always multidimensional, which involve social, cultural and religious issues. People in every society adapt to their environment by way of combining various biological and socio-cultural resources. The fact is that diseases are also related with biological and socio-cultural dimensions of the society that has resulted in the convergence of medical and anthropological interests. Anthropologists are in a position to explain to the health personnel working at

grass root level and to the administrators how the traditional beliefs and practices conflict with western medical assumption, how socio-cultural factors can take care of health and illness, which may change the socio-cultural comprehensive set up. This traditional system of medical anthropology would have impact on the existence of biodiversity associated with it. Therefore it became imperative to work out the animal species which are closely related with the medical system of tribes in the region and its impacts on the biodiversity.

One of the main aims of present study is to compare wildlife utilization made by forest dwelling people at varying degrees of their subsistence economy: from the hunting gathering stage to the more recent phase of the resident cultivators in deforested areas particularly. Traditional hunting of mammals, birds and reptiles have been investigated in different kinds of habitats in order to describe the cultural dimensions adopted by natives in responses to environmental and social changes. Traditional hunting is practised not only by hunting gathering people such as the Nyishi tribe but also by shifting or settled cultivators namely the Apatani and the Monpa tribes. Though the animals such as mithun, pig and livestock farming system is practised, the parts of meats supply in hotels and restaurants done by many agriculturalist groups come from wild animals which may be either directly captured or killed by means of guns or snares or by other indigenous traps. The availability of wild faunal resources, used as food from the natural habitat has led to the development of their own of way hunting and

trapping techniques, selected food habit, and ways of utilizing animal products that exhibits a prey-predator ecological relationship by each group.

Such important aspects have not been comprehensively looked into to deal with the complex issues where society, environment and biodiversity need to be given proper weightage. Therefore, the present study is to evolve viable means to address the issues related to ethnozoology, their impact on biodiversity and to scarce for mitigating measures for biodiversity conservation in Arunachal Pradesh.

The study presented in this thesis covers the following aspects:

1. To make an inventory of animal resources by the Nyishi, Monpa and Apatani tribes of Arunachal Pradesh.
2. To study the magnitude of use and utilization pattern and its impact on biodiversity of the region and on the population of selected species.
3. To study the use of species for life support system of the selected tribal groups.

CHAPTER 2

REVIEW OF LITERATURE

Wildlife resources play a major and often very critical role in the livelihood of a high proportion of the world's population (Pimental *et al.* 1997). The poorest people and households with low income are dependent to large extent on these resources (Prescott-Allen 1982; Scoones *et al.* 1992; Arnold 1995; Neumann and Hirsch 2000; Nasi and Cunningham 2001) and the degree of dependence of a community on wildlife products is determined by the condition of the resources, its proximity to the community, access rights and restrictions, local and outside demand, and income generating options (Warner 1995). Roe (2001) has studied the categories of wildlife products that contribute to the household income of certain forest dwellers obtaining food from wild resources for sustaining livelihood in economically poor section of people of African countries is common (Scoones *et al.* 1992; Warner 1995; Cavendish 1997); however the use of big games for household consumption is a social status (Clarke *et al.* (1996). Some animal species are used as routine food items while others are taken as food during famine when regular food categories are in scarcity (Scoones *et al.* 1991).

The wild as well as domestic animal resources and their use pattern have been studied in tropical countries in general and specifically in third world and South East Asian countries. Wildlife utilization as meat is preferred mainly for domestic consumption and the source for improving household income as well by all

classes of people in Sub-Saharan African countries (Asibey 1966, 1974, 1978; Ajayi 1971; Ajayi 1973, 1979; Asibey and Eyeson 1975; Andu *et al.* 1988; Angelici *et al.* 1999); Anestey 1991; Ammann 2000; Auzel and Wilkie 2000; Balakrishnan 1992; Barnes 1995; Bailey *et al.* 2002; Barkarr *et al.* 2002; Bennett and Rao 2002; Carpaneto and Germi 1989a; Carpaneto and Germi 1989b; Carpaneto and Fusari 2000; Caspary 2001; Eves *et al.* 2002; Fa *et al.* 2000; Fa *et al.* 2002; Feron 1993; Friedmann 2003; Hardin and Auzel 2000, 2002; Kalivesse 1991; Koppert and Hladik 1990; Martin 1983, 1985). In Botswana, the tribesmen obtain about 80% of their meat requirement for food from wild animals and rest from the livestock (Butynski and Richter 1972; Prescott-Allen 1982). The security of food availability is also ensured through cheap bushmeat and other animal groups such as caterpillars, termites, etc. (Nyirenda 1993) in Tanzania. Jardin (1970) has listed hundreds of species belonging to 236 genera being eaten by the people in Africa. Afollayan and Ajayi (1983); Anadu (1987); Lahm (1993) have reported various animal species, invertebrates to large mammals being eaten by the people of West Africa. The wildlife in West Africa has multifaceted value such as source of food, symbol of their culture, and their identity too (Ntiamoa-Baidu 1987). Other studies have indicated that the market subsistence hunting also takes place that leads to unsustainable exploitation of animals (Caldecott 1987; Geist 1988; Alvard 1993; Ludwig *et al.* 1993; Lahm 1993a; Alvard 1994; Joanen *et al.* 1994; Fitzgibbon *et al.* 1995; Noss 1995; Chardonnet *et al.* 1995; Bowen-Jone 1997). In the areas of high human population density, the hunters extirpate large and slow breeding species also (Alvard 1993; Redford 1993; Lahm

1994; Fitzgibbon *et al.* 1995) and various studies on the rate of extraction of wild animals have been reported in Congo basin (Noss 1995; Wilkie *et al.* 1998b; Fa *et al.* 1995; Ngnegueu and Fotso 1996).

The studies in Congo basin have produced anecdotal accounts on bushmeat hunting and drawn world attention on the issue (ma Mbalele 1978; Klemens and Thobjarnarson 1995; Pearce and Ammann 1995; Pearce 1996; McRae 1997) and provided more quantitative information on bushmeat consumption at national/household level (Heymans and Maurice 1973; Asibey 1974a and 1974b; Pierret 1975; Mares and Ojeda 1984; Colyn *et al.* 1987; Wilson and Wilson 1989; Hladik and Hladik 1990; Anestey 1991; Wilson and Wilson 1991; de Garine 1993; Takeda and Sato 1993; Steel 1994; Bennett 1995; Eves 1995; Chardonnet 1995; Njiforti 1996; Auzel 1996). These studies also document species diversity in the region and relate the quantity of bushmeat sold in city markets and/or consumed by city people from the catchments areas of the Congo River. Thus, the scale of bushmeat extraction cannot be related with the issue of sustainability. Nevertheless, the bushmeat consumption studies have been an essential step in the development of an understanding about the importance of bushmeat in the diets and the economy of Africans in the Congo Basin. Modern hunting techniques such as cartridge guns have made hunting more effective. The technique is commonly used by village hunters inhabiting on used the border of Odzala National Park, Congo (Wilkie *et al.* 1992; Infield 1988; Brown 1996; Vanwijnsberghe 1996). Noss (1995) has also evaluated the use of snares and nets in sustainable hunting in the Dzanga-Sangha special reserve in the Congo.

Muchal and Ngandjui (1995), Oates and Davies (1996), Redmond (1989) in their studies in Dja Biosphere Reserve have found some compulsions of forest dwellers associated with the consumption of meat of certain mammalian species like yellow blacked duiker, *Cephalophus sylvicutor*, leopard, *P. paradus*, and Chimpanzees; they killed to eat for traditional compulsion.

Kitty (2004) has described the various groups of animals like small mammals, (rodents and squirrels), large mammals (deer, peccaries and tapir), domestic animals (dog), small carnivores (weasel and fox), large birds (hawks, macaws, herons, galliformes, turkeys and curassows), and rodents were used for food, ritual and craft by North American Maya community during prehistoric period. Hunting of wildlife species in tropical forests has been the culture and tradition source (Mc Kinnonm 1984; Petocz 1987; Beehler 1985; DeVos 1973); Redford and Robinson 1987; Shaw 1991; Pattiselanno 2002, 2003). The trade and commercialization of bushmeat have vastly increased the rate of harvest of wildlife in many tropical countries (Caldecott 1988). The archeological records of the North America have indicated that the anthropogenic activities such as hunting had led to the extinction to large mammals (Grayson 2001, Grayson and Mcltzer 2002, 2003). Akcakaya *et al.* (2000), Hilton-Taylor (2000) and Harcourt (2001) indicated the impact of human population on IUCN Red List categorizing animals and have given suggestions for conservation mammalian species. McKee *et al.* (2003) has emphasized the role of human in species richness and forecasted the changes in mammals and bird species composition and their status for 2005.

South East Asian countries are rich in biodiversity and part of the global hotspot network. Hunting of bushmeat species, trading of wild animals and their products are an impending disaster of the region (Zuraina 1982; Ling 2002; Milner and Bennet 2003; Smith 2003). Bawa and Dayanandan (1997), and Navjot *et al.* (2004) have studied the South East Asian biodiversity, animal exploitation, forest loss and threats due to hunting and changing socio-economic status of people as the major reasons for growing trade in wild animals in the region.

The large sized animals are an economic source for protein supplements in human diet. However, the small animal species are also significant in their contribution. In different parts of the countries such as western and eastern Himalayan tribes, the mini-faunas mainly arthropods have been utilized as food and traditional medicine. Myers (1988) has been studied the nutritional value of the mini-fauna which may be used as replacement of the bushmeat protein. Meat of rodents and birds contains high protein content in contrast to large species and hence the demand for bushmeat of mini-fauna in tropical countries such as Zambia, Zimbabwe and Botswana is more (Eltringham 1984).

Ethnic groups in the European and American society have been using the mini-fauna particularly insect as food since ancient time (Hernandez 1921; Sutton 1988; Ramos-Elorduy 1987, 1990, 1993, 1997a). Grasshoppers and locusts are an important source of food in the rural areas of Venda with a rich ethnozoological heritage (Stajano and Rossi 1947; Taylor 1975; Ramos-Elordu (1992). DeFoliart

(1992) has been provided a brief overview of nutritional quality of edible insects and suggested measures for conservation and management of edible insects.

Zoo-therapy is also a part of ethnozoology that has impact on biodiversity as well as cultural diversity through the utilization of various animals and their body parts by the indigenous people across the world. Human beings have been using animal and plant resources for therapeutic purposes since ancient times. The ethno medicinal aspects have been studied in both indigenous and advance societies throughout the World (Gudger 1925; Branch and Siva 1983; Conconi and Pino 1988; Begossi and Braga 1992; Antonio 1994; Van Huis 1996; Costa-Neto 1999c; Unnikrishnan 1998). Since early times, insects and their products have been used directly and indirectly in the medicinal systems across the societies and culture throughout the world. The medicinal use of insects and insect-derived products is called entomotherapy (Costa-Neto 1999c). Although entomotherapy is an ancient practice but little is documented about it in academic world. Even so, several authors have reported the use of insects as medicines (Alexiades 1999; Antonio 1994; Barajas 1961; Cheesman and Brown 1999; Chen 1994; Conconi and Pino 1988; Fasoranti 1997; Green 1998; Gudger 1925; Hitchock 1962; Majerus 1994; Marques 1994; Maya 2000; Namba *et al.* 1988; Oatt 1998; Pemberton 1990; Posey 1987; Ratcliffe 1988; Souza Dias 1995; Seignobos *et al.* 1996; Valli 1998; van Huis 1996; Weiss 1925, 1946, 1947; Werner 1970; Zimian *et al.* 1997). Insects have been used in curative and preventive therapeutic system in various forms such as live, cooked, ground, infusions, plasters, and as ointments, magical

and religious rituals. Scarabs, for instance, have been a symbol of sexual vigor since ancient time in Egypt; they are found to be very efficacious when used in love charms (Araujo 1977). Amorim (1963); Banderia (1972); Carrera (1993); Figueiredo (1994); Costa-Neto (2002); Torres (2000) have recorded the use of animal species in traditional medicine by indigenous society in Brazil. They recorded about 500 animal species including insects being used as medicine in different parts of the country.

The society in Southeast Asian and pacific countries are found to use wild animals including insects for various purposes. Ellen (1985, 1991, 1993a, 1993b, 1996, 1998) has presented the outline of the cultural history and the ethnography of indigenous people has unpleasant socio-cultural activities including the patterns of resource extraction and over exploitation by ethnic people. He presented systematic and annotated lists of categories of animals utilized by the ethnic groups and notes on uses and cultural associations of the animals, analyses of hunting by Nuaulu tribe on the South Central Seram. The cultural beliefs and social practices based on his investigations on totemic and other restrictions in the use of animals among the people were also discussed. Ishige (1980), Healey (1995), Latinis (1996) have studied the method of hunting of mammals and trapping activities, and also described the methods of processing of meat, ritual and symbolic values of animals and their parts, food and nutritional value of mammalian species utilized by Cuscus tribe in central Maluku. Vries (1927), Ellen (1972, 1975a, 1975b, 1977a, 1977b, 1978, 1979), Valeri (2000) have studied various ethnic groups and their ethnozoological practices in Indonesia and

utilized this relationship for animal classification named as the ethno-systematic. They also mentioned the use of animals in their rites and rituals, and the cultural importance of various animals.

The records on the uses of animals and animal parts for medicines, food, ornaments, rituals and others religious beliefs are very ancient but the term ethnozoology is very recent (Borang 1999). The organized study and research in Indian ethno-biology with emphasis on tribal systems of medicine and culture are of recent origin, initiated in the middle of the last century. There are many volumes that describe the uses of animal and their parts. Some important volumes are Materia Medica of Hindoostan, (Ainsile 1813), The Mammals of India (Jerdon 1974), Fauna of British India including Ceylon and Burma: Mammal (Blandford 1991), The Indigenous Drugs of India (Dey 1896), Handbook of Sericulture (Mukherjee 1899), Outlines of Economic Zoology (Raese 1942), The Book of Indian Animals (Prater 1998) and Wildlife Wealth of India (Majupuria 1990). An excellent work, The Wealth of India: Raw material Vol. I to XI (Anon. 1948-1972) contains wonderful account on the use of the plants and the animals along with their chemical composition. Accounts of the uses of animals, their parts in various activities undertaken by indigenous people are also appearing in anthropological literatures, which serve an important secondary source for ethnozoological study. Some important workers such as Peter (1866) on the tribes of Bhutteanah and Hariyanah, Man (1885) on aboriginal inhabitants of Andaman Islands, Peal (1896) on eastern Nagas of the Tirap and Namtsik areas of eastern Arunachal Pradesh, Nag (1958) and Rao *et al.* (1989) on Baiga tribes of M.P.,

Bose (1964) on Onge tribes of Little Andaman, Ali (1973) on the tribes of M.P., Roy *et al.* (1978) on the people of Agethi and Minicoy Islands, Sarkar (1994) on semi-nomadic tribes of Bihar, Nehal *et al.* (1994) on Bhotiyas of Uttar Pradesh, now in Uttranchal and Bagchi (1994) have recorded the uses of animals and their products or parts by the different tribal communities living in India. Shiva and Verma (2002) have classified the different animal groups and uses of their body parts.

Many studies are available in the field of ethno-botany but few ethnozoological aspects have been carried out in India including the northeastern region. Bora and Sharma (1965); Chopra *et al.* (1970); Choudhury (1982); Ghosh (1924); Gope and Prasad (1983); Saikia *et al.* (1971) have given an account of edible insects used by Indian tribal group including the north-eastern region. Sarkar (1980), Royachoudhuri and Joshi (1995) have described the silk pupae as food of tribal people in India. Chakraborty (2002) has been studied commercial value of fresh water frogs (genus: Rana) and export of their frozen frog legs to USA, France, Belgium, the Netherland, West Germany and a few other countries. Kaul *et al.* (2004) has conducted a survey on hunting of large mammals and pheasants by tribal people for meat, cultural celebrations and for traditional medicines in the Western Himalaya. In northeastern region particularly in Mizoram very few studies have been conducted (Harit 2000, 2001, 2002) on ethnozoological aspects and discussed the use of mammals (porcupine), non-human primate (Macaca species, capped langur and hoolock gibbon) for meat and medicine, different species of arthropods (Bed bugs, grasshoppers, termites, bees, wasps and crabs) in

therapeutic use for curing the diseases like malaria and asthma, rheumatic pain, spleen disease, jaundice and asthma.

Few authors have published books on tribes of Arunachal Pradesh and have given an account of socio-political, socio-economic, social, religious, and other aspects like food habit, folk medicine and folk song of various tribes. The major publications are Arunachal Panorama by Chowdhury (1979), aspects of culture and customs of the tribes by Dutta and Duarah (1990), The Advancing Apatanis of Arunachal Pradesh by Takhe-Kani (1993), Tribes of North East India by Sarthak (1994); Socio-religious Ceremonies of The Apatanies of Arunachal Pradesh by Takhe-Kani (1996), The Nyishi World by Tara (2005) and Tribes of Arunachal Pradesh: Identity, Culture and Languages by Grewal (1997).

Few studies have been reported on these aspects from Arunachal Pradesh, a land of highest tribe of India. The extraction and use of musk has been studied for medicinal use and possible conservation of musk deer through farming species and commercialization of musk (Pandey 1996). Maikuri and Ramakrishnan (1992) have investigated into the ethnobiological aspects of 134 plant species used by the Nyishi tribe and recorded the calorific and protein value of meat of certain animals like deer, frog and snail. Borang and Thapliyal (1993) have been mentioned ethnozoological aspects of the Aassamese macaca (*Macaca assamensis*) and other animals.

Borang (1996) has been studied the ethnozoological aspects of Adi tribes in Arunachal Pradesh. Mithun (*Bos frontalis*) is sacrificed during their seasonal

festivals and domestic ceremony; penis is used to cure the breast pain of lactating women. Besides mithun, the Adi tribe utilizes the animals like horn bill (*Buceros bicornis*), dog, Tibetan jungle crow (*Corvus macrorynchos tibetosensis*), *Macaca assamensis*, *Macaca mulatta*, flying squirrel (*Petaurista petaurista*), and Himalayan black bear (*Selenarctos thibetanus*) as their food and also in therapeutic and socio-cultural, magical and religious practices. Choudhury and Duarah (1999) have been studied the socio-cultural aspects of the Monpa tribes in Arunachal Pradesh but not mentioned the use of animals in their practices. Bora *et al.* (2001) has been studied the ethnozoological practices based on frog and its different developmental stages viz. eggs, tadpole, which the different tribal people utilize as food and medicine. Singh (1996) in his studies on high priority biologically rich areas of Arunachal Pradesh has highlighted certain ethnozoological aspects of 11 animal species used by the Adi tribe inhabiting around the Mouling National Park. Borang (1996) has been reported the ethnozoological aspects of 45 insect species out of which 9 species are used as traditional medicine, 36 species as food by the Nyishi and the Apatani tribes of the Subansiri valley of the state. The use of animal products in traditional medicines among the Mishimi tribe has been discussed by Choudhuri and Martin (1996). Solanki *et al.* (2002), Solanki and Chutia (2004), Solanki *et al.* (2005) have been studied the ethnology of the Nyishi tribe and the use of various animals and hunting techniques for birds, mammals and reptiles, and the use of body parts in various cultural artifacts.

Keeping in view that the large number of indigenous tribes inhabits the different parts of the Arunachal Pradesh with their diverse culture and life style. They utilize the rich faunal wealth of the state. The ethnozoological practices adopted by them require a complete understanding as these practices affects the biodiversity of the region. However, the studies conducted so far are scattered and information on these aspects need consolidation. The systematic investigation on in the field of utilization of various animal categories, loss of various animals and the status of some threatened categories of animals and documentation of indigenous knowledge system need to be addressed which can provide effective measures for conservation of the animal groups and for sustainable use of biodiversity and tribal economy in the region.

CHAPTER 3

STUDY AREA

GEOGRAPHICAL LOCATION

Arunachal Pradesh, the largest state among north-eastern region covering an area of 83,743 km^2, is the part of Eastern Himalayan range situated between 26°28′ to 29°30′ N longitude and 91°51′ to 97°30′ E latitude. The state shares international border with Bhutan in the west, with China in north and northeast and with Myanmar in the east (Figure 3.1). Administratively it is divided into sixteen districts. The present study has been undertaken in following districts namely, Papum Pare (latitude 26°55′ N to 28°40′N and longitude 92°40′ E to 97°30′ E), Lower Subansiri (latitude 93°48′ E to 93°52′E and longitude 27°32′N to 27°37′ N), East Kameng (latitude 26°56′N to 27°59′ N and longitude 92°36′ E to 93°34′ E), West Kameng (latitude 26°54′ N to 28°01′N and longitude 91°30′ E to 92°40′ E) and Tawang (latitude 26°54′ N to 28°01′N and longitude 91°30′ E to 93°22′ E), where the tribal community viz. the Nyishi, the Monpa and the Apatani are distributed. The Tawang, West Kameng and East Kameng districts belong to Kameng sub-division and have an average elevation of 6000 m above the sea level. The Papumpare and Lower Subansiri districts belong to Subansiri sub-division, 3400 m above the sea level.

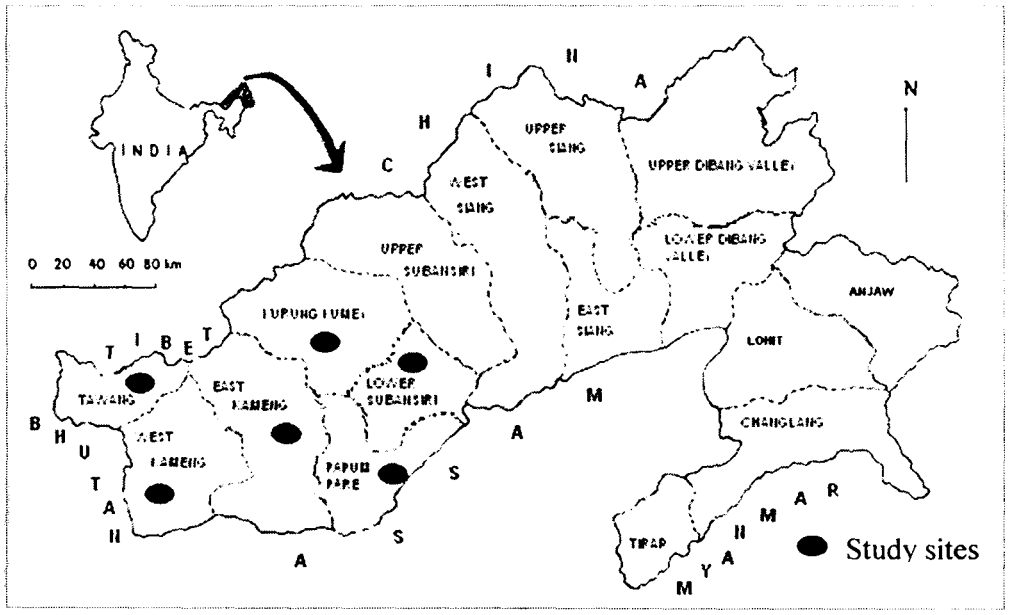
TOPOGRAPHY

The land is predominantly mountainous, falls in Eastern Himalayan ranges that are running north to south. It stretches from snow caped mountains in the north to the plains of Brahmaputra valley in the south. Altitude of the state varies from 100 meters to above 7000 meters, from the floor of the Brahmaputra valley to the crest of the great eastern Himalaya. The hill tops are mostly covered with snow capped throughout year and the valleys are 'U' shaped, typical of glacial valley. Arunachal Pradesh can be divided into two major physiographic regions: the Arunachal Himalaya and the Brahmaputra Valley. The Patkai Hills dominates the Himalayan part of Arunachal Pradesh in the East that can be divided in to four sub-regions viz. Higher, Lesser, the Siwaliks and Purvanchal ranges.

The physiography of Arunachal Pradesh is dissected by the tributaries of mighty river Brahmaputra. The river Tsangpo originates from Tibet and enters in to Arunachal Pradesh where it is called the river Dihang or Siang. The same river on entering in Assam becomes the river Brahmaputra. The Kameng/Bharali, Subansiri, Dihang (Siang) and the Dibang flow southwards, the Lohit flows in the south western direction, the lesser Nao-Dihing flows in the north-east part of Arunachal Pradesh. Thus, Arunachal Pradesh is the part of Upper Brahmaputra river system constituted by six major river system of the state which own specific geo-ecological characteristics.

CLIMATE

The climate of Arunachal Pradesh is quite distinct. It varies from hot and humid in the Siwalik range with heavy rainfall. It becomes progressively cool on moving northwards to the higher altitude. Average annual rainfall maximum and minimum temperature, and relative humidity of districts under study areas are shown in the Figure 3.2. Highest rainfalls (940 cm) and humidity (76%) was recorded in Itanagar and lowest rainfall (720 cm) and humidity (69%) in Tawang during last decade (1991-2001).



Longitude: 91°36′– 97 °30 ′E Latitude: 26°30′– 29°28′N

Figure 3.1 Map of Arunachal Pradesh

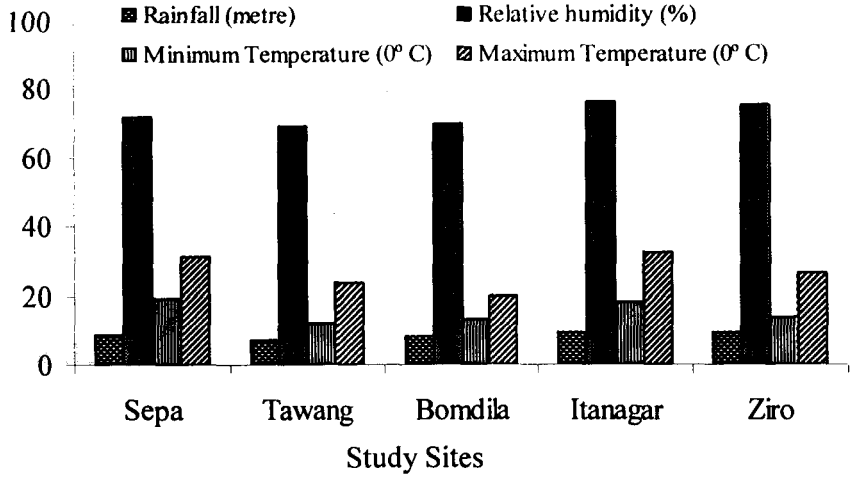


Figure 3.2 Rainfall, Relative humidity, Minimum temperature and Maximum temperature of the study areas

FORESTS AND BIODIVERSITY

The forest is broadly classified as tropical semi evergreen, tropical wet evergreen, sub-tropical leaves, sub-tropical pine, temperate and alpine types (Kalita and Haridasan 2001). Different forest types, its altitudinal range and the important plant species are given in Table 3.1. According to the State Forest Department the Reserve Forests cover 18.53%, Protected Forests 0.02%, Anchal Forest Reserve 0.65%, Village Forest Reserves 0.58%, National Parks 4.79%, and Wildlife Sanctuaries 13.6% of the geographical area. Un-surveyed forests, where status of rights and ownerships are not settled, are termed as Un-class State Forests. Total forest 51,540 km^2 covers 61.549% of total geographical area (Table 3.2). The irregular and undulated topography with lofty hill ridges and deep valleys accompanied by wide variations in climate has influenced rich and fascinating vegetation of Arunachal Pradesh. The three-story strata of vegetation in the

tropical and subtropical forests are one of the significant features of Arunachal forests. Herbs, shrubs and small trees form the ground cover, and the medium sized trees form the middle storey and the lofty trees with the dense canopy from the upper story.

Floral diversity

Arunachal Pradesh is very rich in floral diversity. The state accounts for 2.54% of the total geographical area of the country and possesses more than 23.52% of the flowering plants of the country. About 76.93% plant families of Indian flora are found in Arunachal Pradesh (Chowdhery *et al.* 1996).

Table 3.1 Major forest types and important species of plants

Forest type	Altitudinal range (m)	Important species
Alpine	Above 3500	*Rododendron* sp., *Arenaria* sp., *Saxifraga* sp.
Temperate	1800-3500	*Hacer* sp.,*Castanopsis* sp, *Poplus sp.,Tsga sp., Abies* sp., *Pinus* sp., *Curesus* sp.,
Sub-tropical pine	1000-1800	*Pinus roxburghii, P. merksii*
Sub-tropical broad leaves	900-1900	*Castanopsis* sp., *Quercus* sp., *Michelia* sp., *Alnus* sp., *Schima* sp.,
Tropical wet evergreen	Up to 900	*Dipterocarpus* sp., *Shorea assamica, Altingia excelsa*
Tropical semi-evergreen	Up to 600	*Terminalia myriocarpa, Bombax ceiba, Canarim grandis*

Source: Arunachal Forest News (2001)

Table 3.2 Forests and protected areas of Arunachal Pradesh

Forests	Area (km^2)	Area (%)
Reserved Forest (RF)	9552	18.53
Wildlife Sanctuaries (WS)	7015	13.60
National park (NP)	2468	4.79
Anchal Forest Reserve (AFR)	325	0.64
Village Forest Reserve (VFR)	300	0.58
Protected Forests (PF)	8	0.02
Un-classified State Forest	31772	61.64
Orchid Sanctuary (OS)	100	0.19
Total	51540	100.00

Source: State Forest Department, Arunachal Pradesh (2001)

Choudhery *et al.* (1996) enumerated 4117 species of angiosperms belonging to 1295 genera and 192 families from the state as against 17,500 species representing 2984 genera and 247 families in India. Out of which 2986 plant species belonging to 970 genera and 165 families are of dicots and 1131 species belonging to 325 genera and 27 families are of monocots (Baishaya *et al.* 2001). Choudhery (1999) listed 238 endemic plant species to Arunachal Pradesh. Some of the endemic species of Arunachal Pradesh are *Aconitum lethale*, *Aglaia edulis*, *Albizia arunachalensis*, *Amentotaxus assamica*, *Anoectochilus sikkimenis*, *Aeschynanthus parasiticus*, *Begonia aborensis*, *Hedychium longipedunculatum*, *Litsea mishmiensis*, *Magnolia griffithii*, *Petasites kamengicus*, *Rhododendron nuttallii*, *R. tawangensis*, *Strobilanthes aborensis*, *Syzygium mishmiense*, etc.

Faunal diversity

Arunachal Pradesh has rich assemblage of faunal diversity (Ali and Ripley 1983; Sarkar and Sanyal 1985; Sanyal and Gyaen 1985; Nath and Dey 1985; Mehta 1987; Chatterjee 1989; Singh 1991; Singh 2000). A total 1016 of animal species have been reported from Arunachal Pradesh (Solanki 2002). It has been reported

that a large proportion of terrestrial and aquatic fauna of India are found in Arunachal Pradesh (Pal 1993). The details of the different faunal groups found in Arunachal Pradesh are given in Table 3.3. Among these, 53 species of mammals, 245 species of birds, 13 species each of reptiles and amphibians are coming under rare and endangered categories (Solanki 2002).

Table 3.3 Diversity of faunal groups

Animal group	Genus	Species
Mammals	109	133
Birds	295	716
Reptile	37	51
Amphibian	21	46
Fishes	85	190
Insects	411	657
Mollusks	31	54
Annelids	8	15

Source: Zoological Survey of India, Arunachal Pradesh (2002)

DEMOGRAPHY

The total population of the state is 10, 91,117 (Census Report 2001). Population distribution is least in the Tawang district having 3.1% followed by East Kameng with 5.22%, West Kameng having 6.83%, Lower Subansiri with 8.94% and Papumpare having highest distribution of 11.95% of the total population of the state. The population density of Tawang district is 16 persons/km^2, West Kameng having 10 persons/km^2, East Kameng having 14 persons/km^2, Papumpare having 35 persons/km^2 and Lower Subansiri having 10 persons/km^2. The decadal population growth of these districts are 22.69 for Tawang, 32.21 for West Kameng, 13.24 for East Kameng, 67.21 for Papumpare and 17.37 for Lower Subansiri district. Literacy rate is 41.14% for Tawang, 61.67% for West Kameng,

40.89% for East Kameng, 70.89% for Papumpare and 45.01% in Lower Subansiri district. (Census Record 2001). The details are shown in Table 3.4.

Table 3.4 Demography of the study area

Districts	Population	Decadal growth rate (%)	Population density (per sq. km)	Literacy rate (%)
Tawang	34705	+ 22.69	16	41.14
West Kameng	74595	+ 32.21	10	61.67
East Kameng	57065	+ 13.24	14	40.89
Papumpare	121750	+ 67.21	35	70.89
Lower Subansiri	97614	+ 17.37	10	45.01
Arunachal Pradesh	1091117	+ 26.21	13	54.74

Source: Census record (2001), Department of Statistics, Arunachal Pradesh

ETHNIC DIVERSITY

Arunachal Pradesh is inherited with complexity of nature in terms of environmental, biological and socio-cultural heritage. Nevertheless, it has been witnesses to α diversity (within the group diversity) as well as β-diversity pattern at ethnic level. Mainly β diversity element of ethnic cultural pattern affects the biological diversity as a whole. Arunachal Pradesh is the homeland of a large number of Mongoloid Tribes (Das 1984). 26 major tribes and 110 sub-tribes inhabit different regions of Arunachal Pradesh constituting an indigenous population (Pandey *et al.* 1999). The present study is focused on three major tribes, namely the Nyishi, the Monpa and the Apatani. The distribution of these three tribes is shown in Figure 3.3.

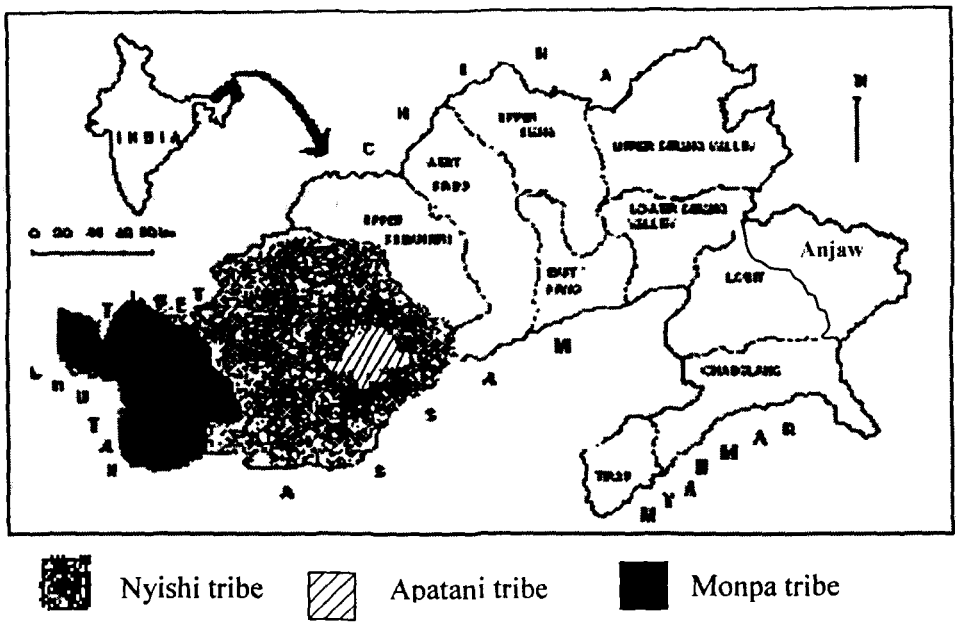


Figure 3.3 Distribution of the Nyishi, the Monpa and the Apatani tribes in Study area

The Nyishi tribe

The people of the Nyishi tribe are of Tibeto-Burman origin having short and sturdy physique similar to the feature of Mongolian race. They wear an admirable headgear of woven cane and it is decorated with beak and feather of hornbills. The Nyishis have used a yellow strand of cloth to tie round the 'podum' or knot of hair. It is a mark distinction between the Nyishi and the Apatani tribes. The women wear a skirt of woven fibre often with green and striped designs. Over this, they wrap themselves with a blanket, which is falls to the knees. Men and women wear numerous strings of multicoloured beads. The women wear large ear-rings falling to their shoulder.

The houses of the Nyishi tribe are made up of bamboos, woods and canes. Every wife has her own separate establishment in the house but the senior wife is the mistress of that house. Polygamy is commonly found in their society.

The farming practice followed by the Nyishi tribe is shifting cultivation otherwise known as 'Jhuming'. Their communication is in Nyishi dialect. They believe Dony-polo religion, worship Sun and Moon and remain associated with nature and natural resources. They are originally forest dwellers and remain dependent on forest and forest products for social and cultural activities. They inhabit the major parts of Lower Subansiri, Papumpare, East Kameng and Kurung Krumey districts of the state. They are second largest group of inhabitants of Arunachal Pradesh. Their total population stands 77,689 (13.44%) in 1991 census (Data on tribe wise population is not available in 2001 Census Report).

The Monpa tribe

The Monpas are of Tibeto-Chinese origin. The word 'Monpa' signifies 'man of the lower country' (Mon-lower country, Pa-belonging to). The total population of the Monpas stands at 38,862 (4.4%) in the Census of 1991.

The Monpa tribe has its own unique system of socio-cultural practices. Culturally they are akin to the people of eastern most part of Bhutan. The Monpa dress consists of a 'chuba' or cloak made of coars woolen stuff dyed red with madder and reaching some way below the hips, and short loose drawers of the same material. Monpa men wear a dome-shaped hat of coarse felt with edges of fur. Usually they wear boots of animal skin which is manufactured indigenously. The

Monpa women wear dress of blue striped or white cotton cloth, wrapped round her body and coming down below the knees, and jacket made of the same woolen stuff as that of the man's 'chuba' reaching the waist. The Monpas might have been polyandrous. Now, monogamy appears to be the prevailing form of marriage amongst them.

The Monpas are good cultivators. They practice a mixed type of agriculture comprising both shifting as well as settle cultivation. They are very good at their looms for making their own garments. The Monpa women weave colourful carpets. The religious establishment among the Monpas is the 'gompa' which is a temple house worshiping the image of the Buddha and also religious books. Every 'gompa' has several prayer flags planted in its vicinity.

Like other tribal peoples, the Monpas traditionally depend on nature and natural resources. Although, Buddhism prohibits the killing of animals but they use different animals and animal products for various purposes.

The Apatani tribe

The Apatani tribe belongs to the Tibeto-Mongoloid stock and believed as descent of legendary ancestor "Abotani". The word 'Apatani' is derived from two words '*Apa*' means display of affection and '*Tani*' means human race (Rawat and Chowdhury 1998).

The Apatanis are the main inhabitants of the Ziro, the Apatani Valley of Lower Subansiri district of the state. The total population of the Apatani stands at 22,526

(2.6%) in the Census of 1991. They generally speak Apatani dialect which has no script. The entire Apatani community is compactly inhabited in a plateau cum valley areas and they divided into two broad groups viz. "Talyang-Hao", distributed on Hari-Kalong, Dutta, Mudang Tage and Bamin-michi villages, and "Niichii-Niitii", distributed in Reru, Tazang, Diire, Hija and Hong villages. This clan system of the tribe have shown peculiar utilization pattern of wild animals.

The main customary dress for men consists of a coarse loin cloth and a blanket whereas the customary dresses of women are skirts and jackets. Their villages are built on high ground. The houses are built on wooden planks. Walls are made up of bamboos and roofs are thatched of paddy straw, bamboos or pine slabs.

They are known for the unique system of agriculture, that combines paddy and fish as traditional culture and oriented for trade and commerce. The Apatani people perform socio-cultural, magical and religious practices in which they involve natural resources including animals.

CHAPTER 4

EXTRACTION OF ANIMALS BY THE NYISHI, MONPA AND APATANI TRIBES AND ITS IMPACT ON BIODIVERSITY

Hunting of animals from wilderness for sustenance has been the way of life in many tribal communities or indigenous groups. In the present study, the capturing of wild mammals, birds and reptiles, dead or alive, irrespective of the techniques used for the purpose has been considered 'hunting'. The kill obtained by hunting are utilized by different tribal groups differently viz; meat as protein supplements in diet, for traditional medicines, trophies, socio-cultural celebrations. The live animals are also used as pets, for biomedical activities and zoo-trades. Therefore, the rate of hunting, extraction, and utilization of the animal species affect the population of species and the entire biological community of the region as well.

In recent decades the sustenance has taken over by commercial hunting, the most common cause of animals' extinction followed by habitat destruction (Diamond 1984; Diamond and Case 1986; Reid 1992; Forester and Machlis 1996; Kerr and Currie 1995; Mc Kinney 2001; Sala *et al.* 2000; Wakermagel *et al.* 2002; Harcourt and Parks 2003). The habitat destruction and degradation, as per current assessments, are major activities that have depleted the animal species, which may ultimately lead to extinction of important species (Hillon-Taylor 2000; Bird Life International 2004). The conservation of animals is concerned with the documentation and analyzing the pattern of extraction of animals in tropical

forests (Feer 1993; Redford 1993; Robinson and Redford 1994; Peres and Terborgh 1995; Alvard *et al.* 1997; Bodmer *et al.* 1997; Wilke and Carpenter 1999; Robinson and Bennett 2000; Townsend 2000; Bakarr *et al.* 2001). Little information is available on amount and mode of extraction of animal species from forest habitat in the world. This information is essential and important in those areas where habitat loss is leading to decrease in population of species. Hunting of wild animals for meat on socio-cultural and magical and religious occasions has been a part of traditional life style in many tribal societies in African and Asian countries. Traditional hunting techniques have been documented in different geographical regions in accordance with the cultural entities of ethnic groups (Terashima 1983; Bailey and Aunger 1989; Colell *et al.* 1994). Each ethnic group has developed their own trapping and hunting techniques, the ways of utilizing animal resources and types of products derived from the animals. Ethnozoological studies carried out in north eastern Zaire and in South Western Uganda by Wilkie (1987), Carpaneto and Germi (1989a, 1989b, 1992), Carpaneto and Fusari (2000) speak of ways in which native people exploit wild animals as protein source and for their respective cultural practices. Studies on hunting and bushmeat utilization has also been carried out in tropical African and neo-tropical countries (Hames 1979; Marin 1983,1985; Bodmer *et al.* 1988,1997; Dei 1989; Wilkie and Carpenter 1999; Auzel and Wilkie 2000; Barkarr *et al.* 2002; Barnnett 2002 and Eves *et al.* 2002). Wildlife hunting and utilization by rural communities living around the protected areas has been the subject for a number of studies in sub-Saharan Africa, the whole of tropical Africa, and the Neo-tropics and all have

assessed the degree of threat to the large number of wildlife species (Asibey and Eyeson 1975; Kalivesse 1991; Alvard 1995; Fa *et al.* 1995; Ziegler 1996; Bakarr and Painemmilla 2000; Carpanneto and Fusari 2000; and Caspary 2001). Hunters kill or maim 60 million animals each year in Neo-tropical forest (Redford 1992).

Angelici *et al.* (1999), Caspary (1999), Bennett and Robinson (2000) and Bennett and Rao (2002) have studied the hunting and wild meat consumption in Asian tropical forests and reported that some of the animal categories have been hunted to observe their animistic ritual pelts and use as traditional and aphrodisiac medicine in ethnic societies. The Himalayas is one of the most important region in the world due to rich biological diversity and contains many endemic and threatened animal species (Baillie and Grombridge 1996; Anon. 1999; IUCN Red List 2003) that are utilized by various ethnic people to maintain their rich cultural traditions (Borang 1996; Sethi and Hilaluddin 2001; Harit 2001, 2002; Bennett and Rao 2002; Solanki 2002; Kumar and Solanki 2004; Solanki and Chutia 2004; Solanki *et al.* 2004; Solanki *et al.* 2005). Some studies have focused the threats and problems in the survival of wildlife in the region. The biotic disturbances such as habitat loss, degradation of habitat and socio-cultural activities are a major cause for fast declining of primate population in northeast India (Srivastava *et al.* 2001a, 2001b; Sunderraj and Johnsingh 2001; Kumar and Solanki 2004), but other groups of animal have not been given the desired attention. Wilderness species are protected from hunting and trade through the wildlife (protection) Act, 1972. But hunting in Eastern Himalaya, which was traditionally for subsistence, has become trade oriented among the tribal people of the region. Hunting and

trading of animals and their parts still continue at an unknown scale. The Eastern Himalayan region including Arunachal Pradesh being a part of 'Hotspot' in India has its own significance at regional and international level. Therefore it becomes imperative to understand the phenomenon methodically. Therefore, present study has undertaken to understand the hunting practices and techniques, quantification of hunt and their impact on biodiversity in the region.

MATERIALS AND METHODS

10 - 15% villages of Nyishi, Monpa and Apatani tribes were surveyed to gather the information on hunting aspects, number and types of species hunted in last three years. Data were collected through personal interviews with inhabitants of villages about the number of persons/families involved in hunting. The above information collected was as per the structured questionnaires (Sethi and Hilaluddin 2001; Solanki *et al.* 2002) (Appendix I). Information on hunting and its related aspects are collected within social and cultural constraints inasmuch it is not possible every time to select people randomly for interview due to non-availability of respondent and sometimes the respondent is reluctant to answer.

One interview is conducted in each identified villages to obtain general information on the species hunted and the extent of hunting of animals by the village people. Thus 157 hunters have been interviewed out of that 57% from the Nyishi tribe, 20% from the Monpa tribe and rest 23% from the Apatani tribe.

Data collected on the subject are analyzed for test of variance with the nonparametric chi-square (X^2) test. Correlation and regression analysis are applied to test the relationship with distance between the villages and hunting ground/forest, and the extent of hunting. Number and types of species hunted and the reasons associated with hunting are also analyzed and evaluated. Extraction patterns of the species are analyzed at two levels: (a) the distance of hunting site from the villages, (b) the number of animals killed each year and the number of individuals involved in it. Age group of the persons involved in hunting is also recorded and analyzed for identifying the age group intensively involved in hunting. Extracted species are identified with the help of vernacular names of animals provided by the villagers and later identified and confirmed with the help of reference books on relevant species such as 'The Book of Indian Animals' Prater (1998), Mammals of Arunachal Pradesh by Choudhery (2002), and Birds of India by Ali (1996). Indirect evidences of animals hunted like skull, horns, trophy, skin, and their numbers are collected from the households.

RESULTS

157 hunters responded to our queries on the different aspects of hunting. Number of hunters responded from different groups are given in Figure 4.1. Male persons are exclusively involved in hunting and the age of the participants ranges from 16–57 years. The mean age of the hunter is 35.5 (± 12.3) years. The age group of hunter between 26 to 35 years is most common (Figure 4.2). However, the various age groups are not the same in all the tribes, the age group between 16 to 25 years

is recorded in all the Nyishi, Monpa and Apatani tribes, whereas the age group of 26 to 35 years is recorded only in the Nyishi and Apatani tribes. The older age group between 55 to 65 years is very small but found in all the three tribes. The age group between 36 to 45 years and 46 to 55 years is the average group and found in all the three tribes. These results indicate that the most active age of hunters is between 26 to 35 years where the section of experienced hunters associated with active group is up to the age of 55 years. Thus the experienced group shares their expertise and carries on field training to the younger groups.

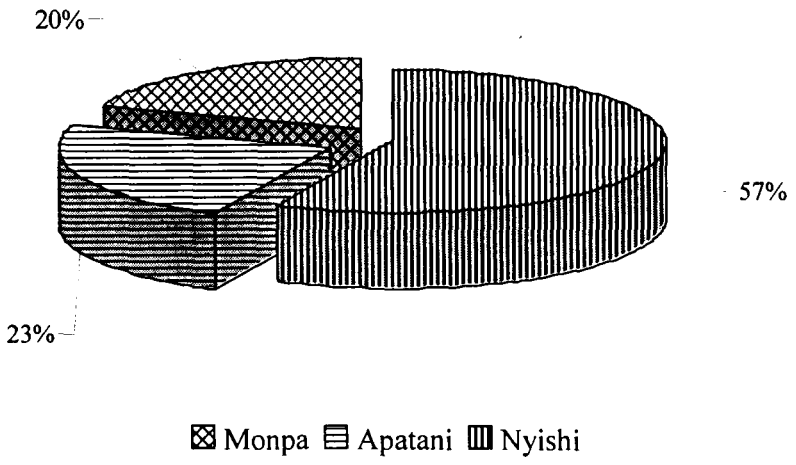


Figure 4.1 Ethnic compositions of hunters

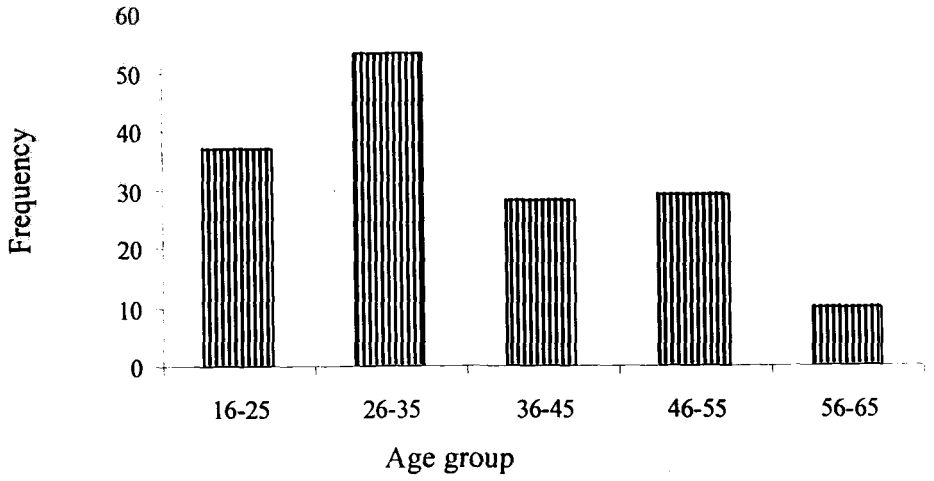


Figure 4.2 Age frequency distribution of hunters

ANIMAL CATEGORIES EXTRACTED

All the tribal groups under the study extracted two major categories of animals viz., mammals and birds. The details of groups of the animals in both categories extracted are given below.

Mammals

43 mammal species are recorded to be extracted from their natural habitat (Table 4.1). Different mammalian groups harvested and their percentages in harvested lots are given in Figure 4.3. Among the mammalians the major groups extracted are carnivores (39%), ungulates (25%), rodents (15%), and primates (8%). Different intensity of hunting is recorded in all the three tribal groups. The Nyishi have extracted maximum mammals (44%) followed by the Apatani (34%), and the Monpa (22%) (Figure 4.4).

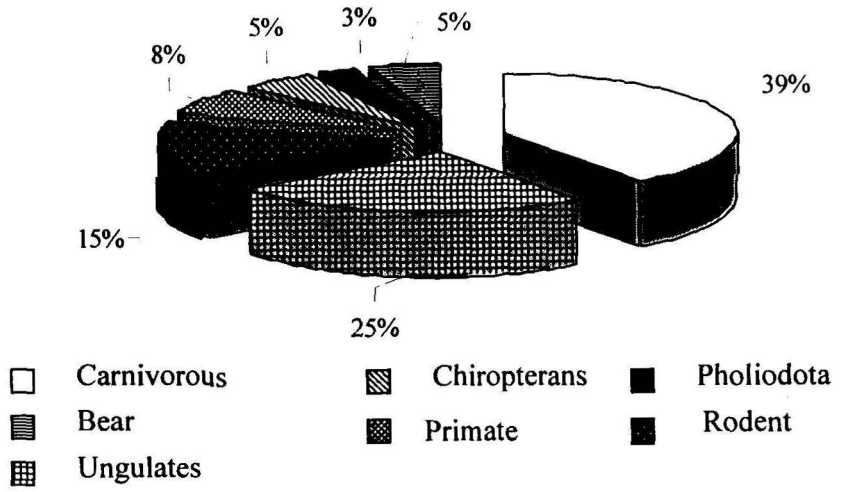


Figure 4.3 Compositions of mammalian groups extracted

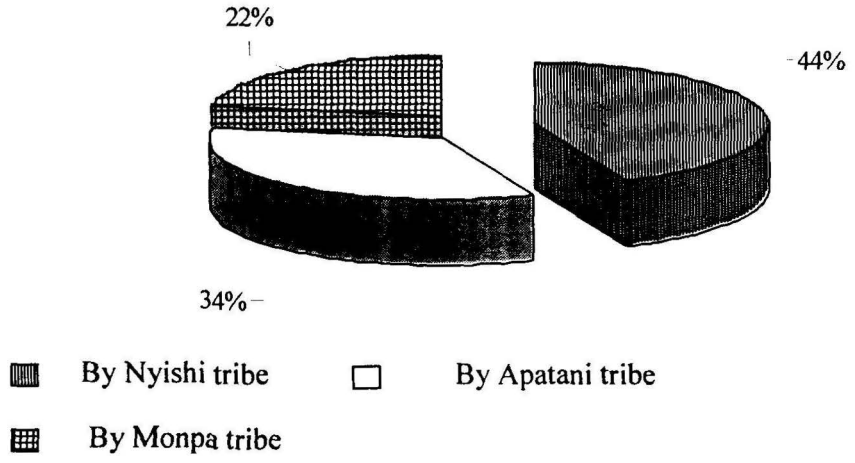


Figure 4.4 Mammals extracted by tribal groups

However, the Nyishi tribe extracted 35 mammalian species, the Monpa and the Apatani tribes have extracted 38 species of each. The composition of mammalian species and their percentage count in between the harvests made by different

tribal groups is given in Figure 4.5. The total number of species extracted by the Nyishi tribe consists of carnivores 37.14%, ungulates 22.9%, rodents 17.14%, primates 8.6%, bear 5.8%, pholiodota 2.9 % and chiropteran species 5.8%. Extraction of mammalian groups by the Apatani tribe is composed of 42.1% carnivores, 18.42% ungulates, 15.8% rodents, 13.16% primates, 2.7% bear and pholiodota of each and 5.27% chiropteran. The Monpa tribe has extracted carnivores 39.45%, ungulates 26.31%, rodents 15.8%, primates 7.9%, bear and pholiodota 2.7% of each, and chiropteran species 5.26%. The pattern of groups of mammals harvested, predominantly carnivores, ungulates, rodents and primates is uniform in all the tribal groups. But the amount of harvest is not uniform in all the tribes. Extraction of carnivorous species by the Apatani tribe is highest.

Table 4.1 Average number of mammals extracted by the Nyishi, Monpa and Apatani tribes (2002-2005). (Numbers in parentheses are number of hunters, 0-species not hunted)

Animal Categories	Common name	Scientific Name	Number of animals		
			Nyishi	Monpa	Apatani
Carnivores	Tiger	*Panthera tigris* [E]	1.10 ± 0.10 (10)	0.0 (0)	1.20 ± 0.18 (5)
	Leopard	*Panthera pardus* [V]	1.14 ± 0.09 (14)	1.20 ± 0.18 (5)	1.13 ± 0.13 (8)
	Clouded leopard	*Neofelis nebulosa* [V]	1.16 ± 0.17 (15)	1.43 ± 0.19 (7)	1.30 ± 0.16 (10)
	Leopard cat	*Felis bengalensis*	1.33 ± 0.14 (12)	2.00 ± 0.20 (7)	1.30 ± 0.16 (10)
	Marbled cat	*Felis marmorata*	1.38 ± 0.18 (13)	1.80 ± 0.13 (8)	1.60 ± 0.16 (10)
	Jungle cat	*Felis chaus*	1.25 ± 0.10 (19)	2.10 ± 0.09 (10)	1.70 ± 0.14 (12)
	Large Indian civet	*Viverra zibetha*	1.20 ± 0.08 (25)	1.33 ± 0.12(15)	1.80 ± 0.13(20)
	Himalayan palm civet	*Paguma larvata*	1.20 ± 0.08 (25)	1.33 ± 0.12 (15)	1.60 ± 0.12 (22)
	Yellow throated marten	*Martes flavigula*	2.18 ± 0.17 (17)	1.70 ± 0.20 (12)	2.12 ± 0.21 (17)
	Yellow bellied weasel	*Mastela kathiah* [V]	2.17 ± 0.20 (18)	1.50 ± 0.14(12)	1.80 ± 0.19 (17)
	Siberian weasel	*Mastela sibirica* [V]	0.0(0)	2.0 0± 0.22 (10)	2.40 ± 0.25 (10)
	Beak striped weasel	*Mastela strigidorsa* [V]	0.0(0)	1.50 ± 0.19 (10)	1.90 ± 0.07 (15)
	Beach marten	*Martes foina*	0.0(0)	1.70 ± 0.14 (12)	1.90 ± 0.07 (15)
	Common mongoose	*Herpestes edwardsi*	1.39 ± 0.08 (37)	1.70 ± 0.14 (12)	2.10 ± 0.19 (10)
	Small Indian mongoose	*Herpestes javanicus*	1.80 ± 0.12 (26)	1.80 ± 0.15 (14)	2.50 ± 0.25 (10)
	Otter	*Lutr lutra* [V]	2.24 ± 0.14 (30)	2.20 ± 0.20 (20)	2.40 ± 0.18 (25)
Ungulates	Barking deer	*Muntiacus muntjac*	2.52 ± 0.17 (29)	2.00 ± 0.13 (20)	1.90 ± 0.05 (30)
	Sambar	*Cervus unicolor*	2.52 ± 0.20 (29)	1.80 ± 0.16 (25)	1.80 ± 0.09 (30)
	Moschus	*Moschus moschiferus* [V]	1.75 ± 0.25 (4)	1.33 ± 0.12 (15)	0.0 (0)
	Hog deer	*Axis porcinus* [L]	1.88 ± 0.11 (32)	0.0(0)	2.20 ± 0.13 (20)
	Serow	*Capricornis sumatraensis* [V]	1.50 ± 0.10 (30)	1.80 ± 0.09 (20)	1.60 ± 0.10 (25)
	Goral	*Naemorhedus goral* [L]	1.88 ± 0.09 (34)	1.60 ± 0.15 (15)	2.05 ± 0.04 (20)
	Bharal	*Pseudois nayaur* [L]	0.0(0)	1.70 ± 0.09 (20)	0.0(0)
	Takin	*Budorcas taxicolor* [E]	0.0(0)	1.03 ± 0.07 (15)	0.0(0)
	Yak	*Bos grunience*	0.0(0)	2.50 ± 0.22 (20)	0.0(0)
	Mithun	*Bos frontalis* [V]	6.73 ± 0.26 (72)	5.60 ± 0.22 (10)	6.60 ± 0.40 (32)
	Wild boar	*Sus scrofa*	2.39 ± 0.09 (38)	2.00 ± 0.17 (15)	2.70 ± 0.17 (27)

Rodentia	Porcupine	*Hystrix indica* [V]	2.67 ± 0.29 (24)	2.00 ± 0.12 (15)	2.70 ± 0.11 (20)
	Malayan giant squirrel	*Ratufa bicolor*	2.31 ± 0.17 (13)	2.40 ± 0.16 (10)	2.70 ± 0.20 (15)
	Red-bellied squirrel	*Callosciurus erythraeus*	2.50 ± 0.13 (14)	1.90 ± 0.14 (18)	1.90 ± 0.40 (20)
	Giant flying squirrel	*Petaurista pitaurista*	2.21 ± 0.11 (14)	1.90 ± 0.16 (18)	1.90 ± 0.04 (18)
	Himalayan striped squirrel	*Tamiops macclellandii*	2.13 ± 0.13 (15)	1.70 ± 0.13 (20)	2.20 ± 0.11 (18)
	Bamboo rat	*Cannomys badius*	5.03 ± 0.47 (29)	1.80 ± 0.13 (20)	9.80 ± 0.77 (20)
Primate	Assamese maccaque	*Macaca assamensis* [V]	2.49 ± 0.19 (39)	2.06 ± 0.14 (18)	2.50 ± 0.15 (20)
	Rhesus macaque	*Macaca mulatta* [L]	2.95 ± 0.24 (39)	1.70 ± 0.11 (18)	2.80 ± 0.15 (20)
	Slow Loris	*Nycticebus coucang* [DD]	0.0(0)	0.0(0)	1.20 ± 0.18 (5)
	Caped langure	*Trachypithechus pileatus* [E]	2.70 ± 0.20 (40)	2.50 ± 0.25 (10)	2.33 ± 0.23 (15)
	Hoolock gibon	*Bunopithicus hoolock* [E]	0.0(0)	0.0(0)	1.20 ± 0.18 (5)
Bear	Himalayan Black Bear	*Selanactos thibetanus* [V]	2.33 ± 0.11 (18)	2.50 ± 0.25 (10)	2.13 ± 0.17 (15)
	Sloth bear	*Ursus ursinus* [V]	1.55 ± 0.11 (21)	0.0(0)	0.0 (0)
Pholiodota	Chinese pangoline	*Manis pentadactyla* [L]	1.74 ± 0.13 (18)	1.60 ± 0.12 (15)	1.90 ± 0.05 (30)
Chiroptera	Flying fox	*Pteropus giganteus*	1.73 ± 0.19 (11)	2.70 ± 1.30 (10)	3.10 ± 0.41 (10)
	Short nosed Bat	*Cynopterus sphinx*	3.29 ± 0.28 (21)	1.60± 0.120 (15)	1.90 ± 0.05 (30)

Species categories as Endangered (*E*), Vulnerable (*V*) Lower Risk/ Near threatened (*L*) and Data deficient (*DD*) respectively, On the 2003 IUCN Red List (IUCN 2003)

Extraction of ungulates is carried out more by the Monpa, rodents and primate species by the Apatani. However more number of bear, pholiodota and chiropteran species are extracted by the Nyishi which is followed by the Monpa and the Apatani tribes (Figure 4.5).

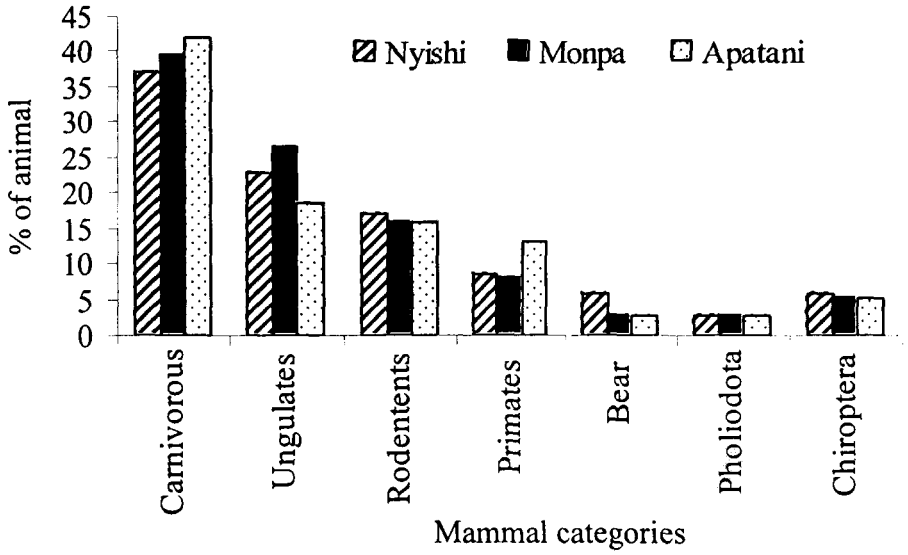


Figure 4.5 Composition of mammalian species extracted by tribal groups

Majority of animal species extracted belong to the threatened categories as per IUCN classification. More than half of the harvested species belongs to the vulnerable category and one fourth to the endangered category. The details of categories of the harvested species are given in Figure 4.6.

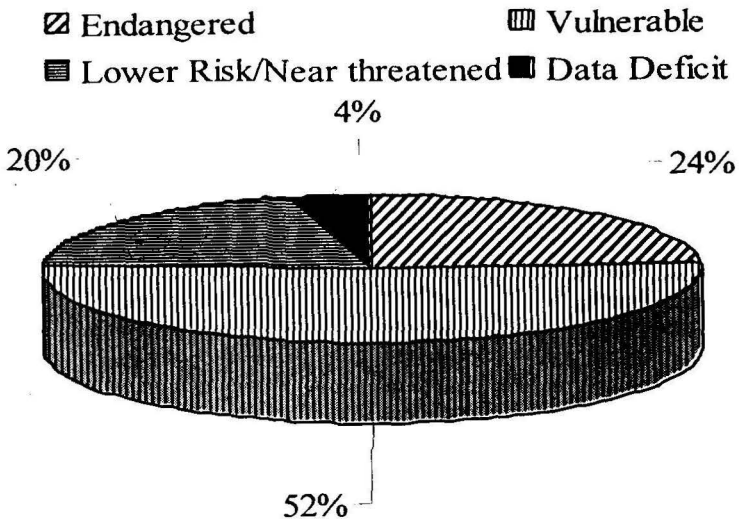


Figure 4.6 Categories of threatened mammals extracted

Birds

All the three tribal groups have extracted 53 species of birds (Table 4.2). Grouping of extracted birds and their composition is given in Figure 4.7. The categories and composition of extracted bird species are: Passeriformes 42%, Ciconiformes 20%, Strigiformes 10%, Buceriformes and Piciformes 8% each, and Galliformes and Cuculiformes 6% each. Passeriformes, ciconiformes and strigiformes combined make more than 70% of the total extraction of birds.

Among the avian species extracted 18 species come under Schedule-I, 34 species in Schedule IV, and one species in Schedule V as per Wildlife (Protection) Act, 1972

(Figure 4.8). As per IUCN Red List (2003) the categories of birds: Endangered (5), Vulnerable (5) Critically Endangered categories (1) are given in Figure 4.9.

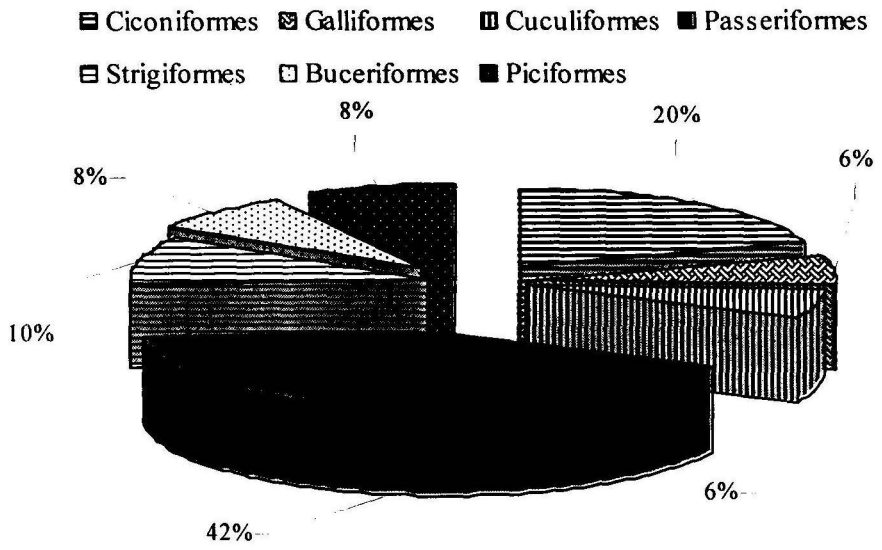


Figure 4.7 Composition of avian groups extracted

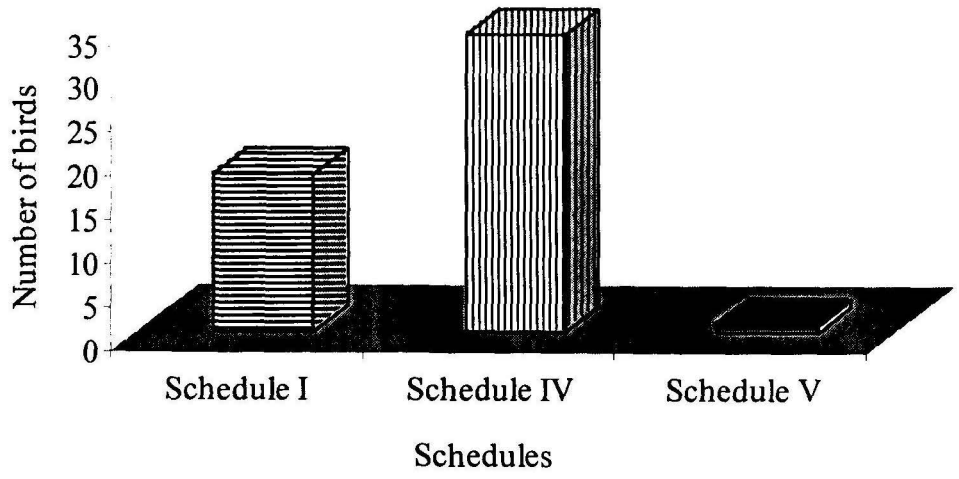


Figure 4.8 Categories of threatened birds as per Wildlife (Protection) Act 1972

Table 4.2 Average number of birds extracted by the Nyishi, Monpa and Apatani tribes (2002-2005).
(Numbers in parentheses are number of hunters)

Family	Common name	*Scientific name*	Number of animal		
			Nyishi	Monpa	Apatani
Ciconiformes	Blyth's baza or brownlizard hawk	*Aviceda jerdoni*	6.0 ± 0.43 (30)	4.5 ± 0.30 (22)	5.6 ± 0.38 (25)
	Indian blackcrested baza	*Aviceda leuphotes*	5.1 ± 0.34 (35)	3.8 ± 0.27 (23)	5.3 ± 0.35 (33)
	Longlegged buzzard	*Buteo rufinus*	6.4 ± 0.29 (35)	4.5 ± 0.39 (22)	6.6 ± 0.31 (34)
	Common buzzard	*Buteo buteo*	4.6 ± 0.36 (36)	3.9 ± 0.25 (23)	4.9 ± 0.35 (35)
	Feather-toed hawk eagle	*Spizaetus nipalensis*	4.3 ± 0.30 (40)	4.8 ± 0.38 (20)	4.7 ± 0.28 (35)
	Crested hawk eagle	*Spizaetus cirrhatus*	4.9 ± 0.30 (40)	5.2 ± 0.40 (21)	5.3 ± 0.32 (32)
	Bonelli's hawk eagle	*Hieraaetus fasciatus*	4.7 ± 0.28 (40)	4.8 ± 0.35 (21)	4.8 ± 0.28 (36)
	Rufous bellied hawk eagle	*H. kieneriii*	4.8 ± 0.23 (45)	5.5 ± 0.37 (21)	5.0 ± 0.28 (35)
	Crested serpeat eagle	*Spilonis cheela*	5.0 ± 0.19 (45)	5.4 ± 0.23 (23)	5.5 ± 0.16 (36)
	Red breasted falconet	*Microhierax caerulescens*	6.3 ± 0.52 (45)	5.4 ± 0.48 (23)	5.8 ± 0.45 (36)
Galliformes	Painted spur fowl	*Galloperdix lunulata*	8.7 ± 0.46 (43)	8.2 ± 0.30 (26)	8.6 ± 0.48 (36)
	Grey jungle fowl	*Gallus sonneratii*	8.2 ± 0.80 (48)	7.0 ± 0.12 (26)	8.3 ± 0.61 (36)
	Red jungle fowl	*G.gallus*	9.0 ± 0.44 (48)	7.0 ± 0.48 (26)	8.2 ± 0.46 (36)
Psittaciformes	Indian red breasted parakeet	*Psittacula alexandri*	3.9 ± 0.28 (35)	4.7 ± 0.28 (25)	4.2 ± 0.29 (34)
	Himalayan slaty headed parakeet	*P.himalayana*	1.9 ± 0.14 (35)	1.8 ± 0.12 (25)	2.0 ± 0.15 (34)
	Lorikeet	*Loriculus vernalis*	2.4 ± 0.10 (37)	2.6 ± 0.10 (25)	2.6 ± 0.10 (34)
Cuculiformrs	Cuckoo	*Cuculus canorus*	3.1 ± 0.15 (43)	3.2 ± 0.21 (27)	3.3 ± 0.16 (35)
	Red winged crested cuckoo	*Clamator coromandus*	2.9 ± 0.13 (43)	3.0 ± 0.19 (22)	3.0 ± 0.13 (35)
	Pied crested cuckoo	*C.jacobinus*	3.3 ± 0.13 (50)	3.4 ± 0.21 (22)	3.5 ± 0.15 (35)
Passeriformes	Indian drongo cuckoo	*Surniculus lugubris*	4.0 ± 0.18 (50)	4.3 ± 0.23 (27)	4.6 ± 0.23 (32)
	Large greenbilled malkoha	*Rhopodytes tristis*	7.0 ± 0.19 (51)	7.2 ± 0.26 (25)	7.3 ± 0.21 (32)
	Black drongo/king crow	*Dicrurus adsimilis*	5.2 ± 0.14 (52)	5.2 ± 0.16 (25)	5.5 ± 0.18 (35)
	Racket tailed drongo	*D. paradiseus*	9.9 ± 0.42 (47)	9.4 ± 0.50 (25)	10.0 ± 0.55 (35)
	Bronze drongo	*D.aeneus*	5.3 ± 0.20 (53)	5.8 ± 0.30 (28)	5.7 ± 0.26 (32)
	Crow billed drongo	*D. annectans*	5.0 ± 0.18 (53)	5.5 ± 0.17 (28)	5.3 ± 0.17 (32)

	Hair crested drongo	*D. hottentottus*	5.4 ± 0.21 (55)	5.5 ± 0.30 (28)	5.3 ± 0.25 (36)
	Yellow billed blue magpie	*Cissa flavirostris*	5.9 ± 0.26 (51)	6.7 ± 0.29 (23)	6.5 ± 0.25 (36)
	Himalayan tree pie	*Dendrocitta formosae*	5.6 ± 0.24 (53)	5.7 ± 0.36 (23)	5.8 ± 0.26 (36)
	Raven	*Corvus corax*	6.0 ± 0.17 (53)	6.6 ± 0.25 (23)	6.4 ± 0.16 (36)
	Jungle crow	*C. macrorhynchos*	*5.0 ± 0.14 (53)*	*5.1 ± 0.25 (28)*	*5.2 ± 0.20 (30)*
	House crow	*C. splendens*	4.9 ± 0.21 (53)	5.3 ± 0.32 (28)	5.3 ± 0.31 (30)
	Black headed yellow bulbul	*Pycnonotus melanicterus*	5.6 ± 0.18 (52)	6.3 ± 0.21 (28)	6.2 ± 0.20 (30)
	Red vented bulbul	*P.cafer*	5.6 ± 0.18 (52)	6.2 ± 0.21 (25)	6.2 ± 0.20 (30)
	Whitecheeked bulbul	*P. leucogenys*	5.6 ± 0.25 (52)	5.9 ± 0.38 (25)	5.8 ± 0.30 (30)
	Striated green bulbul	*P. striatus*	9.3 ± 0.41 (55)	8.6 ± 0.42 (25)	7.9 ± 0.48 (30)
	Black bulbul	*Hypsipetes madagascariensis*	8.0 ± 0.45 (55)	7.5 ± 0.30 (28)	7.6 ± 0.50 (30)
	Redcapped babbler	*Timalia pileata*	7.7 ± 0.46 (55)	7.4 ± 0.61 (28)	7.3 ± 0.59 (30)
	Yellow breasted babbler	*Macronous gularis*	8.6 ± 0.46 (55)	8.5 ± 0.35 (28)	8.5 ± 0.51 (30)
	Slender billed babbler	*Turdoides longirostris*	*8.4 ± 0.42 (55)*	*8.5 ± 0.48 (28)*	*8.6 ± 0.46 (30)*
	Necklace laughing thrush	*Garrulax moniliger*	9.3 ± 0.41 (55)	8.5 ± 0.44 (28)	8.4 ± 0.46 (30)
Strigiformes	Grass owl	*Tyto capensis*	5.9 ± 0.35 (50)	6.8 ± 0.58 (26)	6.8 ± 0.58 (26)
	Forest eagle owl	*Bubo nipalensis*	5.4 ± 0.26 (50)	6.4 ± 0.28 (26)	6.4 ± 0.28 (26)
	Brown wood owl	*Strix leptogrammica*	6.0 ± 0.22 (51)	6.1 ± 0.34 (26)	6.1 ± 0.34 (26)
	Barred jungle owlet	*Glaucidium radiatum*	5.4 ± 0.23 (51)	5.6 ± 0.34 (26)	5.6 ± 0.34 (26)
	Spotted owlet	*Athene brama*	5.1 ± 0.20 (50)	5.9 ± 0.28 (26)	5.9 ± 0.28 (26)
Bucerotiformes	Great hornbill	*Buceros bicornis*	4.8 ± 0.18 (50)	5.0 ± 0.25 (20)	5.0 ± 0.26 (33)
	Indian pied hornbill	*Anthracoceros malabaricus*	6.7 ± 0.18 (50)	6.7 ± 0.27(20)	6.2 ± 0.31 (33)
	Wreathed hornbill	*Aceros undulatus*	6.4 ± 0.14 (50)	6.7 ± 0.23 (23)	6.2 ± 0.26 (33)
	Rufous necked hornbill	*A. nipalensis*	*5.9 ± 0.18 (51)*	*6.4 ± 0.23 (23)*	*6.0 ± 0.28 (33)*
Piciformes	Bluethroated barbet	*Megalaima asiatica*	6.6 ± 0.19 (47)	7.1 ± 0.20 (21)	6.5 ± 0.26 (28)
	Himalayan great barbet	*M. virens*	5.6 ± 0.19 (44)	6.3 ± 0.20 (21)	5.9 ± 0.21 (28)
	Lineated barbet	*M. lineata*	5.1 ± 0.18 (45)	5.3 ± 0.26 (21)	5.4 ± 0.25 (28)
	Indian golden backed woodpecker	*Dinopium javanese*	4.3 ± 0.17 (45)	4.4 ± 0.26 (21)	4.5 ± 0.21 (28)

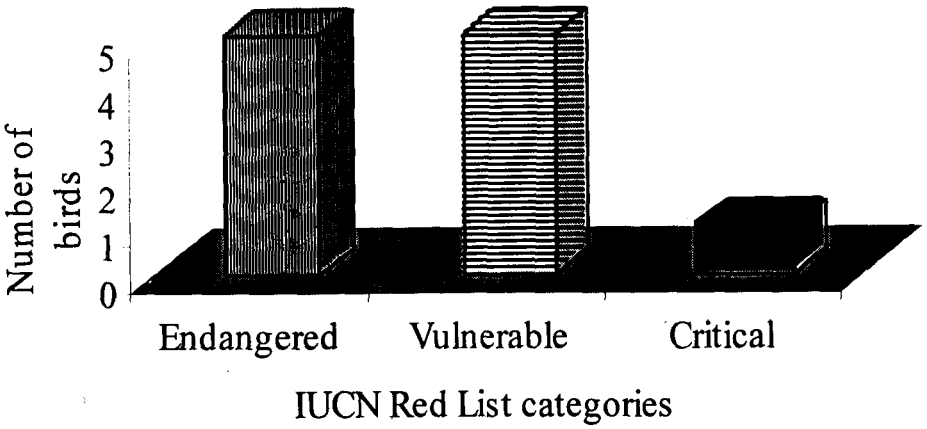


Figure 4.9 Categories of threatened birds as per IUCN Red List Red List (2003)

HUNTING SEASON AND TOOLS

Hunting is intensive during 'jhuming' and after harvesting of the crops mainly in the month of October-December and April-May. September and October are the suitable months for group hunting for all the tribes. However, hunting time and seasons vary with species to species. Capturing and killing of bear, larger cats particularly leopards are carried out during night by the Monpas and the Nyishis. Deer and birds are generally hunted during 'dusk'. The birds like hornbills and hawks are hunted by the Apatani and the Monpa tribes inside the nest during hatching and incubation of eggs. But the Nyishi do not kill hornbills during breeding seasons.

Hunting tools used by hunters

Tribal people have used various types of indigenously designed mechanical trap for hunting.

(a) Bows and arrows: It is a common hunting technique practiced by all the tribes. Different tribes call them differently in their own dialect. Bows and arrows are made by bamboo. The sharp metallic triangular tip on an arrow is smeared with root tuber of *Aconitum ferox*, which is poisonous in nature and immobilizes the animal fast and ultimately kills it (Plate I and II).

(b) Mechanical Traps: Different types of mechanical traps are traditionally used to capture and kill different types of animals such as tigers, deer, rodents and birds. Common mechanical traps used by the tribes are shown in the Figure 4.10, 4.11, 4.12, 4.13, 4.14, 4.15 and 4.16 (Plate I and II).

(c) Guns: Guns are the modern weapon of hunting owned by persons who are politically strong, economically sound and often literate and used by most people of the "basti" in addition to the owner. Both air gun and cartridge gun are used in killing birds and other wild animals (Figure 4.17 and 4.18).

Hunting frequency of different tools used by the Nyishi, Apatani and Monpa tribes have been shown in the Table 4.3. All four different hunting tools viz., gun, bow and arrow, spear and mechanical traps are more effective tools. The gun is the most effective hunting tool. Hunting frequency of the most effective

tool, gun is: 41.3% per year by the Nyishi, 51% by the Apatani and 50% by the Monpa tribe.

Table 4.3 Hunting tools and animal kills (2002-2005)

Hunting tools	Nyishi		Apatani		Monpa	
	No. of kill	% of kill	No. of kill	% of kill	No. of kill	% of Kill
Gun	191.5	41.3	197.0	51.0	157.0	50.0
Mechanical trap	121.5	26.1	140.0	36.3	110.0	35.0
Spear	75.00	16.1	23.5	6.1.0	23.5	7.1
Bow and arrow	75.00	16.1	25.0	6.4.0	23.5	7.1

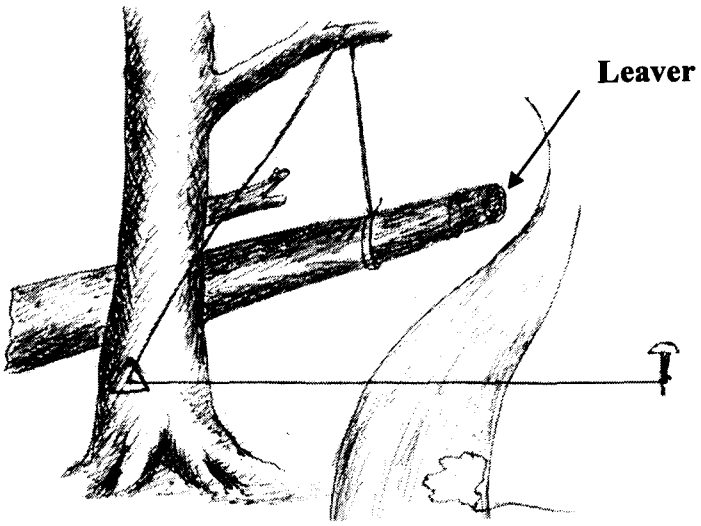


Figure 4.10 Rope trap

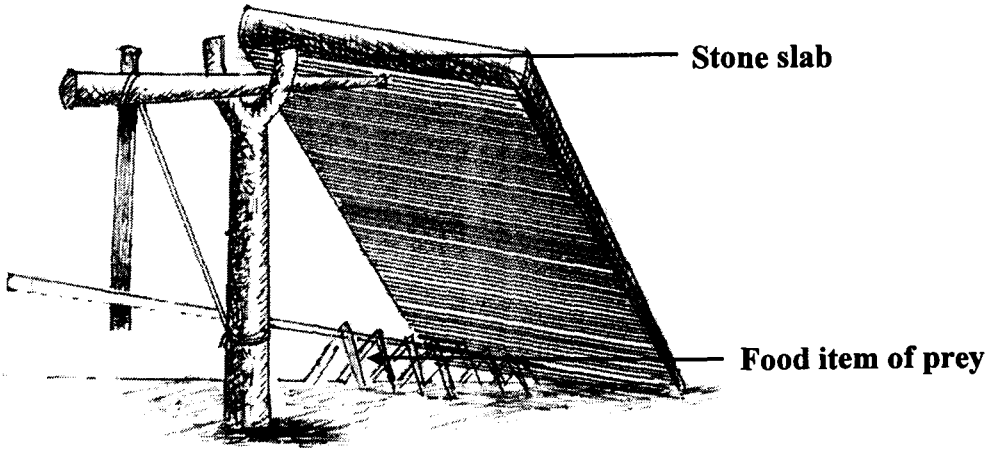


Figure 4.11 Slab trap

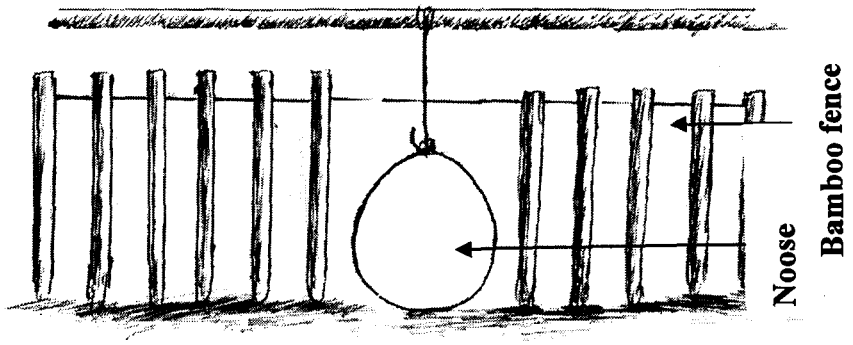


Figure 4.12 Fencing trap

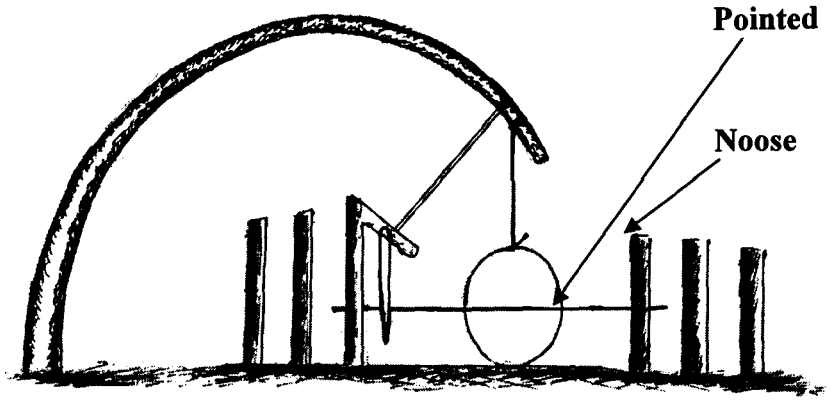


Figure 4.13 'Khama' a fencing trap

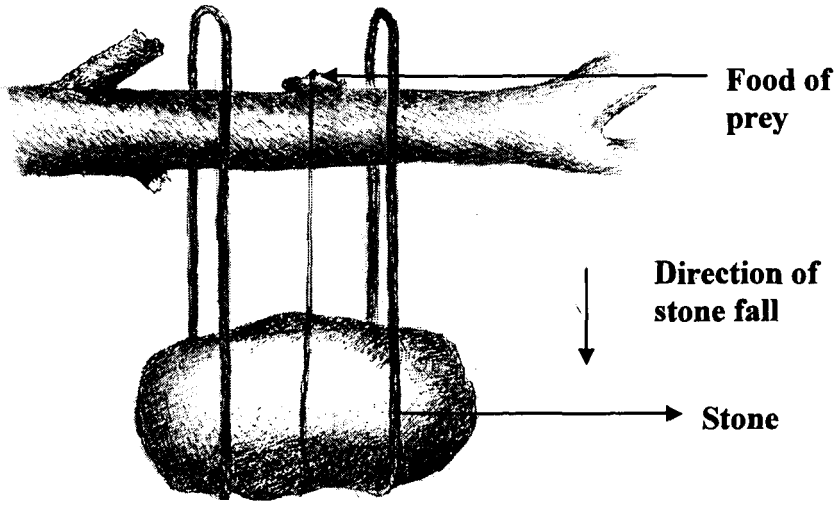


Figure 4.14 Bird trap (Thachar/pigin)

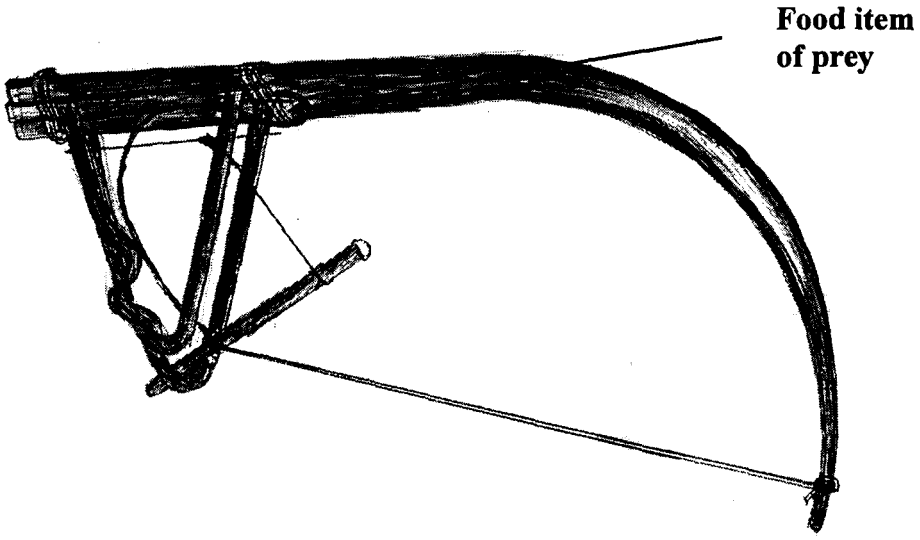


Figure 4.15 Rat trap (Gurung)

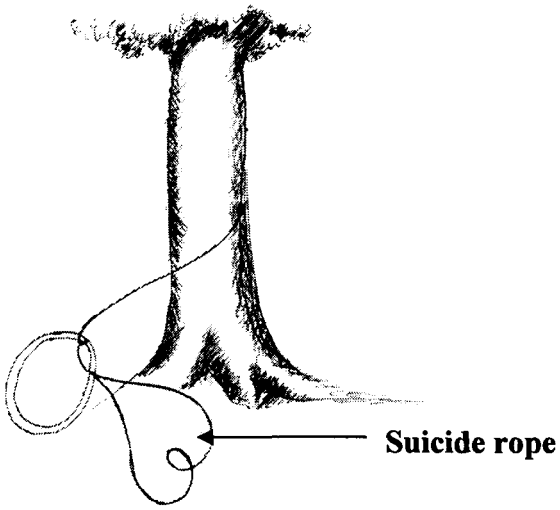


Figure 4.16 Rope trap (suicide rope)

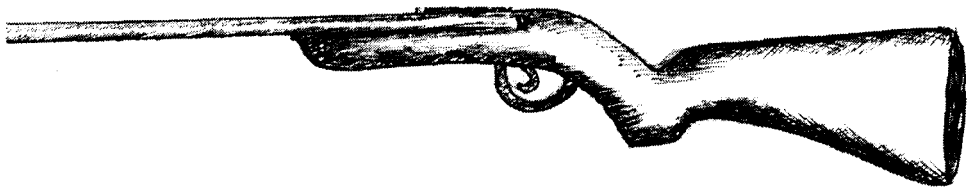


Figure 4.17 Air gun

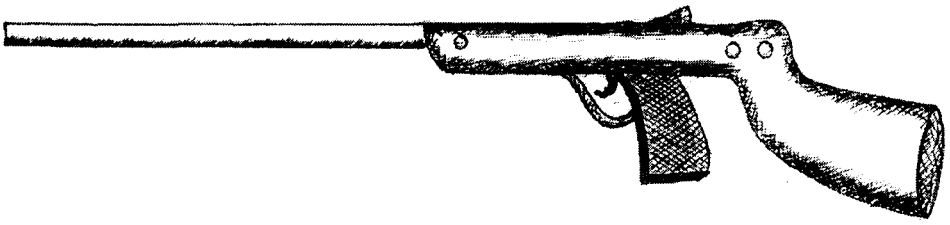


Figure 4.18 Cartridge gun

HUNTING SITE DISTANCES

The distance between village and hunting sites in forest is one of the major factors that influence the frequency of hunting. The distances of villages from their hunting arena have shown negative relationship with hunting frequency. The regression analysis between the hunting frequency and the distance of hunting area in forests from villages shows a significant negative correlation for mammal ($R^2 = 0.79$, $P < 0.001$, df = 29, Figure 4.19) and for bird ($R^2 = 0.68$, $P < 0.001$, df = 29, Figure 4.20) by the Nyishi tribe. The Apatani tribe also shows similar tendency for mammal ($R^2 = 0.72$, $P < 0.001$, d.f = 22) (Figure 4.21), and for bird ($R^2 = 0.86$, $P < 0.001$, d.f = 22) (Figure 4.22). However, the regression analysis is not significant in case of the Monpa tribe for mammal ($R^2 = 0.048$, $P < 0.001$, df =50, Figure 4.23), and for bird ($R^2 = 0.11$, $P < 0.001$, df =50, Figure 4.24).

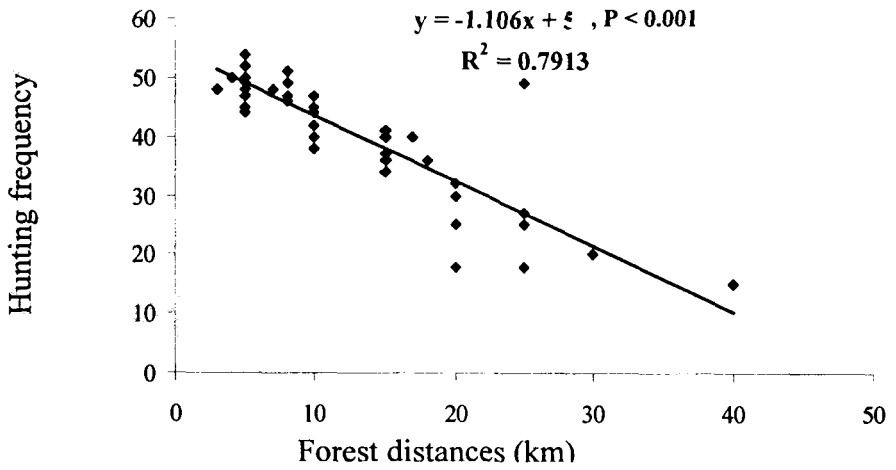


Figure 4.19 Relationship between hunting frequency of mammals and distance of village from hunting area in Nyishi tribe

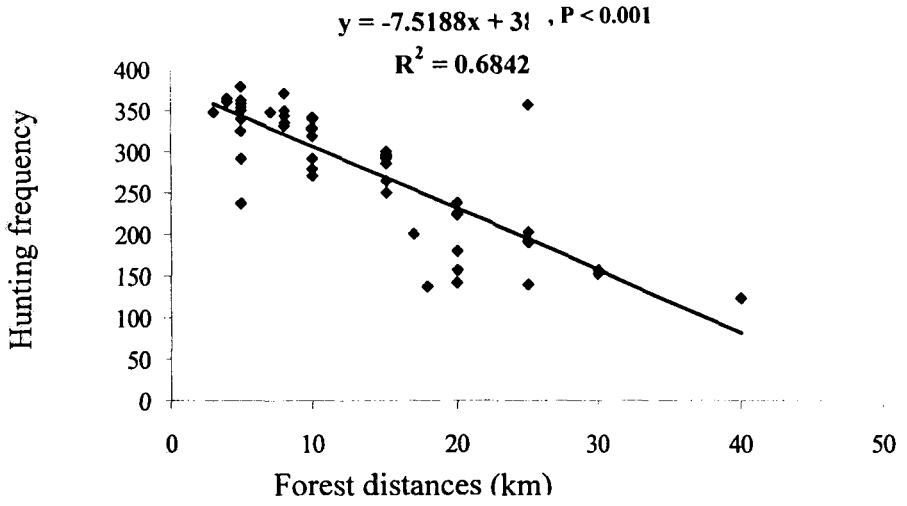


Figure 4.20 Relationship between hunting frequency of birds and distance of village from hunting area in Nyishi tribe

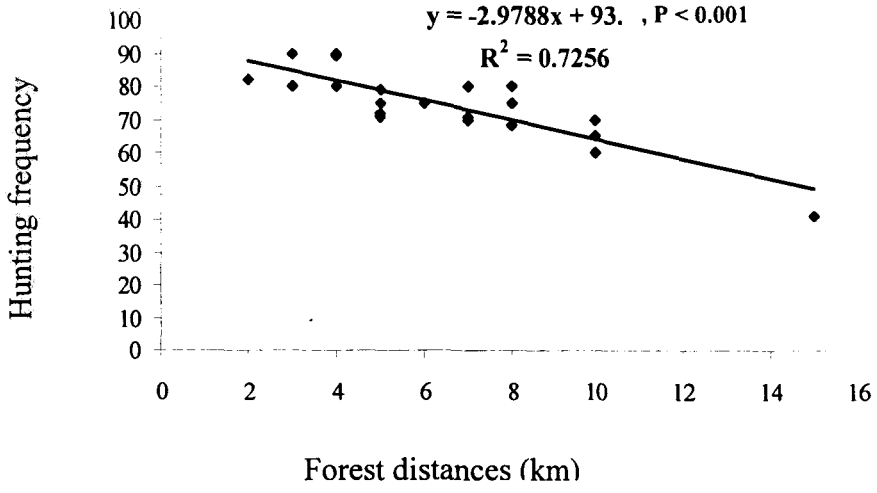


Figure 4.21 Relationship between hunting frequency of mammals and distance of village from hunting area in Apatani tribe

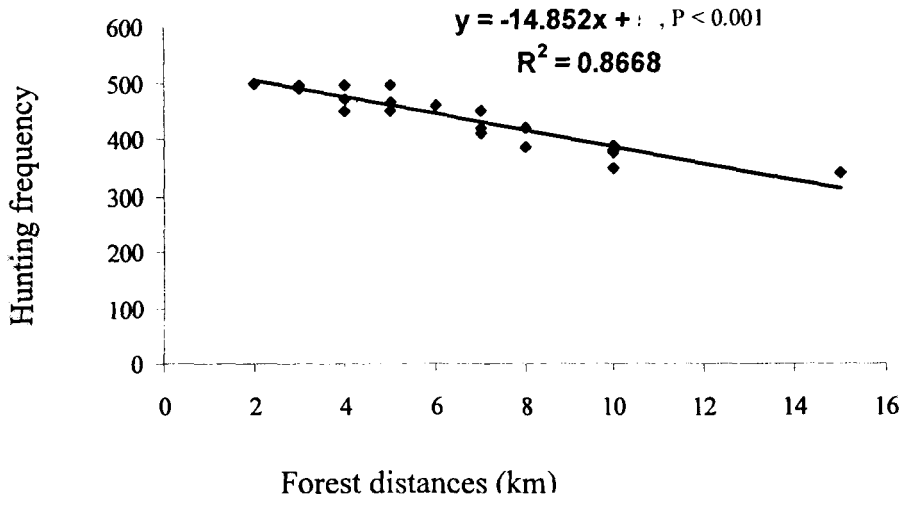


Figure 4.22 Relationship between hunting frequency of birds and distance of village from hunting area in Apatani tribe

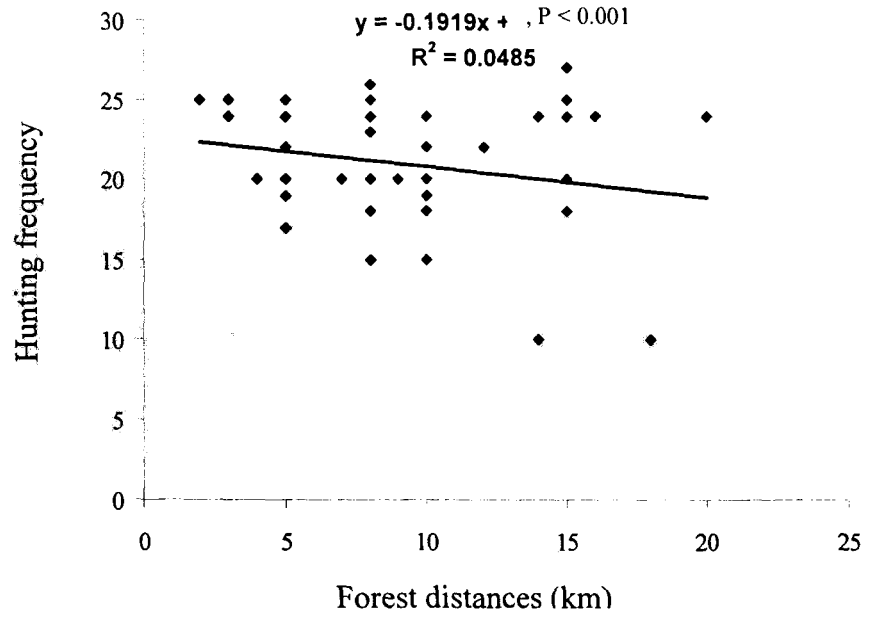


Figure 4.23 Relationship between the hunting frequency of mammals and the distance from the village from hunting area in Monpa tribe

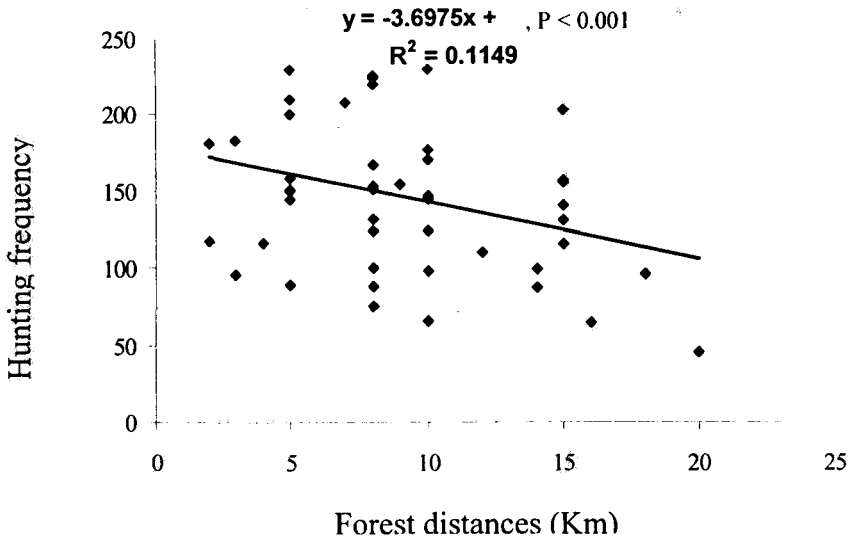


Figure 4.24 Relationship between hunting frequency of birds and distance of village from hunting area in Monpa

FREQUENCY OF HUNTING

Hunting frequency is classified into four categories namely very often, often, sometimes and rarely. The hunters who claim to hunt one to three times per week come under the category of very often. It was found that 30% hunters undertake hunting very often, 21% often, 18.4% hunters sometimes, and 18.4% rarely. Chi-square analysis of hunters motivation in hunting shown significant results, X^2 (4) = 2.89, $P < 0.05$.

The rate of hunting mammals is high among the Nyishi and the Apatani i.e. 2.5 animals/hunter/year as compare to Monpa, 1.9 animals/hunter/years. The rate of

hunting birds is almost similar in all the three tribal groups i.e. 6.1 birds/hunter/year by the Nyishi people, 6.0 birds/hunter/year by the Apatani and 5.8 birds/hunter/year by the Monpa. Thus, the rate of killing is more among the Nyishi and the Apatani tribe hunts mammals more frequently than the Monpa people (Table 4.4, 4.5, 4.6 and 4.7).

REASONS CITED FOR HUNTING

An attempt is made to identify the various causes of hunting of wild animals by the ethnic people. The study reveals that 44% respondents cited utilitarian reasons for hunting such as economic benefit and for food supplements, 18% cited cultural reasons and 18% hunted for enjoyment. But, 19% respondents do not hunt wild animals for personal reason and 1% does not hunt owing to moral or ethical reasons. Chi square analysis of response (positive and negative, yes/no) on hunting of wild animals has been done ($X^2 = 13$, $P < 0.05$, d.f. = 4).

Table 4.4 Number of mammals hunted in study area (2002 – 2005)

Animal categories	Common name	Scientific name	Animal hunted during the period		
			Nyishi	Apatani	Monpa
Carnivores	Tiger	*Panthera tigris*	11	6	0
	Leopard	*Panthera pardus*	16	9	6
	Clouded leopard	*Neofelis nebulosa*	22	13	10
	Leopard cat	*Felis bengalensis*	16	13	14
	Marbled cat	*Felis marmorata*	18	16	15
	Jungle cat	*Felis chaus*	25	20	21
	Large Indian civet	*Viverra zibetha*	30	35	20
	Himalayan palm civet	*Paguma larvata*	30	35	20
	Yellow throated marten	*Martes flavigula*	37	36	20
	Yellow bellied weasel	*Mastela kathiah*	39	30	18
	Siberian weasel	*Mastela sibirica*	0	24	20
	Beak striped weasel	*Mastela strigidorsa*	0	29	18
	Beach marten	*Martes foina*	0	29	20
	Common mongoose	*Herpestes edwardsi*	53	21	20
	Small Indian mongoose	*Herpestes javanicus*	48	25	25
	Otter	*Lutra lutra*	65	60	45
Ungulates	Barking deer	*Muntiacus muntjac*	73	58	40
	Sambar	*Cervus unicolor*	73	55	45
	Moschus	*Moschus moschiferus*	7	0	20
	Hog deer	*Axis porcinus*	60	44	35
	Serow	*Capricornis sumatraensis*	45	40	35
	Goral	*Naemorhedus goral*	64	41	25

	Bharal	*Pseudois nayaur*	0	25	35
	Takin	*Budorcas taxicolor*	0	0	29
	Yak	*Bos grunience*	0	0	50
	Mithun	*Bos frontalis*	491	210	56
	Wild boar	*Sus scrofa*	91	71	30
Rodentia	Porcupine	*Hystrix indica*	64	54	30
	Malayan giant squirrel	*Ratufa bicolor*	30	40	24
	Red-bellied squirrel	*Callosciurus erythraeus*	35	39	35
	Giant flying squirrel	*Petaurista pitaurista*	31	35	35
	Himalayan striped squirrel	*Tamiops macclellandi*	32	40	35
	Bamboo rat	*Cannomys badius*	146	195	37
Primate	Assamese maccaque	*Macaca assamensis*	97	50	37
	Rhesus macaque	*Macaca mulatta*	115	55	32
	Stumped tailed macaque	*Macaca arctoides*	*0*	6	0
	Capped langur	*Trachypithechus pileatus*	108	35	25
	Hoolock gibon	*Bunopithicus hoolock*	0	6	0
Bear	Himalayan Black Bear	*Selanactos thibetanus*	42	32	25
	Sloth bear	*Ursus ursinus*	31	25	18
Pholiodota	Chinese pangoline	*Manis pentadactyla*	33	55	25
Chiroptera	Flying fox	*Pteropus giganteus*	19	31	15
	Short nose bat	*Cynopterus sphinx*	69	58	25
Total			2166	1701	1090

Table 4.5 Rate of Mammal killing

Tribes	Rate of killing
Nyishi	722/year
Apatani	568/year
Monpa	363/year
Total	1,653/year

Table 4.6 Number of birds hunted (2002 – 2005) in the study area

Family	Common name	Scientific name	Frequency of bird hunting		
			Nyishi	Apatani	Monpa
Ciconiformes					
	Blyth's baza	*Aviceda jerdoni*	190	139	99
	Indian black crested baza	*Aviceda leuphotes*	188	174	88
	Long legged buzzard	*Buteo rufinus*	235	225	98
	Common buzzard	*Buteo buteo*	173	171	89
	Feather-toed hawk eagle	*Spizaetus nipalensis*	178	164	96
	Crested hawk eagle	*Spizaetus cirrhatus*	202	169	110
	Bonelli's hawk eagle	*Hieraaetus fasciatus*	195	171	96
	Rufous bellied hawk eagle	*H. kienerii*	224	174	115
	Crested serpeat eagle	*Spilornis cheela*	232	197	124
	Red breasted falconet	*Microhierax Caerulescens*	293	207	124
Galliformes	Painted spur fowl	*Galloperdix lunulata*	389	309	212
	Grey jungle fowl	*Gallus sonneratii*	413	298	183

	Red jungle fowl	*G.gallus*	456	294	181
Psittaciformes	Indian redbreasted parakeet	*Psittacula alexandri*	144	142	117
	Himalayan slaty headed parakeet	*P.himalayana*	70	69	45
	Lorikeet	*Loriculus vernalis*	92	87	65
Cuculiformrs	Cuckoo	*Cuculus canorus*	137	115	87
	Redwinged crested cuckoo	*Clamator coromandus*	129	105	66
	Pied crested cuckoo	*C.jacobinus*	170	122	75
Passeriformes	Indian drongo cuckoo	*Surniculus lugubris*	206	147	116
	Large green billed malkoha	*Rhopodytes tristis*	372	232	181
	Black drongo/king crow	*Dicrurus adsimilis*	281	192	130
	Racket tailed drongo	*D. paradiseus*	481	367	236
	Bronze drongo	*D.aeneus*	292	183	161
	Crow billed drongo	*D. annectans*	271	171	153
	Hair crested drongo	*D. hottentottus*	305	192	155
	Yellow billed blue magpie	*Cissa flavirostris*	311	235	153
	Himalayan tree pie	*Dendrocitta formosae*	307	208	132
	Raven	*Corvus corax*	327	230	151
	Jungle crow	*C. macrorhynchos*	276	156	144
	House crow	*C. splendens*	270	158	147
	Yellow bulbul	*Pycnonotus melanicterus*	302	186	175
	Red vented bulbul	*P. cafer*	302	186	156
	White cheeked bulbul	*P. leucogenys*	299	174	147
	Striated green bulbul	*P. striatus*	525	238	216
	Black bulbul	*Hypsipetes*	451	227	210

		madagascariensis			
	Red capped babbler	*Timalia pileata*	435	220	207
	Yellow breasted babbler	*Macronous gularis*	484	254	238
	Slender billed babbler	*Turdoides longirostris*	476	257	237
	Necklace laughing thrush	*Garrulax moniliger*	525	252	239
Strigiformes	Grass owl	*Tyto capensis*	306	177	177
	Forest eagle owl	*Bubo nipalensis*	280	167	167
	Brown wood owl	*Strix leptogrammica*	315	158	158
	Barred jungle owlet	*Glaucidium radiatum*	282	146	146
	Spotted owlet	*Athene brama*	262	153	153
Bucerotiformes	Great hornbill	*Buceros bicornis*	250	164	100
	Indian pied hornbill	*Anthracoceros malabaricus*	345	203	134
	Wreathed hornbill	*Aceros undulates*	330	205	154
	Rufous necked hornbill	*A. nipalensis*	309	199	147
Piciformes	Bluethroated barbet	*Megalaima asiatica*	320	182	149
	Himalayan great barbet	*M. virens*	256	164	132
	Lineated barbet	*M. lineate*	236	151	111
	Indian golden backed woodpecker	*Dinopium javanese*	200	126	93
	Total		15299	9992	7575

Table 4.7 Rate of bird killing

Tribes	Rate of killing
Nyishi	5100/year
Apatani	3331/year
Monpa	2525/year
Total	10,956/year

DISCUSSION

Hunting of wild animals is common all over the world in tribal inhabiting countries like China, Vietnam, Yunnan, Indonesia, South America, West and Central Africa (Mittermermeir 1997; Daoying 1999; Eudey 1999; Malone *et al.* 2002). This practice is also not un-common in Indian counterparts; northeastern region shows a prominence in it (Harit 2002; Borang 1996; Solanki *et al.* 2002; 2004; Solanki and Chutia 2004). Arunachal Pradesh encompasses large ethnic diversity (Solanki 2002) and all ethnic groups hunt wild animals for food and for their body parts which they use in different socio-cultural, magical and religious practices and also traditional medicines practice.

Hunting and poaching is found to be a seasonal activity, maximum numbers of animals are extracted in winter and pre monsoon season. The agricultural pattern i.e. jhum cultivation, appears to be the deciding factor in hunting intensity. Before the start of agricultural operation, the hunters remain free from other engagements. Categories of animal hunted also depend on season. The hunting frequency of non-human primate, bear and hornbill mainly increases during agricultural operation. Among all the three tribes, the Nyishi tribe is the more extensive jhum cultivator than the Apatani and the Monpa. Therefore, the total number of animals killed by the Nyishi per year is more as compared to that of the Apatani and the Monpa tribes (Table 4.1, 4.4 and 4.5). The Monpa tribe extract more animal species than the other two tribal groups as more animal species diversity exist in their region but the frequency of extraction of animals is more in

case of the Nyishi and that is due to intensive hunting practices than the others (Table 4.1 and 4.2). Hunting of wild animal for trading of bushmeat and their body parts is the prime activity among the local people and has become a way of life in many ethnic groups. Anadu *et al.* (1988) has recorded the species of mammals including primates that are sold for cash money in the local market of South-Western Nigeria. Illegal trade of bushmeat and animal body parts of primates have frequently been recorded in African countries (Anadu *et al.* 1988; Auzel and Wilkie 2000), the situation is not different in north-eastern region in India. Such practices are also frequently observed in Arunachal Pradesh (Dutta 1998, 2000, 2002, 2003; Solanki *et al.* 2002, Solanki and Chutia 2004). Madhusudan and Karanth (2000) have studied the local hunting compatible with large mammal conservation in Western Ghat, India. During the slash and burn cultivation (jhum cultivation) the selling of wild animals mainly wild boar, deer, porcupine, sometimes civet, primates and bear meat is frequent in local markets of Arunachal Pradesh. Studies of hunting in the Peruvian Amazon have shown that hunters prefer large bodied mammals and mammals with high economic value (Bodmer's 1995, de Thoisy *et al.* 2000, Cowlishaw and Dunbar 2000). In Arunachal Pradesh all the Nyishi, the Apatani and the Monpa tribes have selected medium sized animal, preferably ungulates for meat. The rate of loss of mammals and birds estimated due to these practices in the tribal groups are 1653 and 10,956 per year, respectively. The contribution of the Nyishi in loss of animal diversity is maximum i.e. 722 mammals and 5100 birds/year followed the Apatani and the

Monpa where the loss of species is 568 and 3331 individuals/year and 363 and 2525 individuals/year respectively (Table 4.5 and 4.7) (Plate VI and IX).

Various other factors associated with life style and their use values in tribal communities in Arunachal Pradesh also play a pivotal role. The socio-cultural, magical and religious and therapeutic activities prevailing in the ethnic groups and the use values of particular animal categories are most common reasons for hunting. Sacrifice of animals in graveyard, bride prize of marriage ceremonies are the common example of cultural practices of both the Nyishi and the Apatani tribes. The Monpas has different cultural and religious back ground because of their belief in Buddhism. They are different from the other two groups in use pattern of animals and their body parts. Therapeutic uses of particular animals and their body parts such as the musk of musk deer, the gall bladder of bear and non-human primates used by all the Nyishi, the Apatani and Monpa tribes are common probably due to indigenous knowledge system. These factors lead to the hunting of wild animals in the regions.

A large number of mammals and birds mainly Galliformes are hunted in the western Himalaya and many of these are of conservation concern (Fuller & Garson 2000; Fuller *et al.* 2000; Bird Life International 2000; IUCN 2003). Out of the 43 mammalian species hunted by the tribal communities in Arunachal Pradesh, twenty four (56%) species fall under the Endangered, the Vulnerable, the Lower Risk/Near threatened and the Data deficient category as per IUCN Red List (IUCN 2003). Therefore the species under these categories deserve more

conservation concern. The Endangered and the endemic species, like takin (*Budorcas taxicolor*) are recorded to be hunted in nearly 50% of the Monpas in Tawang.

The gun, bow and arrow, and some mechanical traps are the most widely used method of hunting (Plate I and II). Alvard (1995) has stated that the change over the technical weapon like shot guns in place of traditional hunting tools has often been proved as one of the factors contributing to over-hunting. Changing technology and its easy access with no accountability imposed on the user one the major threats for wild animals (Halford *et al.* 2003). Jhuming activities are not only causing loss of habitat but also altering living environment hence forcing animals to come out in open where they become easy prey to hunter. Eves *et al.* (2002) in their studies in Congo Basin have reported that habitat loss is the primary cause of wildlife extinction, while hunting for commercial purposes has become the immediate threats to the future of wildlife in Congo Basin. Ellis (1999) has also recorded that hunting of primates for food poses the greatest threats to Gorilla species of West and Central Africa.

Ecological impact of hunting

Redford (1992) has described the empty forest syndrome as a complete phenomenon of habitat depletion as well as hunting of large animals. It is applied in both forest as well as terrestrial ecosystem. The role of frugivorous animals in seed dispersal as herbivory in pollination and prey predation relationship is well studied by Simonetti 2000. In the present study it is observed that various kinds of

herbivorous animals mainly the deer group and the frugivorous such as non-human primates, chiropteran and other bird species like hornbill are mostly hunted. The removal of such species will have a serious impact on genetic diversity, regeneration of tree species and ecosystem as a whole. The genetic variability of trees in the habitat where primates are found will be significantly higher than the habitat where the primates have been eliminated by hunting with other animals (Vo Halle 2002). Thus, hunting of animals, particularly primates and hornbills will have greater impact on the animal genetic diversity and population structure of plants in the ecosystem at large and the survival of the species as such on long term basis. As has been predicted, when any link in the food chain is eliminated, the whole system will collapse in course of times.

Extraction of herbivorous animals such as deer has another ecological impact. This group of animals has been providing a prey-predator relationship with top carnivorous animals mainly tiger, leopard etc. Species being hunted are the main prey to wild predators. So the reduction of prey base will reduce the survival possibility of natural predator. The improper prey predator ratio leads to conflict with human being. These carnivores resort to domestic animal for food and hence get exterminated. The negative impacts of hunting on animal populations are greatly increased when other anthropogenic activities like deforestation and habitat fragmentation bring addition pressure on animals. Animals become more vulnerable to hunting when available habitat is reduced and access by hunters to forest increases (Mittermeier and Coimbra-Filho 1977; Cormier 2000).

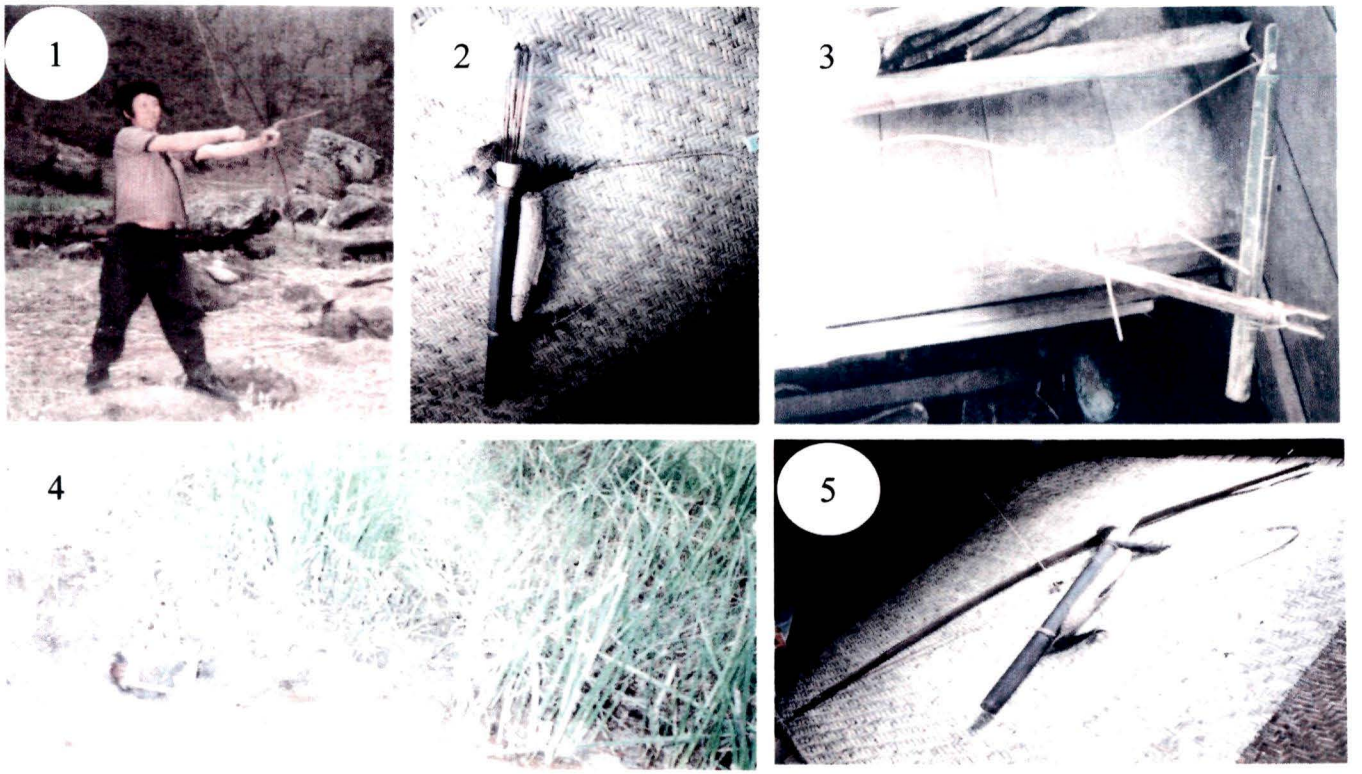


Plate I: Hunter and hunting traps

1) Professional hunter of Monpa tribe, 2) Arrow, 3) Bird and rat trap, 4) Bird in trap and 5) Bow and arrow.

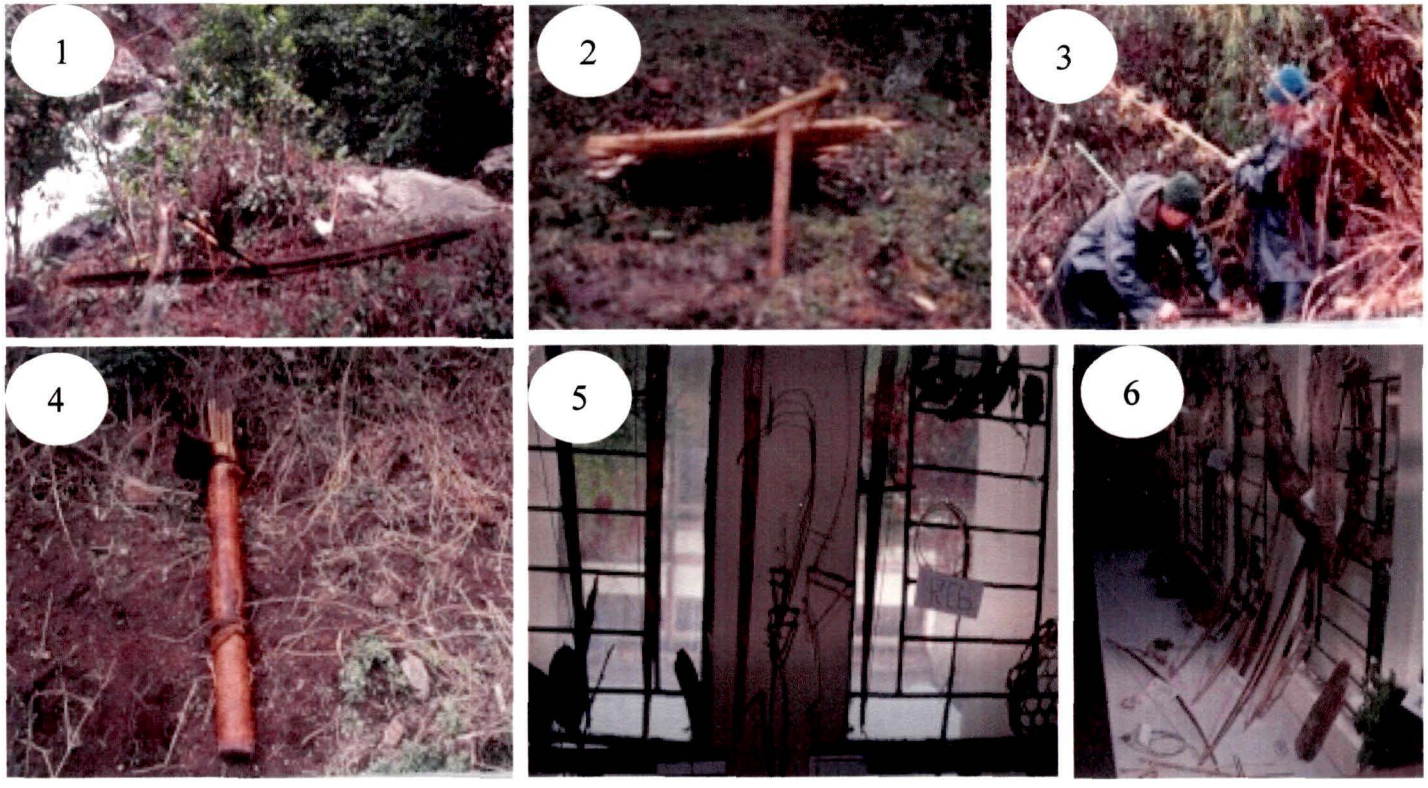


Plate II: Different types of indigenous traps

1) Big bow in action at hunting site, 2) Mat trap, 3) Hunters on trap making, 4) Arrows in quiver on hunting site and 5) and 6) Bird and rat traps in museum.

CHAPTER 5

USE OF ANIMALS FOR THERAPEUTIC PURPOSES

Ethnomedicine is a branch of traditional medicine which deals with plants, animals and minerals, *etc.* and their use in the treatment of various diseases and ailments (Werner 1970). Janes (1999) define the traditional medicine as the wide range of diagnostic and therapeutic interventions by non-biomedical health care practitioners. Traditional medicines and their practitioners contribute to the cultural expressions through the experience, practice, interpretation, and management of illnesses. It includes indigenous beliefs, concepts, knowledge and practice prevailing among the ethnic people for preventing, lessening or curing disease or ailment (Young 1983). Traditional medicinal systems play a key role in health care around the world and provide health care to more than 80 % of the world's population (Anon. 1998).

Modern medicines are asserted to be scientifically and widely accepted as the mainstream medicines, however, the traditional medicines are approved in many countries and therefore doctors have not only good understanding of modern medicine system but also in the traditional system of medicine. Modern medicine, also known as conventional medicine in US (Ho 2001); practitioners are trained in the organized institution such as universities, medical colleges/schools and hospitals. The term "complementary and alternative medicine" reflects the nature of treatment that it complements modern medicine, or used as an alternative. It is not recognized as premier medicine system and hence not taught in institutions

but considered synonymous with traditional medicine as "unconventional medicine" (Jonas 1998; Zollman 1999).

Zootherapy is the treatment of diseases by the use of medicines that are obtained from the animals and their body parts. Marques (1994) has explained zootherapy as "all human cultures that present a structured medical system utilize animals as medicines." Such a statement forms the basis of his 'zootherapeutic universality hypothesis.' Indeed, animals are therapeutic arsenals that have been playing significant roles in the healing processes, magic rituals, and observing religious practices by the people in the different continents. The use of animals and animal body parts in traditional medicine is not new. It has been used by different ethnic group across the world. Various national and international news papers like Hong Kong Standard (17th March 1994), International Herald Tribune (8th April 1994) Sunday Morning Post (10th April 1994), and Eastern Express (23rd April 1994) have published the use of rhinoceros horn, bone and claws of tiger in Traditional Chinese Medicines (Anon. 1998). The consumptive use values of animals have been shown both in indigenous and Western societies all over the world (Gudger 1925; Conconi and Pino 1988; Antonio 1994; Marques 1995; van Huis 1996; Jackson 1998; Costa-Neto 1996, 1999a, 1999b, 2000, 2003, 2004). Some authors have pointed out that animal-based medicines have been in use since antiquity (Weiss 1947; Angeletti *et al.* 1992; Rosner 1992; Costa-Neto 2003).

Since uses of plants for therapeutic purposes was well known in ancient time and still use of plants for health care is more popular. Studies on zootherapy have

recently stimulated the interest in many researchers from different disciplines and sought for compounds with pharmacological action (Werner 1970; But *et al.* 199; Faulkner 1992; Lazarus and Atilla 1993). This interest increases when it is considered that the annual global trade in animal based medicinal products accounts for billions of dollars per year (Kunin and Lawton 1996). World Health Organization has selected 252 essential chemicals which have been selected for therapeutic purposes; of them 11.1 % are plant origins, 8.7% come from animals (Marques 1997). Animal derivatives may bring considerable benefits to both producer and user in terms of monetary value and welfare to their society. The use of insects in the therapeutic activities is termed as entomotherapy (Costa-Neto 2003). Although entomotherapy is an ancient practice, nevertheless, little is known in the academic world. Only few authors have given the account of the use of insects as medicines (Antonio 1994; Fasoranti 1997; Alexiades 1999; Zimian *et al.* 1997; Green 1998; Namba *et al.*1998; Maya 2000; Costa-Neto 2003). They have been used live, cooked, grounded, in plasters, and in ointments as curative, preventive medicines as well as in magical and rituals. Compounds like terpenoids (triterpenoids and steroids, carotenoids, iridoids), sugars, polyols and mucilages, saponins, polyphenolic glycosides, quinines, anthraquinone glycosides, cyanogenic glycosides and alkaloids are the important compounds derived from the insects' body and used as ethno medicine (Andary *et al.* 1996). Kunin and Lawton (1996) have recorded the promising anticancer drugs, isoxanthropterin and dichostatin have been isolated from the wings of Asian sulphur butter flies (*Catopsilia crocale*, belongs to family pieridae) and from the

legs of Taiwanese stag beetles (*Allomyrina dichotomus* of Scarabaeidae family) respectively. Costa-Neto (2003) has reported that Cockroach (*Periplanata americana*) and other insects are good for Asthma.

The use of traditional medicine derived from different categorizes animals is common in India. Tiger bone, horn of rhinoceros and wild buffalo are commonly used in traditional Chinese medicine (Jackson 1998; Barua 1998). The loss of animal resources due to therapeutic activities has been studied by various authors in African countries (Adeola 1992, Costa-Neto 1996, 2002, 2004; Costa-Neto and Olivera 2000b). Use of fruit bats (*Latidaens salimalii*; *Pteopus fanulus*; *P. hypomelanus*; *P. melanotus*,) to cure headache and female ailment is common in India and other South East Asian countries (Anon. 2003). People of North Eastern Region also use animals and animal body parts in making traditional medicine (Lalramnghinglova 1999; Harit 2000, 2001, 2002; Anon. 2003). Tribal groups in Arunachal Pradesh do utilize the animals and animal body parts as traditional medicine (Solanki and Chutia 2004, Solanki *et al.* 2005).

Such zotherapeutic application has not been studied in north-eastern region in general and in Arunachal Pradesh particularly in a systematic manner. In this study an attempt has been made to record the use of animals and animal parts in traditional medicine, use values of different categories of animals and loss of animal in the region due to these practices. The information thus gathered will also be useful in conserving the biodiversity of the region.

MATERIALS AND METHODS

Questionnaire based information are collected about the animal based traditional medicine system and therapeutic activities prevailing among the Nyishi, Monpa and Apatani tribes. The groups of animals taken by the people into consideration are dependent upon availability. Therefore, the easily available animals belong to arthropods including insects, mollusks reptiles, birds and large mammals are given priority. 100 (70 men and 30 women) persons of each ethnic group have been interviewed on the basis of the questionnaire (Annexure I) prepared. The people interviewed are mostly local healers, herbalists, elders, farmers and midwives. Special attention has been given on methods of processing, since information on this aspect will indicate how a given folk medicine is therapeutically efficient in terms of the right ingredient, the proper dose. The informations are also collected about the animal species and its body parts used in zootherapy, and mode of application and administration of the folk medicine. Data collection has been organized in such a way so that people's utilitarian knowledge regarding the use of animal resources as folk medicines can be highlighted. By using this kind of approach, ethno-biologists can record the native's knowledge in the way they organize, perceive and use universally and not by imposing a Western understanding (Posey 1986). The number of animal species utilized for therapeutic purposes are categorizes as insects mollusks, fishes, reptiles, birds and mammals, etc.

The use-value of each animal is calculated on modifying the following equation:

$$UV = \frac{(\sum RM \times C)}{N}$$ (Phillips and Gentry 1991)

Where, UV = Use Value Index,

RM= the total number of body parts extracted (use) from individual animals,

C= the number of times which a particular animal has been reported to be utilized,

N=the total number of informants questioned about Zootherapy

The species utilized in therapeutic purposes are identified by cross-checking of the vernacular names given by local folk with English names and reconfirmed with the help of reference, guide, manuals and books on the category of animals.

RESULT

Therapeutic use of animals

The use of animals for the therapeutic purpose is one of the most consistent cultural practices observed by all tribal people in the northeastern region. Mini-faunas include annelids, arthropods (mainly insects), mollusks, and lower vertebrates like fishes and amphibians; larger faunas including reptiles, birds and mammals utilize for the therapeutic purposes are also recorded. The faunal species extracted for the therapeutic activities have been quantified and expressed in Figure 5.1. The faunal categories utilized widely for the therapeutic purposes are mammals (48%), birds (28%), insects (17%), and other categories were used

in smaller quantity. The mammalian species are harvested for therapeutic uses by different tribal groups studied during this period (2002-2005) given in the Table 5.1 (Plate III).

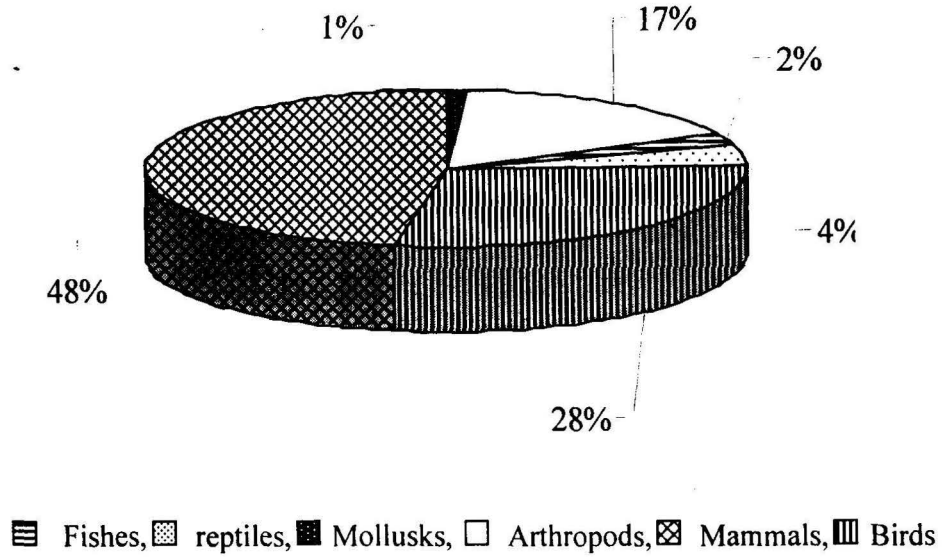


Figure 5.1 Percentage of different animal groups utilized for therapeutic purposes

The mammalian species harvested/killed for the therapeutic purposes by all the three tribal groups are given Figure 5.2. Among these the maximum species are the carnivorous (38%), followed by ungulates (21%), rodentia (15%), primates (13%), bear and chiroptera (5%) each and pholiodota is least harvested (3%) for therapeutic purposes. Harvesting of mammalian group by the three tribal groups viz., the Nyishi, the Apatani and the Monpa is given in the Table 5.1. The Pattern of extraction of mammalian groups is similar among the three tribal groups. However, the Apatani extracts carnivores and primates and the Monpa extracts

ungulates more than others the two tribal groups. Other mammalian groups harvested by all the three tribal groups are nearly equal.

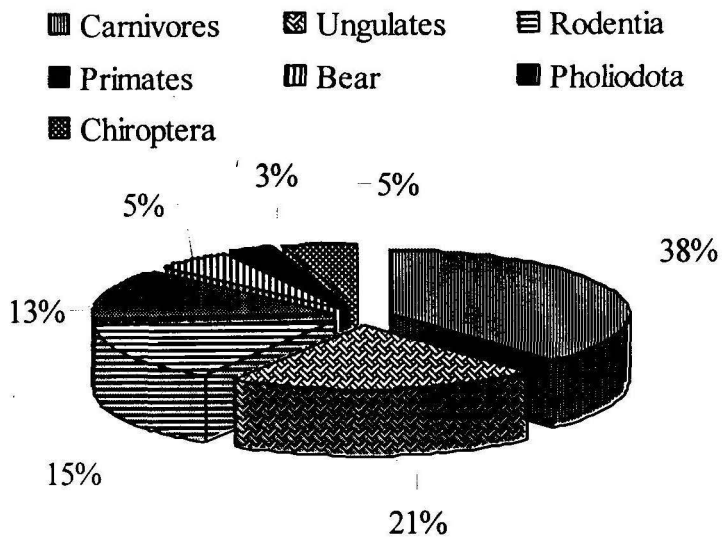


Figure 5.2 Percentage of various mammalian groups harvested in study area

Table 5.1 Mammalian groups harvested for therapeutic purposes

	Animal harvest (%)		
Animal Categories	Nyishi	Monpa	Apatani
Carnivores	36%	35%	40%
Ungulates	23%	25%	19%
Rodentia	17%	17%	16%
Primate	9%	10%	14%
Bear	6%	3%	3%
Pholiodota	3%	3%	3%
Chiroptera	6%	7%	5%

Threatened species as zootherapeuticals

A total of 35 different species of mammals are recorded to be utilized by the tribal groups for the therapeutic purposes (Table 5.2). Out of 35 animal species utilized

as source for the therapeutic activities by the indigenous people of the Arunachal Pradesh, 18 species belong to the threatened categories as per the IUCN Red List 2000 and Wildlife (Protection) Act 1972. Among the threatened categories of mammalian species, 22% belongs to the endangered category, 50% to the Vulnerable, and 22% to the Lower Risked category (Figure 5.3).

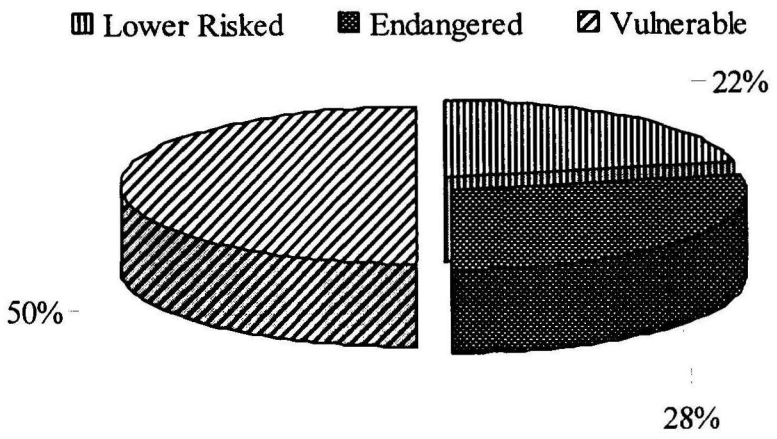


Figure 5.3 Percentage of various threatened categories of the mammals used for therapeutic activities

It is reflected from this study that the entire range of mammalian species killed (Table 4.1) are not used in traditional medicine system by all the tribal groups except the Nyishi tribe. The details of mammalian species utilization in therapeutic activities are shown Figure 5.4 to 5.6. The Nyishi people killed /extracted 35 mammalian species and utilized all of them for therapeutic purposes, the Apatani tribe has kill a 39 mammalian species and utilized 35 species only whereas the Monpas have utilized 29 mammalian species in therapeutic activities out of 38 killed (Table 4.1 and 5.1).

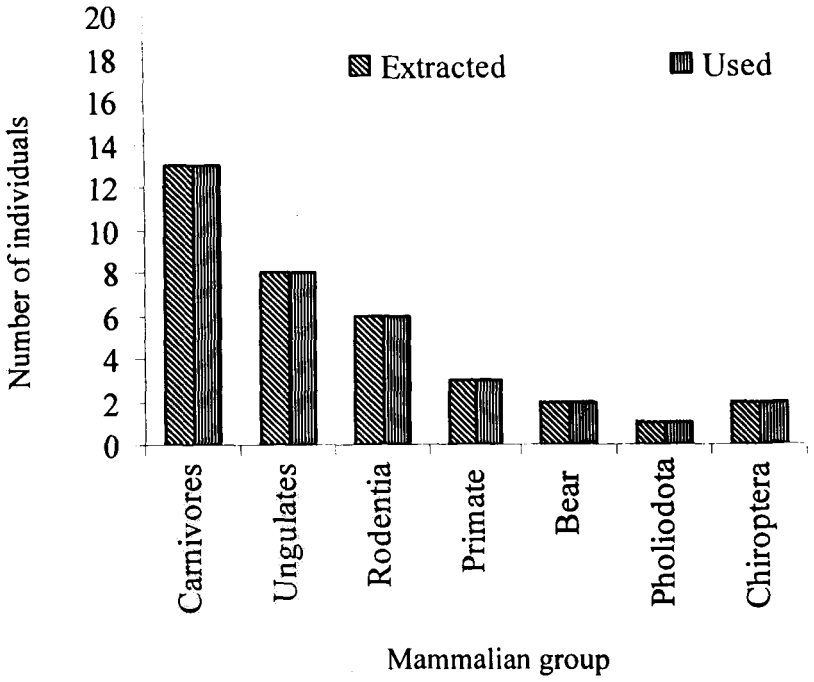


Figure 5.4 Number of various mammalian groups extracted and used for therapeutic purposes by the Nyishi tribe

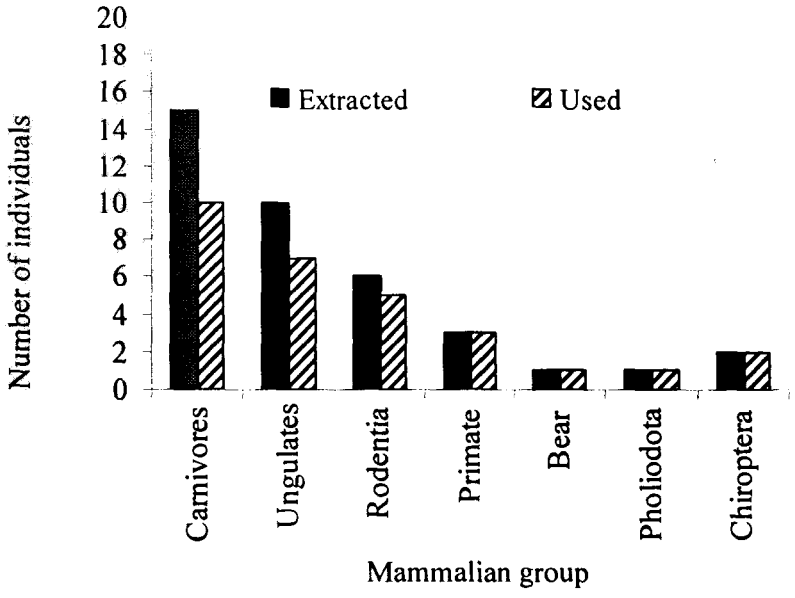


Figure 5.5 Number of various mammalian groups extracted and used for therapeutic purposes y the Monpa tribe

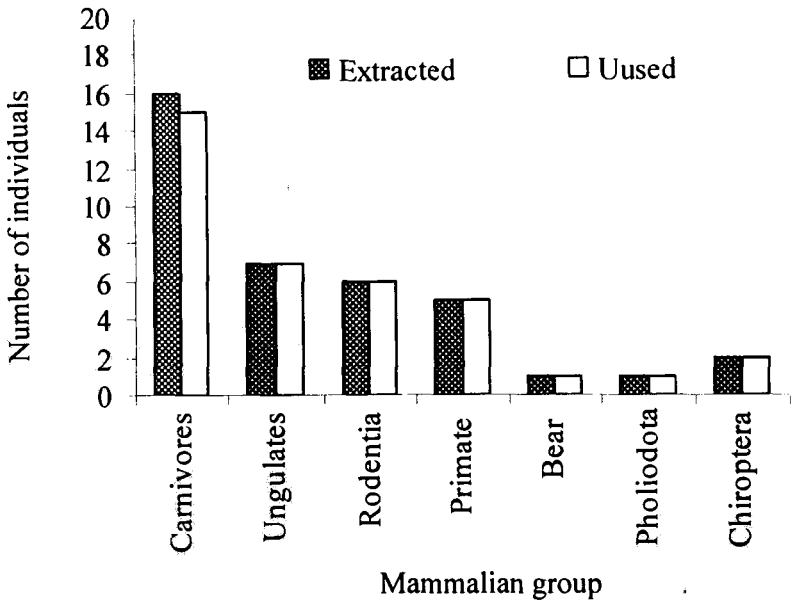


Figure 5.6 Number of various mammalian groups extracted and used for therapeutic purposes by the Apatani tribe

Birds are also utilized in the traditional therapy. The uses of different avian species by different tribal groups under this study are also given in Table 5.2. The result indicates that the Passeriformes are used intensively by all the tribes ranging from 29-31% followed by Ciconiformes 21-28%. The use of Strigiformes, Buceriformes, Piciformes, Psittaciformes varies from 6-17% in different tribal groups. Galliformes is used least 5% (by the Nyishi), 3% (by the Apatani) but no species in this group are utilize by the Monpa tribe for therapeutic purposes. The details of use pattern of avian groups by all the three tribal groups are given in Figure 5.7, 5.8 and 5.9.

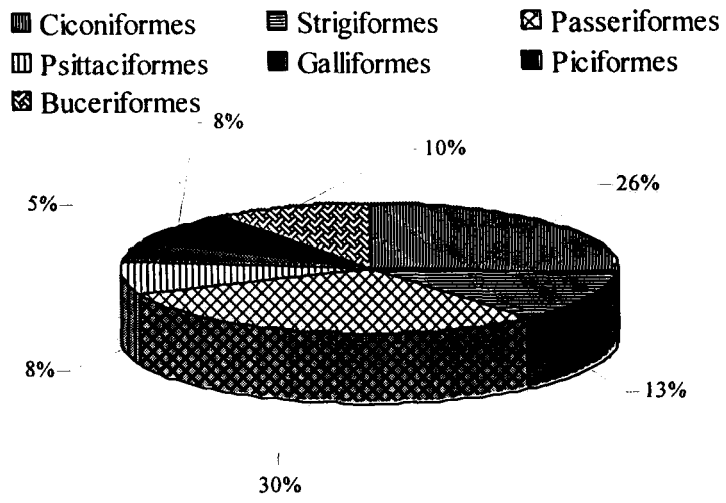


Figure 5.7 Percentage of different categories of birds used by the Nyishi tribe for therapeutic purposes

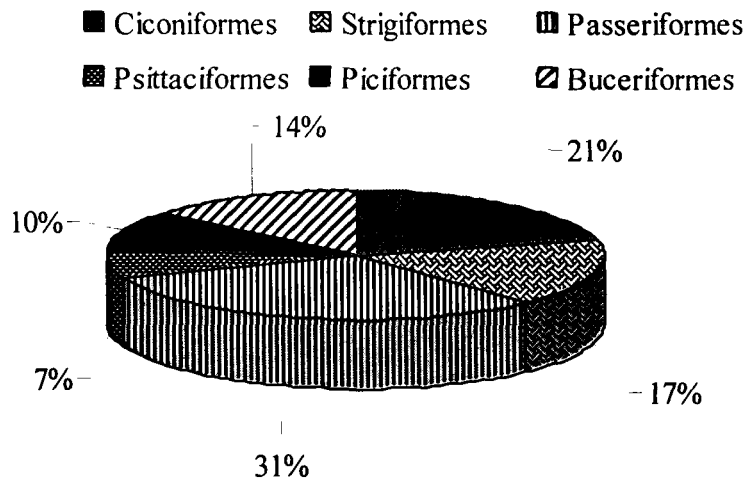


Figure 5.8 Percentage of different categories of birds used by the Monpa tribe for therapeutic purposes

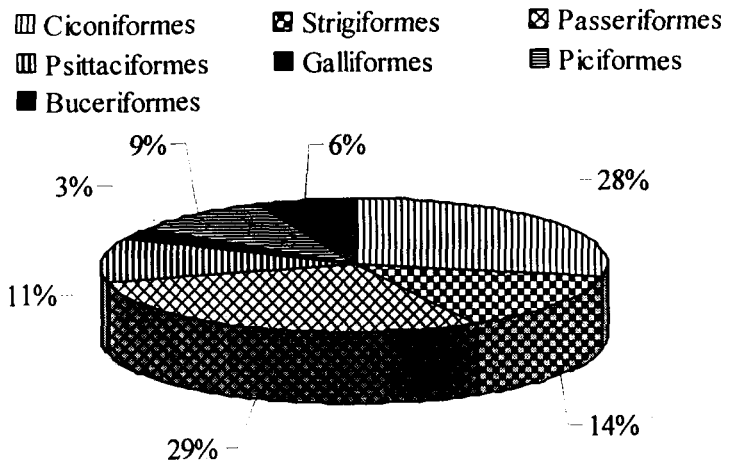


Figure 5.9 Percentage of different categories of birds used by the Apatani tribe for therapeutic purposes

Like mammals, all bird species extracted by tribal people are not used for therapeutic purposes. All the three tribes have extracted 53 bird species (Table 4.2). Out of them, the Nyishi people utilize 39 species, the Apatani people utilize 38 species and the Monpa people utilize 29 species in their traditional medicine. Details of avian groups extracted and utilized by the tribes are given in Figure 5.10, 5.11 and 5.12.

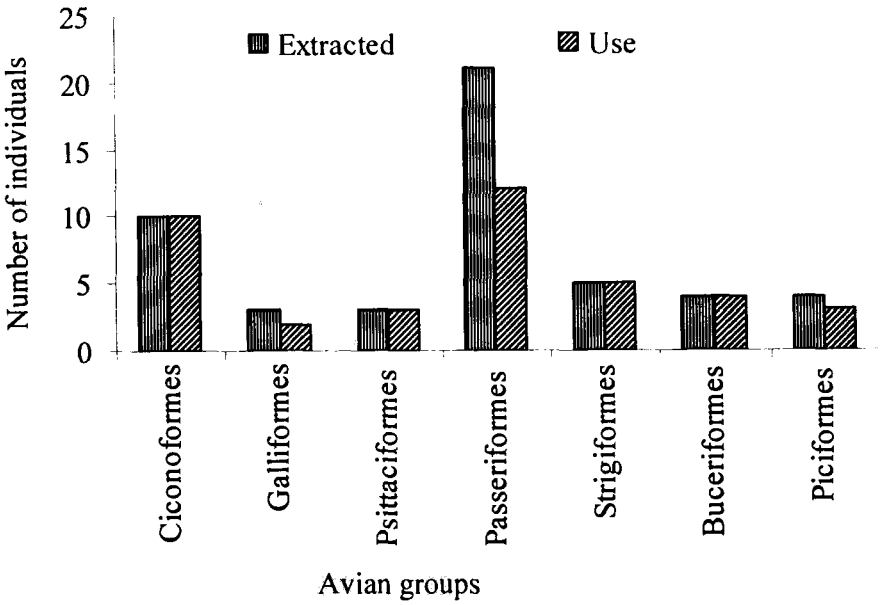


Figure 5.10 Number of birds extracted and used for therapeutic purposes by the Nyishi tribe

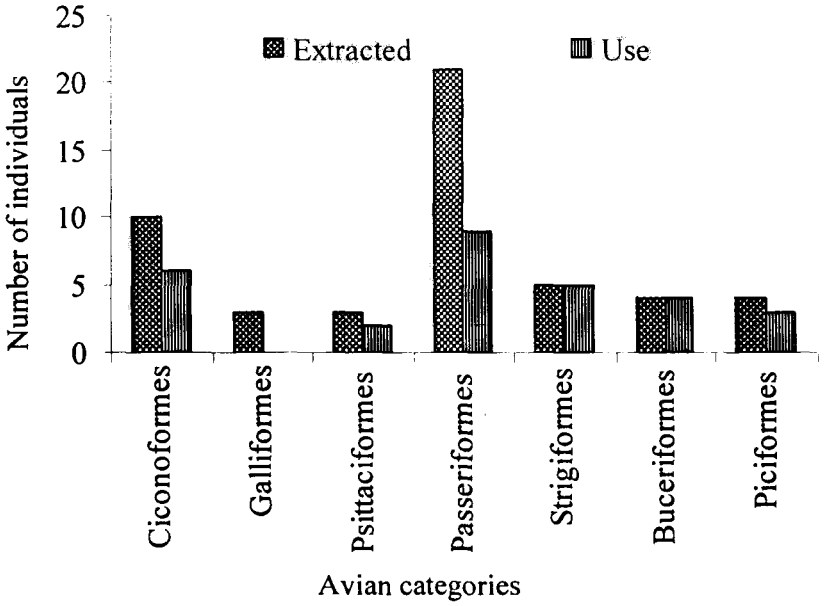


Figure 5.11 Number of birds extracted and used for therapeutic purposes by the Monpa tribe

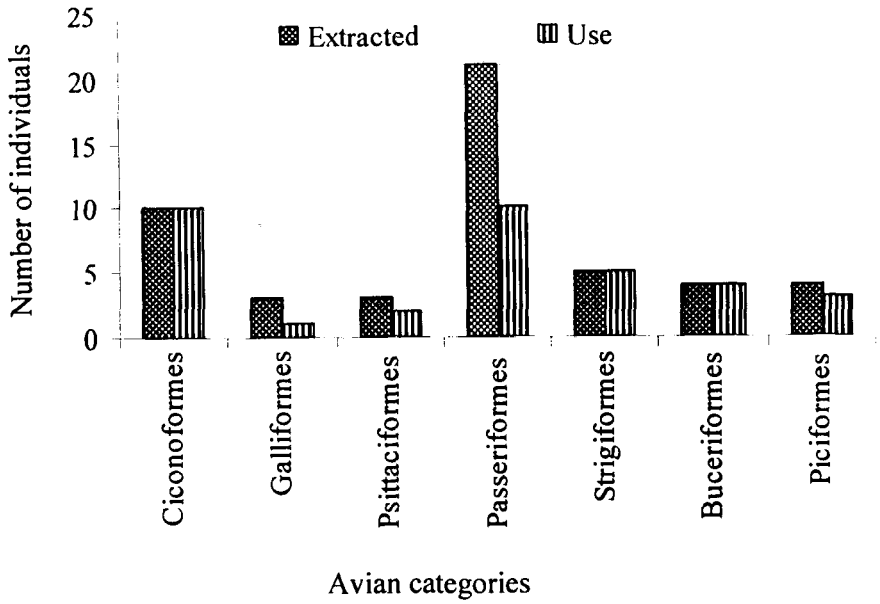


Figure 5.12 Number of birds extracted and used for therapeutic purposes by the Apatani tribe

Mammalian body parts in therapeutic activities

The animal categories, use of body parts, mode of preparation and their remedial use are given in details in the Table 5.2. Generally whole body of mini-faunal species is used in therapeutic activities. But the mantle of mollusks and whole insect viz. beetles, bugs, bees and wasps are observed which are used in traditional medicine by the indigenous people of the region. However, in large faunal species only specific body parts are used in particular body ailments (Table 5.2). A total of 7 different body parts namely meat, gall bladders, bones,

fats, penis, alimentary canals and horns from mammals (Table 5.3) and 5 different body parts of birds namely meat, fats, feathers, bones and legs are used for therapeutic purposes (Table 5.4). But other materials like mucous, exoskeletons, mantles, tentacles and fresh blood from selective mini- therapeutic fauna are used to treat locally diagnosed ailments. All of these resources are obtained through hunting, fishing and manual collection (Plate III). The therapeutic use value shows that it ranges from 0.04 to 0.20. The highest use value is 0.20 for Himalayan black bear and the tiger. The details of the use values of different mammalian species are given in Table 5.5.

Table 5.2 Animals and body parts used for the therapeutic purposes

Animal group	Animal	Part use	Disease treated	Mode of use
Mollusks	Pila (*Pila globosa*)	Body flesh	Asthma and tuberculosis, stomach disorder and eye irritation	Cooked or roasted meat is eaten
Arthropods	Crab (*Cancer pararus*)	Whole animal	Jaundice, indigestion and other stomach problems	Grinded animal is boiled and the extract is taken
	Cockroach (*Periplanata american*)	Whole animal	Asthma and tuberculosis	Extract of roasted insect, the water is consumed
	Crickets (*Gryllodes sigillatus*) (*Acheta domestica*)	Whole animal	Dysentery and asthma	Roasted insect is extracted in water and the water is consumed.
	Honey Bee (*Apis indica*) (*Apis florae*) (*Apis mellifera*)	Whole animal	Boil, snakebite, scorpion bite and cough	Powder of the roasted animal is mix with honey and applied locally
	Wasp (*Plistes herbraeus*) (*Vespa orientalis*)	Whole animal	Boil, stomach problem, headache bronchitis and strokes	The animal powder is mixed with powder of snake head and applied locally or consumed
	Stone fly (*Dinocras cephaloles*)	Nymph stage	Stomach disturbance and dysentery	Fried or boiled insect is consumed as food
	May fly (*Ephemera dancia*)	Nymph stage	Stomach disturbance and dysentery	Fried or boiled insect is consumed as food

	Caddis fly (*Philopotamus montanus*)	Nymph stage	Stomach disturbance and dysentery	Fried or boiled insect is consumed
	House fly (*Musca domestica*)	Larva	Dysentery and diarrhea	Boiled larva is consumed
	Water bugs (*Pentatomidae* sp.)	Whole animal	Hallucination	Fried, cooked or boiled insect is consumed
Fishes	Bami fish (*Mastacembelus armetus*)	Mucus	Wound, pox, anemia and asthma	The mucus is sucked directly from the fish body
	Cuchia (*Monomterus cuchia*)	Fresh blood and whole animal	Body weakness, anemia and asthma	The animal is consumed after boiling or the blood is sucked directly
	Chaca fish (*Chaca chaca*)	Whole body	Pox, burn wound and skin disease	Dry fish grinded into powder and applied locally
Reptiles	Monitor lizard (*Varanus bengalensis*)	Flesh, skin and fat	Asthma, malaria and stomach problems, piles and rheumatic pain	The fat is massaged locally for rheumatic pain. Cooked meat is consumed; Ash of the skin is applied locally on piles and rheumatic pain
	Tortoise (*Geoemyda mouhati*)	Flesh and shell	Pox, stomach disturbance, bronchitis, asthma and stroke	Cooked meat is consumed, shell is grinded and the powder is applied locally

	Snakes			
	Python (*Python reticulates*)	Flesh, bile and fat	Snake bite, rheumatic pain, burn wound, body ache	Meat, bile and fat is applied locally
	Cobra (*Naja naja*)	Flesh, bile and fat	Snake bite, rheumatic pain, burn wound, body ache	Cooked meat is consumed, bile and fat is applied locally in bone fracture (sometimes use with bee and wasp)
Birds				
	Ciconiformes			
	Eagles (*Spizaetus nipatensis*) (*S. cirrhatus*) (*Hieraactus fasiatus*) (*Hieraactus fasiatus*) (*Spilorries cheela*)	Fat, feather and meat	Rheumatic pain, malaria, typhoid, body weakness, pox and burn wounds	Cooked meat is taken, fats and burnt ash of feather is used for massage locally
	Galliformes			
	Red jungle fowl (*Gallus gallus*)	Flesh and fat	Nasal congestion, boils and dysentery	Apply warm fat in nose; cooked meat is taken in dysentery
	Passeriformes			
	Droncos (*Dierunus adsimillis*) *Dierunus paradiseus* *Dierunus aencus* *Dierunus hottentottus* Crow (*Corvus macrohnchos*) Raven (*Corvus corax*) House crow(*Corvus splendens*)	Fat, feather and meat	Malaria, typhoid, dysentery, pox and wounds	Cooked meat is taken; fats and ash of feather is applied locally

Strigiformes			
Grass owl (*Tyto capensis*) Forest eagle owl (*Bubo nipalensis*) Brown wood owl (*Strix leptogrammica*) Barred jungle pwlet (*Glaucidium radiatum*) Spotted owlet (*Athens brama*)	Fat and meat	Dysentery, diarrhoea, night blindness, burn wound, body ache, and skin disease	Cooked meat is taken, fat is massaged locally
Buceriforemes			
Great hornbill (*Buceros bicornis*) Indian pied hornbill (*Anthracoceros malarucus*) Wreathed hornbill (*Aceros undulates*) Rufuos necked hornbill (*Aceros nipalensis*)	Meat, fat, feather	Malaria, dysentery, typhoid, burn wound, pox and rheumatic pain	Cooked meat is taken or the powdered meat is taken with water; fat is massaged locally
Piciformes			
Blue troated barbet (*Megalemia asiatica*) Himalayan great barbet (*Megalemia virens*) Lineated barbet (*Magalemia lineate*)	Meat and fat	Malaria, dysentery, typhoid, burn wound, pox and rheumatic pain	Cooked meat is taken or the powdered meat is taken with water; fat is massaged locally

Mammalia				
	Carnivores			
	Tiger (*Panthera tigris)* Leopard *(Panthera paradus)* Clouded leopard (*Neofelis nebulosa*) Leopard cat (*Felis bengalensis)* Marbled cat (*Felis marmorata*) Large Indian civet *(Veverra zibetha)* Himalayan palm civet *(Paguma larvata)* Yellow throated marten *(Martes flavigula)* Yellow bellied weasel *(Mastela kathiah)* Siberian weasel *(Mastela sibirica)* Beak striped weasel *(Mastela strigidorsa)* Beach marten *(Martes foina)* Common mongoose *(Herpestes Edwardsi)* *Small Indian mongoose* *(Herpestes auropunctatus)* Otter *(Lutra lutra)*	Meat, fat and bone	Malaria, dysentery, typhoid, burn wound, pox and rheumatic pain	Cooked meat is taken; Powdered meat is taken with water, fat is used for massage locally, powdered bone is applied locally.
	Ungulates			
	Barking deer *(Muntiacus muntijac)*	Meat and testis	Body weakness, male impotency	Cooked meat and testis are taken

Sambar *(Cervus unicolor)* Hog deer *(Axis porcinus)* Yak *(Bos grunience)* Musk deer *(Moschus moschiferus)*	Meat and musk	Body weakness, malaria, diarrhea, pox, dysentery, tuberculosis, rheumatic pain	Powdered meat and musk gland is taken
Serow *(Capricornis sumtraensis)*	Meat	Body weakness, jaundice, asthma, paralysis and male impotency	Cooked meat and testis are taken
Goral *(Naemorhedus goral)*	Meat	Body weakness, jaundice, asthma, paralysis and male impotency	Cooked meat and testis are taken
Bharal *(Pseudois nayaur)*	Meat	Body weakness, jaundice, asthma, paralysis and male impotency	Cooked meat and testis are taken
Takin *(Budorcas nayaur)*	Meat	Body weakness, jaundice, asthma, paralysis and male impotency	Cooked meat and testis are taken
Mithun *(Bos frontalis)*	Meat, gall bladder, testis, hair and horn	Body weakness, male impotency, lactation deficiency, breast pain, wound, pox and menstruation irregularities	Cooked meat and testis are taken; horn is grinded and powered is taken with boil water, hair ash is applied locally
Wild boar *(Sus scrofa)*	Fat	Tumor and furuncles	Fats is used in massage
Rodents			
Porcupine *(Hystrix brachyuran)*	Meat, fat and stomach	Body ache, rheumatic pain, burn wound, fracture bone and gastric ulcer	Meat is cooked consumed, fat is applied locally, dried stomach extract is used as tea
Malayan giant squirrel *(Ratufa bicolor)* Red-bellied squirrel *(Callosciurus erythraeus)* Giant flying squirrel *(Petaurista pitaurista)* Himalayan striped squirrel *(Tamiops macclellandii)*	Meat, intestine	Curing poisonous infections, like snake bite, insect bite	Meat is cooked with intestine and intestinal components and applied locally

Primate			
Assamese maccaque *(Macaca assamensis)* Rhesus macaque *(Macaca mulatta)* Stumped tailed macaque *(Macaca arctoides)* Capped langur *(Trachypithichus pileatus)* Hoolock gibbon *(Bunopithicus hoolock)*	Meat, gall bladder, gut	Malaria, typhoid, jaundice, diarrhoea, relief delivery pain during parturition	Meat is cooked and eaten, dry meat and gut and gall bladder is dipped in water and the extract is taken
Bear			
Himalayan black bear *(Selanactos thibetanus)* Sloth bear *(Ursus ursinus)*	Meat, gall bladder	Malaria, typhoid, jaundice, diarrhoea, pox, stomach disturbances and wound	Cooked meat is eaten, gut and gall bladder is dipped in water and the extract is taken
Pholiodota			
Chinese pangoline *(Manis pentadactyla)*	Meat, scale and gut	Malaria, typhoid, jaundice, diarrhoea, pox, stomach disturbances and wound	Cooked meat and gut is eaten; ash of scale is applied locally
Chiroptera			
Flying fox *(Pteropus giganteus)* Bat *(Cynopterus sphinx)*	Meat, wing and gut	Malaria, typhoid, jaundice, diarrhoea, pox and burn wound	Cooked meat and gut is eaten; ash of forelimb is applied locally

Table 5.3 Relative % of body parts of mammals used for therapeutic purposes

Animal body parts	Nyishi (n=35)	Monpa (n=29)	Apatani (n=37)
Meat	100.0	100.0	100.0
Gall bladder	42.9	41.3	48.6
Bone	37.7	34.4	40.5
Fat	51.4	41.3	54.0
Penis	20.0	10.3	18.9
Alimentary canal	28.6	27.5	27.0
Horn	20.0	17.2	18.9

n=total number of species whose body parts were used

Table 5.4 Relative % of body parts of birds used for therapeutic purposes

Animal body parts	Nyishi (n=39)	Monpa (n=29)	Apatani (n=35)
Meat	100.0	100.0	100.0
Fat	76.9	68.9	80.0
Feather	82.0	62.0	71.4
Bone	64.1	51.7 62.8	
Legs	51.2	62.0	57.1

n=total number of bird species whose body parts were used

Table 5.5 Use value of animals

Animals	Therapeutic use value
Tiger	0.20
Leopard	0.10
Leopard Cat	0.08
Clouded Leopard	0.09
Jungle Cat	0.05
Marble Cat	0.05
Fishing Cat	0.06
Sloth Bear	0.09
Himalayan Black Bear	0.20
Large Indian Civet	0.04
Small Indian Civet	0.04
Himalayan Palm Civet	0.04
Spotted Lisang	0.04
Yellow-bellied Weasel	0.04
Otter	0.08
Asian mongoose	0.08
Monitor Lizard	0.06
Chinese Pangolin	0.06
Barking Deer	0.04
Sambar	0.04
Goral	0.04
Red Goral	0.04
Takin	0.04
Serow	0.04
Musk Deer	0.09
Bhoral	0.04
Mithun	0.08
Wild Boar	0.04
Assamese Macaque	0.06
Rhesus Macaque	0.06
Caped Langur	0.06
Giant Flying squirrel	0.06
Himalayan Marmot	0.05
Porcupine	0.08
Bat	0.06
Hornbill	0.10

DISCUSSION

The zootherapy is considered by some researchers to be a mysterious and sometimes even absurd practice. Its pertinence should be emphasized as many researches have pointed out that the significance of traditional medicines cannot be ruled out because animals are the source of modern drugs being used in medical science (Launet 1993; Lazarus and Attila 1993; Ferreira 1993; Marques1997). Several components of fish have been extracted and are employed as remedies in standardized medicine (Hamada and Nagi 1995; Salte *et al.*. 1996). 'OMEGA -3', a poly saturated compound obtained from oily sea fish like cod, herrings and salmon, has medicinal value and is used as anti-tumor and analgesic (Finkl 1984). The tetra dotoxin (TTX) a water soluble guaridinium derivative of a bioactive compound, 'procanin', has the ability to inhibit transmission in the nerve cells (Colwell 1997). In the present study it is found that fat, mucous and blood from two fish species, *Mastacembelus armetus* and *Monopterous cuchia,* are used for treatment of nerve diseases, burn wounds and body weakness respectively. It may be due to the presence of active bio-molecules that need further investigation. The gall bladder of bear, non-human primates and mithun is used to prepare traditional medicines, which are used for treatment of serious fever like malaria and typhoid. Utilization pattern of the body parts is different in different tribes (Table 5.2).

Indigenous people of the region use meat of all the ethno-faunal species in their traditional medicine system. The Apatani uses 54.0%, the Nyishi 51.4%, and the Monpa 41.3% of mammalian fats and gallbladder for therapeutic purposes. Mammalian bone is also used in traditional medicine system by all the three tribes. The Apatani people utilize 40.5% mammalian species, the Nyishi people utilize 37.1% of species and the Monpa people utilize 34.4% of species for bone in their folk medicine (Table 5.3). Penis and horns of mammals particularly ungulates are also used as raw materials of their traditional medicines. The Nyishi people use the highest number of species of 20.0% followed by the Apatani people 18.9% and the Monpa people use minimum number of 17.2% of animal species. To get one body part like gallbladder or penis and others at least one animal needs to be killed. Thus, the use of such vital organ takes a heavy toll of animals and thus heavy loss to the faunal community and ultimately the biodiversity of the region. The rate of endangered species may increase.

Meat, fats, feathers, bones and legs of the different avian species are utilized as raw materials for traditional medicine. The body parts of avian species and their use by the tribal group is given in Table 5.4. Meat is commonly used from an extracted species. But the number of species (N) extracted for the purposes by the three tribes are different. Among all these three tribes, the Apatani people utilize 80% (28 species), the Nyishi people 76.9% (30 species) and the Monpa people with lowest 68.9% (20 species) fat as raw materials of traditional medicine. The Nyishi people utilize birds and their body parts for therapeutic activities. The highest 82% of bird species which is followed by the Apatani with 71.4% and the

Monpa people with 62% of species. The Monpa people extract 62% of bird species for leg parts in their traditional medicine. But the Apatani people extract 57.1% and the Nyishi people extract 51.2% of bird species in their traditional medicine. For bone, the Nyishi people extract 64.1% of bird species, the Apatani people extract 62.8% and the Monpa people extract 51.7% of bird species in traditional medicine. Thus, due to regular therapeutic practices the birds are also lost every year which contributes to the loss of biodiversity of the region.

The use value is the index that indicates the use of animals and their various parts and the intensity of use in the activity. The higher the use values the more extensive use of animals. The larger cats namely *Panthera tigris*, and *P. paradas* and bears are the animal which contribute to the traditional medicine through their body parts like bones, gall bladders and meat. It is found in this study that tigers, leopards, Himalayan black bears, sloth bears, primates, mithuns and hornbills are the most variedly used animals. However, the therapeutic use value (UV) of tiger and Himalayan black bear is 0.20, and both the hornbills and the leopards contribute 0.1 and the both bears 0.09. This indicates extensive use of the animal categories. Some species with UV, ranging from 0.04 - 0.20 are found to be important resources for therapeutic activities (Table 5.5). Non-human primates dominate this category. Due to high use value these species are found to have lower UV but have their important place in some of the activities mentioned in the table. About 90 animal species including both mini-faunas comprising 16 of invertebrate species and 3 of fish species; large faunal species comprising 4 reptilian species, 39 bird species and 37, mammalian species are used by the

tribal people for therapeutic purposes (Table 5.2). Thus, the animals are the important resources in traditional medicine vis-à-vis this tradition severely affects the animal population in their natural habit. The zootherapeutic activities in the tribal society have large impact on loss of animal species which contribute to the loss of biodiversity of the region. Therefore, it is important to conserve the bio-diversity of the region through the sustainable use of animal resources in therapeutic activities.

Instead of ending the practitioners of zootherapy into the prisons or creating policies that force them abandon such practices, the decision makers should view this human-nature interaction within its cultural dimensions. The values of animal based medicine are very important in tribal culture. They are the main available resources for the majority of the tribal population with limited access to allopathic medicine or other osteopathy in medical care system. Since people have been using animals for a long time, suppression of their practice by imposing strong and stringent measure will not be of much help in the long run. Policies should accommodate the cultural dimensions as well as help animals to save them from extinction.

Growing literature on this aspect shows that the cultural aspect of human-nature interaction should be taken into account in all debates related to sustainable development (Morin-Labatut and Akhtar 1992; Sachs 1993; Agrawal 1995; Zwahlen 1996). This cultural perspective includes the way people perceive, use, allocate, transfer, and manage their natural resources (Johannes 1993). Alcorn

(1995) has stated, that 'conservation is a social and political process'. In this way discussing the relationship between food provided by the environment and the physiological consequence that result from them as well as the socio-economical structures that support them within the multidimensionality of the sustainable development is one of the key elements to achieve sustainability (Costa-Neto and Marques 2000a, 2000b). Researchers should recognize that the sustainable use of natural resources for their medicinal value is one of the ways by which biodiversity is used and the richness of biodiversity needs to be conserved in order to maintain overall environmental values including sustainable development of societies (Kangas 1997). However the demand for natural products from large mammals may become a serious problem if collectors overexploit the larger cats, non-human primates, hornbills and other focal species. All are at present either the endangered or the vulnerable species and any more harvest in less than a decade will make them extinct from the region.

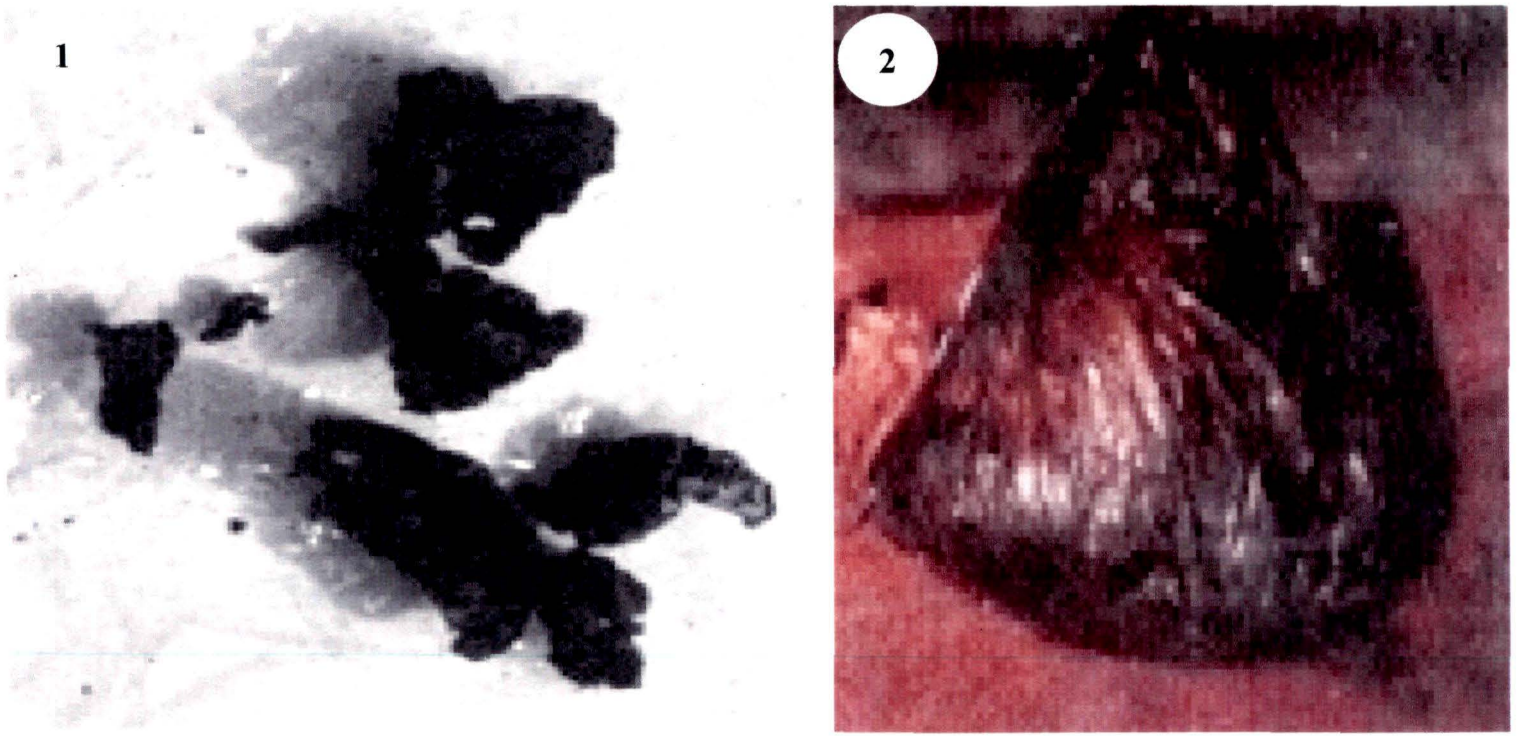


Plate III. Animal parts used for therapeutic purposes
1) Musks of Musk deer and 2) Stomach of porcupine.

CHAPTER 6

USE OF ANIMALS IN SOCIO-CULTURAL ACTIVITIES IN THE NYISHI, MONPA AND APATANI AREAS

Ever since the evolution of human beings on earth, men have developed certain traditions to keep their groups in unity. Diversification has occurred with the passage of time in the social groups and their cultural traditions. The tradition has been nurtured by nature. But the increasing hunger for economic development and the loss of ethical and moral values among the social groups have adverse impact on the survival of animals and plants. The rate of loss of animals and plants has accelerated year by year. Now, it is an admissible fact that the extension of space at present resulting from increasing human activity is greatest in bio-geological history (Melchias 2001).

Wildlife (animal) has its importance in social and cultural ceremonies for many groups of people. Sacred forest and the animals with socio-cultural values have been featured in many parts of the world (Anon 1995a; Kothari *et al.* 2000). deVos (1978), Ntiamoa-Baidu (1987,1992, 1995), Sanagho (1991), Adeola (1992) have reported that many wild animals mainly primates have been associated with socio-cultural ceremonies of the African people. Barkey *et al.* (1980) has described the use of seal, polar bear and sea lion for their fur and skin for making coat, blankets, and boots by the Arctic American. Lippold (1971) and

Toynbee (1973) have studied the cultural use of animals such as cats, birds and cattle by the Egyptian and Romanian people.

The Indian ethnic communities inhabiting Western and Eastern Himalayas, the Peninsular India, and North-Eastern states of India have maintained close relationship between cultural and biological diversity of the region. The flora and fauna of the region is closely related with their ethnic culture. The ethnic groups inhabiting the state of Arunachal Pradesh have been observing age-old traditional customs. The use of natural resources for religious and cultural purposes is common. All tribal groups use wildlife products in their socio-cultural practices. Dam and Hajra (1981), Haridasan *et al.* (1990), Pandey *et al* (1990), Borang (1996), Choudhury and Duarah (1999), Solanki *et al.* (2002), Kumar and Solanki (2003), Solanki and Chutia (2004) have documented certain aspects of the use pattern of wildlife and their products on different occasions. The category of wildlife and its products used for the purpose are derived from animal species of the threatened categories (Solanki *et al.* 2005). However there has been some paucity of scientific study on the proper utilization pattern of animal resources in different socio-cultural practices in tribal communities including the Nyishi, Apatani and Monpa tribes and its impacts on biodiversity of the region. It is very important and desirable to understand the cultural diversity as well as the loss of animal species due to the ethnic culture of the region. Hence the present study has been undertaken for having its scientific understanding and systematic documentation.

MATERIALS AND METHODS

The details of the method for gathering information on these aspects have been given in the chapter 4. To emphasize the socio-cultural aspects, people are interviewed individually on the subject and information is collected relating to the traditional uses of animal and animal parts in different socio-cultural ceremonies. The head of the cultural troop of each tribe is also contacted for quantitative information on animal categories and the numbers sacrificed in celebrations each year.

The socio-cultural use-value of each animal is calculated by the formula

$$UV = \frac{(\sum RM \times C)}{N}$$ (Phillips and Gentry 1991)

Where, UV = Use Value Index,

RM= the total number of body parts used from individual animals,

C= the number of times a particular animal has been reported to be utilized,

N=the total number informants.

In the present study the traditional uses, rearing and management of mithuns by the Nyishi tribe are also incorporated owing to cultural importance of this animal. In addition, the professional caretaker of mithun (mithun boy) is approached and information gathered on the number of mithuns owned by each household in the villages. 30 households from each 5 villages, namely Pachin, Kankarnala, Upia and Sagali and Yazali of the Nyishi dominated tribe are surveyed for the

information. Various local institutions such as Gram Panchayats and Government Departments like Animal husbandry and Veterinary, Divisional Forest Office, Statistical office, etc are also contracted for gathering official statistics regarding mithun population, distribution, prevalence of diseases, predation cases and the like. The current mithun population in some of the Nyishi villages is also collected.

RESULTS

Customary uses of animals by Nyishi people

1) Festival: The mithun is the most possessed and considered mobile wealth/assets among the Nyishi tribe beside their ornaments. The main festival the Nyokum Yello is associated with large scale sacrifice of mithuns during the four day long festival where they are used for appeasing the deities considered responsible for safe harvest and bumper yield of the crop. The slain body of the mithun is used for the community feast (Plate IV).

2) Ceremonial use: The sacrifice of mithun for the community feast during socio-cultural celebrations at the time of the post-harvest ceremony and the reaping is common. The most important occasion is the marriage ceremony, where mithuns are sacrificed for the community feast as well as some live mithuns are given to the bride's family/clan as dowry (as the bridegroom's family/clan stay in the bride's house for the celebration). Dowry is a part of this occasion and strong materialistic culture grows in their society. The use of animal and animal parts is a must in such ceremonies. Beside mithun, other animals like squirrel, boar and

hornbills are also invariably used during marriages. Another ceremony is the Yullo in which the animal is sacrificed in lieu of human life to appease the Wiyus (Plate IV).

3) Dispute solving: The most important dimension of the culture is that the mithuns are sacrificed to save a man's life. In case of enmity, one's thirst to kill the other is satisfied by killing one's mithun. To settle any clash, they consider the mithun as the show-piece to kill and satisfy the anger.

4) Decorative: Generally the flesh of the animal is eaten after cooking and other body parts such as horns, skull and teeth are used as decorative pieces for glory. The animals, other than mithuns hunted for the purpose are deer, antelopes, primates, bears, tigers and other cats.

Customary uses of animals by Apatani people

From time immemorial, the animal, wild, domestic and semi-domestic including mithun, have found an important place in various ceremonies in the Apatani society. Be it festivals or social get-together the mithuns are primarily counted for meat. Some of the occasions where the use of mithun is mandatory are:

1) Dree festival: The festival is observed on 5th July annually by the Apatanis. The 'Dree' is celebrated for preventing agricultural crops especially paddy from invading pest and possible threat of famine. One or more mithuns are sacrificed during the dree celebration.

2) Matrimonial ceremony: Usually, a calf of mithun is gifted to the groom family by the Apatani during the matrimonial ceremonies as a socio-cultural practice.

3) Condolence: The death of every Apatani is given due respect by sacrificing a mithun for every deceased male member. Poor families use cow in place of mithun (Plate IV).

Head gear and animal parts

The use of headgears is a long practised tradition and is essential to maintain the rich socio-cultural traditions in the tribal communities of Arunachal Pradesh. Each headgear has two components viz. plant based and animal based components. Bamboos and canes are the principal plant material used to give different shape viz. conical, round, oval, semi-circular, concave and the size of the headgear varies from one tribe to another tribe. The frame of headgear is decorated by different parts of wild animals including beak and feathers of hornbill, skin of black bear, primates, leopard, leopard cat, squirrels, and tiger. The teeth of various animals such as wild boar, bear, and tiger are important items for headgear decoration. The beaks and feathers of birds from ciconiformes (hawk eagle, falconet and buzzard), and passeriformes (racket tailed drongo) are also important (Table 6.1).

Table 6.1 Animal parts used in headgear by tribal groups

Tribes	Headgear	Shape	Associated animal Common name	scientific name	Body parts
Nyishi	Bompa	Concave and oval	Great Indian hornbill	*Buceros bicornis*	Beak and feather
			Pied hornbill	*Anthracoceros malabaricus*	Beak and feather
			Wreathed hornbill	*Aceros undulatus*	Beak and feather
			Rufous necked hornbill	*A. nipalensis*	Beak and feather
			Racket tailed drongo	*Dierunus adsimillis*	Tail feather taw and beak
			Eagles	*Spizaetus nipalensis*	Beak, taw and feather
				S. cirrhatus	Beak, taw and feather
				Hieraactus fasiatus	Beak, taw and feather
				H. kiererii	Beak, taw and feather
			Buzzards	*Buteo buteo*	Beak, taw and feather
				B. rufinus	Beak, taw and feather
			Tiger	*Panthera tigris*	Teeth, taw and nail
			Leopard	*P. paradus*	Teeth, taw and nail
			Leopard cat	*Felis bengalensis*	Teeth, taw and nail
			Assamese macaque	*Macaca assamensis*	Skin
			Capped langur	*Trachypithecus pileatus*	Skin
			Himalayan black bear	*Selanactos thibetanus*	Skin
Apatani		Concave	Porcupine	*Hystrix brachyuram*	Sting
			Eagles	*Spizaetus nipalensis*	Beak, taw and feather
				S. cirrhatus	Beak, taw and feather
				Hieraactus fasiatus	Beak, taw and feather
			Great Indian hornbill	*Buceros bicornis*	Feather
			Assamese macaque	*Macaca assamensis*	Skin
			Capped langur	*Trachypithecus pileatus*	Skin
Monpa	Yama	Round with arms	Yak	*Bos grunniens*	Tail hair
	Overchamo	Round and conical	Clouded leopard	*Neofelis nebulosa*	Skin
			Squirrels	*Petaurista petaurista*	Skin
				Callosciurus erythraeus	Skin

	Yangcha	Spherical and oval	Assamese macaque	*Macaca assamensis*	Skin
			Rhesus macaque	*Macaca mulatta*	Skin
Hill Miri	Bopya (cane hat)	Concave	Great Indian hornbill	*Buceros bicornis*	Beak and feather
			Himalayan black bear	*Selanactos thibetanus*	Skin
Nocte	Khopoak	Cnical	Wild boar	*Sus scrofa*	Teeth
			Himalayan black bear	*Selanactos thibetanus*	Skin, teeth and toe
			Serow	*Capricornis sumtraensis*	Body hair
Wancho		Conical	Great Indian hornbill	*Buceros bicornis*	Beak and feather
			Pied hornbill	*Anthracoceros malabaricus*	Beak and feather
			Wreathed hornbill	*Aceros undulatus*	Beak and feather
			Rufous necked hornbill	*A. nipalensis*	Beak and feather
Adi	Mimakdumlup	Spherical	Great Indian hornbill	*Buceros bicornis*	Beak and feather
			Pied hornbill	*Anthracoceros malabaricus*	Beak and feather
			Wreathed hornbill	*Aceros undulatus*	Beak and feather
			Rufous necked hornbill	*A. nipalensis*	Beak and feather
			Himalayan black bear	*Selanactos thibetanus*	Skin, teeth and toe
			Eagle	*Spizaetus nipalensis*	Beak, taw and feather
				S. cirrhatus	Beak, taw and feather
				Hieraactus fasiatus	Beak, taw and feather
				H. kienerii	Beak, taw and feather

25 animals are identified whose body parts are used to decorate headgear. The highest umber of animal species, namely 17 are used by the Nyishi people to decorate the head gear, 9 animal species by the Adi people, 7 animal species by the Apatani, 6 animal species by the Monpa, 4 animal species by the Wancho, 3 animal species by the Nocte and 2 animal species by the Hill Miri people. Most of the items being used for the purpose are derived from animals of the threatened category (Table 6.2). The present status of all the animals used in this endeavor is given in the Table 6.2. The fourteen (14) animal species used belongs to Schedule-I category and 9 animals come under Schedule-II (as per IUCN Red list 2003 and Wildlife (Protection) Act 1972). 10 species of the 25 fall in Appendix-I and 11 species in Appendix-II and 4 species under Appendix-III as per CITES. The amount of loss of species under different threatened categories is found to be 50.6% for Schedule-I/Appendix-I and 38.6% for Schedule-II/ Appendix-II and 10.6% are recorded during 2002-2005 (Table 6.2) (Plate V).

Table 6.2 Threatened categories of animals used in decoration of headgear

Conservation Bodies/ Protection Act	Schedule- I/ Appendix-I	Schedule-II/ Appendix-II	Schedule-III/ Appendix-III	Total
IUCN Red List	14	9	2	25
Wildlife Protection Act 1972	25	14	9	25
CITES	10	11	4	25
Average Loss of Species	50.6%	38.6%	10.6%	

Besides headgear decoration, skins of 21 animal species are used in different activities such as carpet, coat, bag and decorative part of the 'dao' cover by the tribal people. The 'dao' is an indigenous sword like thing invariably used by all the tribes when they go to forest. The Nyishi, Aptani and Monpa tribes together use 15 animal species, the Nyishi and Apatani together use 6 species, the Nyishi alone use 5 species, and the Nyishi and the Monpa together use 1 species of skin. The teeth of 5 animal species are used as necklace and finger ring by the Nyishi and Apatani tribes. The Monpa tribe does not use the teeth of wild animals. Details are given in the Table 6.3.

Table 6.3 Animal body parts as decorative items

Animals	Body parts	Use	Tribe
Tigers	Skin	Carpet use by priest	Nyishi and Apatani
	Teeth	Decorative item of dao cover, headgear and necklace	Nyishi
Leopards	Skin	Carpet, coat and bag	Nyishi, Monpa and Apatani
	Teeth	Decorative item of dao cover and headgear	Nyishi
Clouded leopards	Skin	Carpet and coat	Nyishi, Monpa and Apatani
	Teeth	Decorative item of dao cover, bag and headgear	Nyishi
Jungle cats	Skin	Bag, carpet and coat	Nyishi, Monpa and Apatani
	Teeth	Decorative item of dao cover and headgear	Nyishi
Marble cats	Skin	Carpet and coat	Nyishi, Monpa and Apatani
	Teeth	Decorative item of dao cover, bag and headgear	Nyishi
Civets	Skin	Carpet, bag and coat	Nyishi, Monpa and Apatani
Weasels	Skin	Carpet, bag and coat	Nyishi, Monpa and Apatani
Mongooses	Skin	Bag and coat	Nyishi, Monpa and Apatani
Otters	Skin	Bag and coat	Nyishi, Monpa and Apatani
Barking deers	Skin	Carpet, cushion, bag and coat	Nyishi, Monpa and Apatani
	Head	Decorative item for gloriousness of home	Nyishi, Monpa and Apatani
Sambers	Skin	Carpet, cushion, bag and coat	Nyishi, Monpa and Apatani
	Head	Decorative item for gloriousness of home	Nyishi, Monpa and Apatani
Musk deers	Skin	Carpet, cushion, bag	Nyishi and Monpa
	Head	Decorative item for gloriousness of home	Nyishi and Apatani
Hog deers	Skin	Carpet, cushion, bag	Nyishi and Apatni
	Head	Decorative item for gloriousness	Nyishi and Apatani

		of home	
Serrow	Skin	Carpet, cushion, bag	Nyishi, Monpa and Apatni
	Head	Decorative item for gloriousness of home	Nyishi, Monpa and Apatani
Mithns	Skin	Carpet, cushion	Nyishi and Apatani
	Skull	Decoration	Nyishi and Apatani
Yaks	Skin	Shoes, blanket, carpet and bags	Monpa
Squirrels	Skin	Bag, dao cover	Nyishi, Monpa and Apatani
Porcupines	String	Decoration	Nyishi, Monpa and Apatani
	Skin	Decoration	Nyishi, Monpa and Apatani
Hornbills	Beak	Decoration	Nyishi and Apatani
	Feather	Decoration	Nyishi and Apatani

Customary uses of animals by Monpa people

1) Losar: The 'Losar' is a New Year festival celebrated by the Monpa tribe. The Yak is sacrificed in the 'losar' festival.

2) Matrimonial ceremony: Usually, a young yak is gifted to the bride's during the occasion. Different products/parts of the animals are used during socio-cultural activities. The items commonly used are described below.

(a) Hide shield: It is made up of dry skin of bear and yak locally called 'khuk'. The Monpa uses a hide shield as an armor of defense.

(b) Coat: It is locally called 'Pakcha', made from dry skin of samber and other wild animals. They wear the coat to protect themselves from severe cold and climatic severity but not during religious occasions (Plate VI).

(c) Cap: It is a kind of headgear made from the tail hair of yak. It is locally called 'Yama' Aged person of either sex use it commonly during the routine work (Table 6.1)

(d) Hat: There are three types of hats, which are made up of monkey hair and skin, locally called 'yangcha', the female folk uses it only during cultural practices. It is round in shape; the central part is made up of woolen cloth encircled by a stripe of monkey fur. The other type is made up of skin of the jungle cat. It gives an aesthetic look and is used only by the male folk during their cultural rituals locally called 'over-chamo'. The third one is also made up of fur of the jungle cat. It also gives a beautiful aesthetic look and is, mainly used by the male during special occasions but the shape is different in different occasions. It is also round in shape but encircled by corrugated stripe of fur of the smaller cat (Table 6.1).

(e) Dao: It is locally called the 'dang', made from iron steel and decorated with skin and hair of the wild goat (*Capricornius sumatraensis*). The 'dao' is used as a tool to cut tree while in forest and also as a weapon in war.

The Monpa people do not believe or observe any such cultural practices in which the animals are sacrificed as the Apatani and Nyishi people do. There are some strong cultural as well as magical and religious practices performed by the Aptani and Nyishi people in which both domestic and wild animals should are sacrificed with no alternative.

Animal trophy as decorative item

All the tribes including the Nyishi, the Apatani and the Monpa culturally glorify their houses with the trophies made of the body parts of wild animals. The use pattern of various body parts in the form of trophies is given in Figure 6.1. The skull (49%), skin (34%), and teeth (11%) are the major body parts used as trophies. Skulls, teeth, claws and skins from larger cats (tigers, leopards, clouded leopards), lesser cats (jungle cats, marble cats), bears (sloth bears and black bears), primates (assamese macaque, rhesus macaque and capped langur), deer (sambers, hog deers, barking deers, musk deers), takin, goral, squirrel, wild boar and Chinese pangolin have been recorded to be in use as trophies (Plate IX).

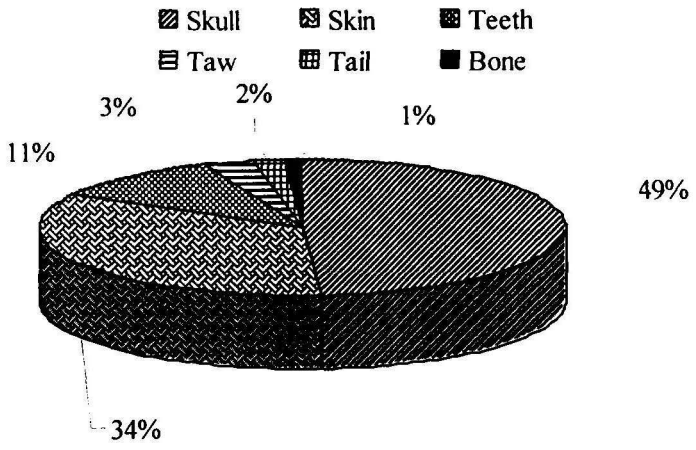


Figure 6.1 Relative percentage of various body parts used as trophy for decoration

Impact on mithun population in some villages of the Nyishi tribe

The population of mithun is highest in Arunachal Pradesh, 70% of total population of north-eastern region. Among the various districts of Arunachal Pradesh, the highest number of mithuns is found in Upper Siang and the lowest population in Tawang district (Anon. 1997). The details of the population distribution of mithun in different districts have given in the Table 6.4.

The major population pattern of mithuns is found in the Nyishi and the Adi dominated area. A random survey in district Papumpare is done to know the demography of mithun population that may represent for the Nyishi tribe. The distribution of mithun population in five villages is recorded an average: 32.9/household for Sagali, 29.2/household for Kankan Nalah, 28.5/household for Upia, 22.8/household for Pachin and 20.1/household for Yazali. The population is composed of adult male, adult female, young male and young female.

Table 6.4 District wise Mithun population in Arunachal Population

Sl No	Districts	Mithun population
1	Tawang	62
2	Wes Kameng	2,633
3	East Kameng	17,034
4	Papumpare	8,140
5	Lower Subansisri	31728
6	Upper Subansiri	7,775
7	West Siang	18,340
8	Upper Siang	22,343
9	East Siang	7,417
10	Dibang Vally	3,133
11	Lohit	4,720
12	Tirap	781
13	Changlang	---
	Total	1, 24,106

Source: Veterinary Live Census (Quin-Quenial Report, 1997)

The adult mithun population in surveyed villages is: 12.6/household for Sagali, 8.8/household for Upea, 8.6/household for Kankan Nalah, 7.4/hosehold for Pachin and 6.7/hosehold for Yajali. The adult female population is 14.9/household for Sagali, followed by 12.1 for Kankan Nalah, 11.3/household for Upea, 8.8/household for Pachin and 8.5/hosehold for Yajali. The Young male population is 4.8/household for Sagali, 4.0/household for Upea, 3.8/household for Kankan Nalah, 3 hosehold for Pachin and 2.3/household for Yajali. The Young female population is 4.7/household for Kankan Nalah, 4.6/household for Sagali, 4.4/household for Upea, 3.4/household for Pachin and 2.6/household for Yajali (Figure 6.2).

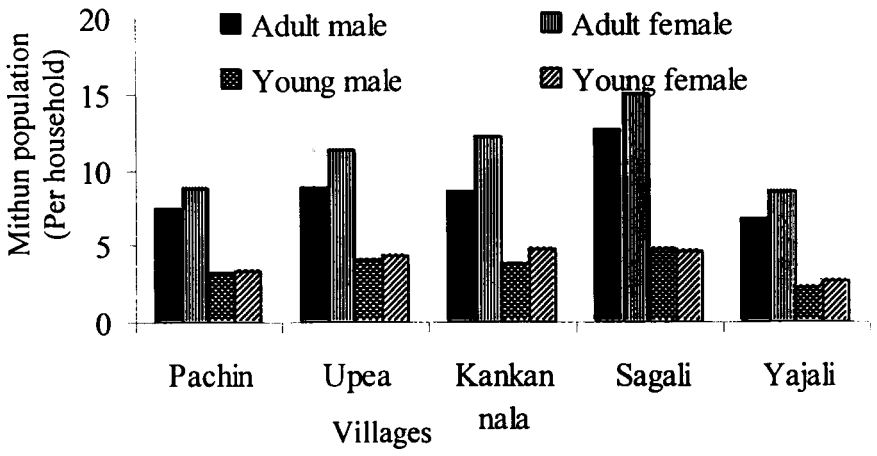


Figure 6.2 Mithun population in five villages of the Nyishi area

Causes of depletion

Landslide, disease and meat utilization are common factors that lead to the depletion of mithun population. The average loss of mithun/household/year is 1.9 due to landslide, 1.4 due to disease and 4.7 due to meat utilization as recorded in Pachin village. In Kankan nalah, the rate of loss is 1.4/household/year due to landslide and disease. However, in Sagali 1.6/household/year for land slide, 2.0/household/year for disease and 7.2/household/year of mithun for meat utilization are found to have depleted the population. But in Upea 1.6/household/year for land slide, 1.3/household/year for disease and 5.2/household/years of mithun are found to have depleted. In Yajali it is recorded 1.6/household/year for land slide, 2.0/household/year for disease and 6.9/household/year of mithun for meat utilization. The utilization of mithun for

meat is found to be the major cause for the loss of the animal. The causes of depletion of the mithuns are shown in Figure 6.3.

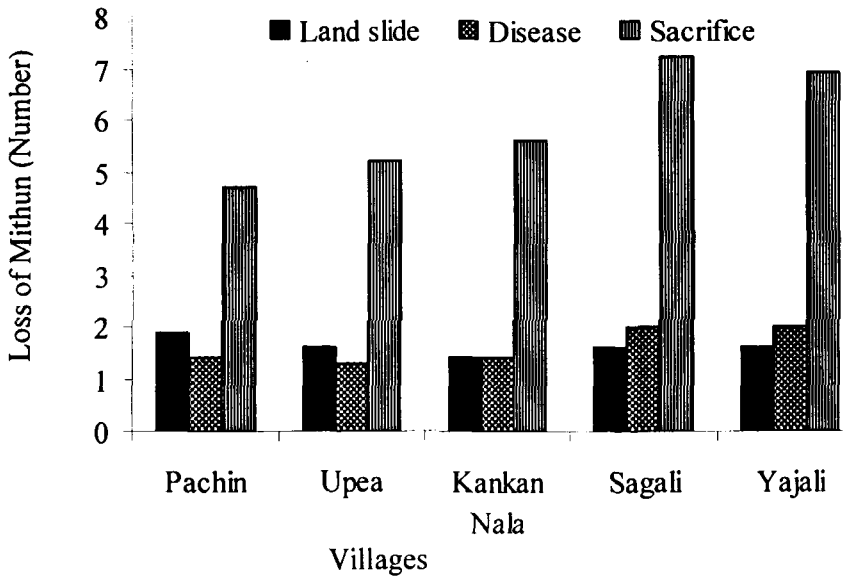


Figure 6.3 Rate of depletion of Mithun and causes for loss

Use value of different animals in different tribal groups

The cultural use value varies with different animals. Hornbills and mithuns have more cultural use value (UV) i.e. 0.09, followed by felines (tiger, leopard, clouded leopard, and jungle cat) and primates (Assamese macaque, rhesus macaque, caped languor) 0.08, bear (black bear and sloth bear) 0.07. The monitor lizard has less cultural use value i.e. 0.04 (Table 6.5) (Plate IV, V, IX).

Table 6.5 Cultural Use Value (UV) of animals

Serial No	Animal Species	Cultural use value
1	Mithun	0.09
2	Hornbill	0.09
3	Tiger	0.08
4	Leopard	0.08
5	Clouded leopard	0.08
6	Jungle cat	0.08
7	Assamese macaque	0.08
8	Capped langur	0.08
9	Rhesus macaque	0.08
10	Black bear	0.07
11	Sloth bear	0.07
12	Monitor lizard	0.04

DISCUSSION

The socio-cultural activities in the indigenous communities are observed to maintain sovereignty and age-old traditions. The killing of various domestic animals such as cows, dogs, pigs and goats, semi-domestic animals like mithun (*Bos frontalis*), Yak (*Bos gruniens*) and wild animals such as wild boar, primates, hornbill, hawk, etc is involved invariably to celebrate different socio-cultural ceremonies. Hence the utilization of the animals remains a rational proposition. In the present age, the indigenous society has advanced and has become modernized and modern weaponry systems are in use. A section of educated elite among the tribal communities is overlooking the rational use of the animal. This takes a heavy toll on animals and it is disastrous for the survival of animals and the biodiversity of the region. If these practices and systems of celebrations remain continued for few decades, the animals' existence and survival would be in danger.

Borang and Thapalyal (1993), Borang (1996), Harit (2000, 2001, 2002), Solanki *et al* (2002), Solanki (2002), Kumar and Solanki (2004) have reported in their studies that the biological diversity in the region is depleting because the animals and their body parts are used in socio-cultural celebration, therapeutic activities and also because their habitats are degraded due to the shifting cultivation called "*jhum cultivation*". The use of avian products like skin and feather in hat has been in practice among the tribal people excluding females all over the world (Eltringham 1984). Different socio-cultural practices have led to the trading of live birds and their products such as skin, wing feather, beak and toes all over the world. This has led to the extinction of some of the species from the world. In Indonesia, bird skin is exported @ $ 50–75 per bird (Inskipp *et al.* 1988). The selling of wild birds, mainly galliforms, and the meat of wild boar, non-human primate and deer is still not uncommon in north eastern region in India and other South East Asian countries (KSBK 1998; Times of India 2002). It has been reported (5th December 2005 Times of India) that the killing of hornbill is a socio-cultural practice during the 'Hornbill festival' in Nagaland and it has lead to the depletion of hornbill in the region. The use of modern weaponry such as gun has created disasters to hornbills. Due to non-availability of hornbill, the indigenous tribes of Nagaland are facing serious problems in maintaining their traditional culture (Plate V).

The hornbill species are facing severe hunting pressure and because of that the species have become locally extinct from some areas in Mizoram, Nagaland and

Meghalaya. Arunachal Pradesh is not much different from other states. The Great Indian Hornbill (*Buceros bicornis)* is not seen now in many parts of Tirap district in Arunachal Pradesh (Datta 1998, 2001, 2002, 2004). It is an indication that the distributional range of the hornbills is gradually shrinking. The high price of beak and feather of hornbill is one of the major reasons for extensive killing and becoming locally extinct in some parts in northeast region. The Hornbill feather is a highly priced item among the Wancho tribe in Arunachal Pradesh. Two body feathers are bought for Rs 260/- and the price for a tail feather varies between Rs 600 to 1600/-. The Nyishi and Adi tribes prefer to use feathers and beaks of Great Indian Hornbill in their headgears inspite of the high price, Rs 1000/- and 2,500/- in the local market for the feathers and the beaks respectively (Datta 1998, 2000). Women folk in some of the tribes, mainly Tangsa, Nocte and Wangcho wear feathers of the oriental pied hornbill in their traditional dresses during their folk dance (Datta 2001). In other Asian countries the hunting of hornbill is still continued in spite of their threatened status (Bennett *et al.* 1997). The teeth of wild boar and other animals are also incorporated by the Nocte tribe in their headgears and used during the *Chalolaco* festival (socio-cultural ceremony) of the tribe. Thus, the hunting of these animal categories by the tribal communities in Arunachal Pradesh directly contributes to the loss of biodiversity in the region. The animal based socio-cultural practices definitely affect the distribution and abundance of these animals, hence the biodiversity in the region. The uses of different categories of wildlife species and their body parts in headgear decoration as well as marriage ceremony, wearing of dresses made of animal

parts are the vital issues at this point of time when the conservation issues are being given topmost priorities. A serious attempt is required for restoration of the situation before it reaches to point of no return. An appropriate measure needs to be initiated so that the cultural and biological diversity in the region can be balanced. Priorities for conservation of faunal resources may be decided on the basis of the total use values of animal categories. Animals with higher use value need immediate attention. The total use values and the animal categories vary from region to region. Bagossi and Braga (1992), Marqes (1995), Costa-Neto (2000) have observed that the marine animals such as triggerfish, sea turtles and toad fish have more use value hence are more susceptible to threats and deserve more conservational concern. The cultural aspects of human and its relation with nature should be taken into account in all the debates related to sustainable development (Morin-Labatut and Akhtar 1992; Sachs 1993; Agarwal 1995; Zwahlen 1996). This cultural perspective includes the way people perceive, use, allocate, transfer and manage natural resources. Alcorn (1995) has stated that conservation is a social and political process. Researchers should devise a mode where the sustainable use of natural resources and the cultural value of the society remain at a sustainable state. Thus, the conservation of cultural identity of the tribes and the faunal diversity in the region are two important aspects that need to be addressed carefully. It may be appropriate if the prototype of animal parts that they use to adorn headgear and in cultural practices can be introduced. Some efforts in this direction have been initiated by the Wildlife Trust of India (WTI) with the help of Arunachal Wildlife and Nature Foundation (AWNF), a

local Non Governmental Organization. The artificial hornbill beak of fiberglass has been designed and made available to local people as replacement of the real beaks in order to maintain their cultural traditions as well as the conservation of wild animals in their habitat. This initiative has been taken up to generate awareness among the native groups inhabiting the Pakhui Wildlife Sanctuary. This endeavor has given very positive results. It is a small beginning but much more can be achieved by extending such concepts on a large scale for other animals. Awareness may be generated to bring a change in the mindset of the tribal people to adopt the alternatives in their socio-cultural rituals.

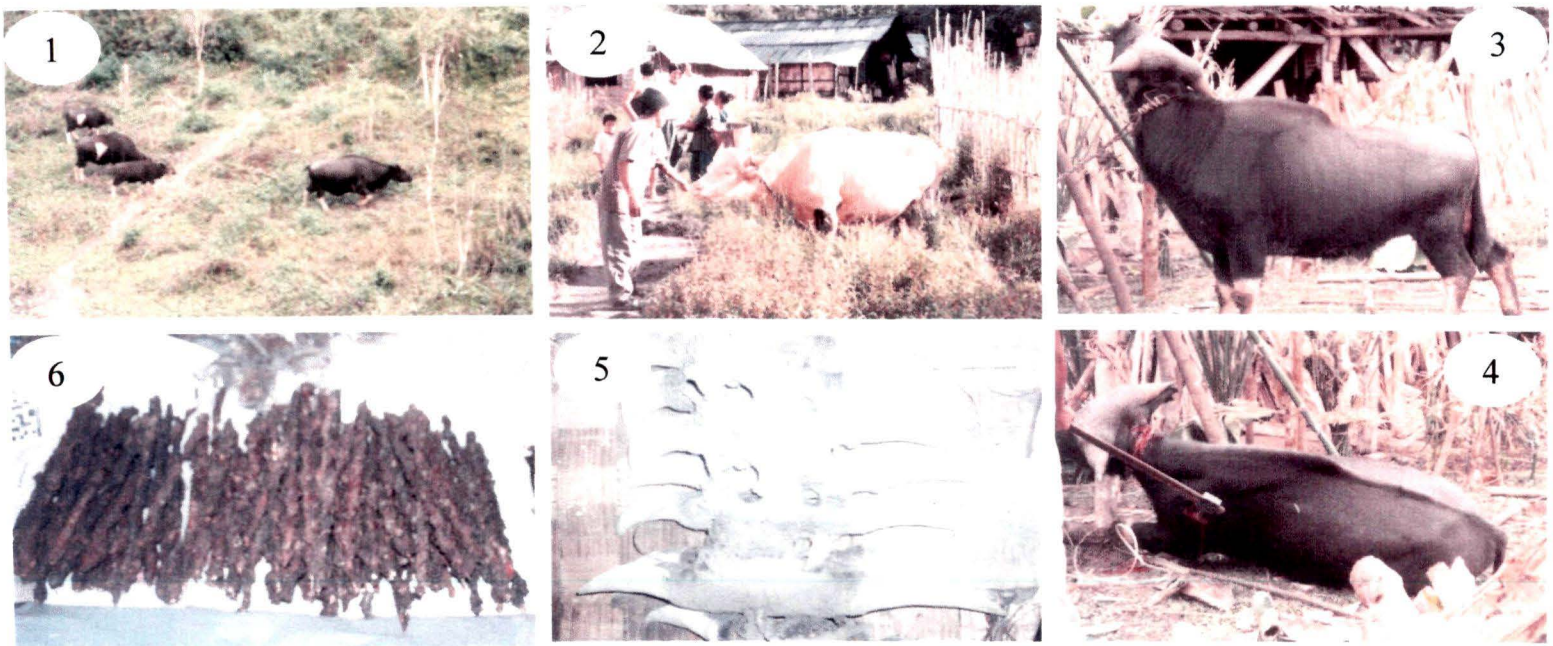


Plate IV: Mithun

1) Mithun in natural habitat, 2) Mithun in house, 3) Mithun for sacrifice,
4) Mithun minute after sacrifice, 5) Mithun horns and 6) Dry mithun meat in market.

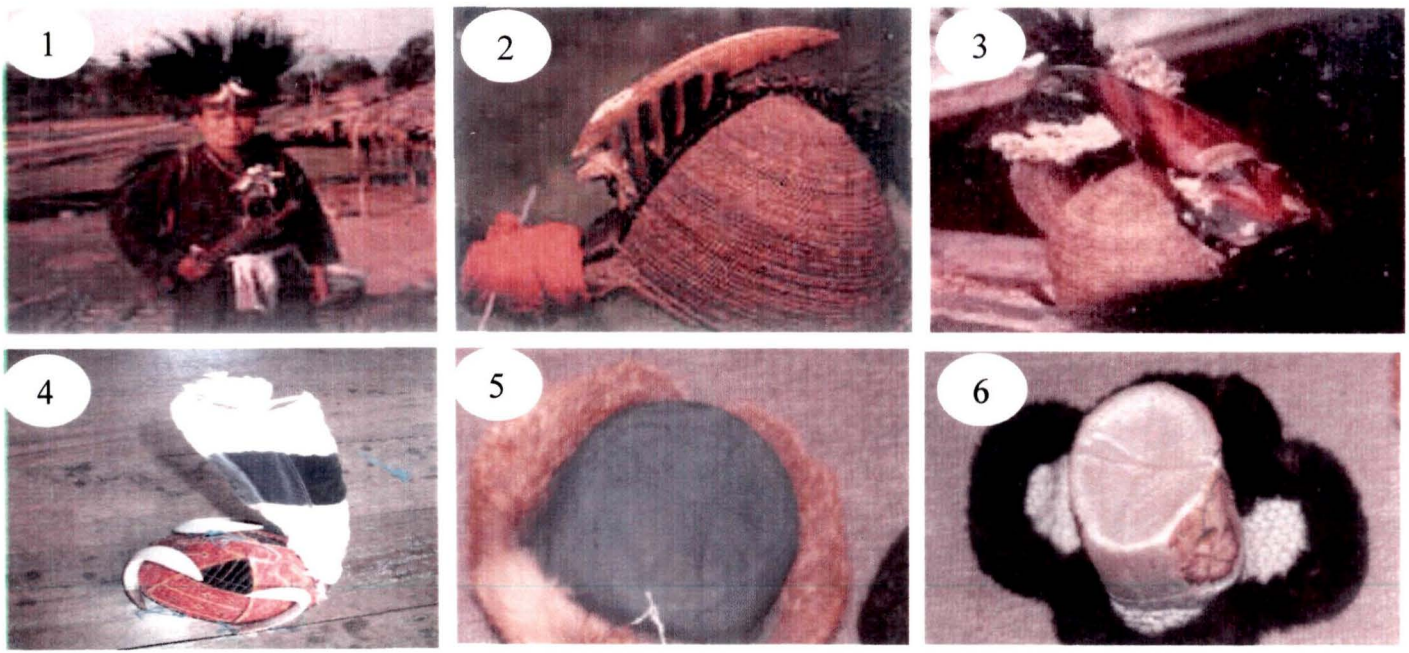


Plate V: Headgears and Dao decorated with animal body parts
1) Headgear and dao with wild boar teeth, bear skin, and hornbill feather and tiger teeth,
2) Headgear decorated with hornbill beak and feather, 3) Headgear with hornbill beak,
4) Headgear with wild boar teeth and hornbill feather, 5) Headgear with primate skin and
6) Headgear with squirrel skin.

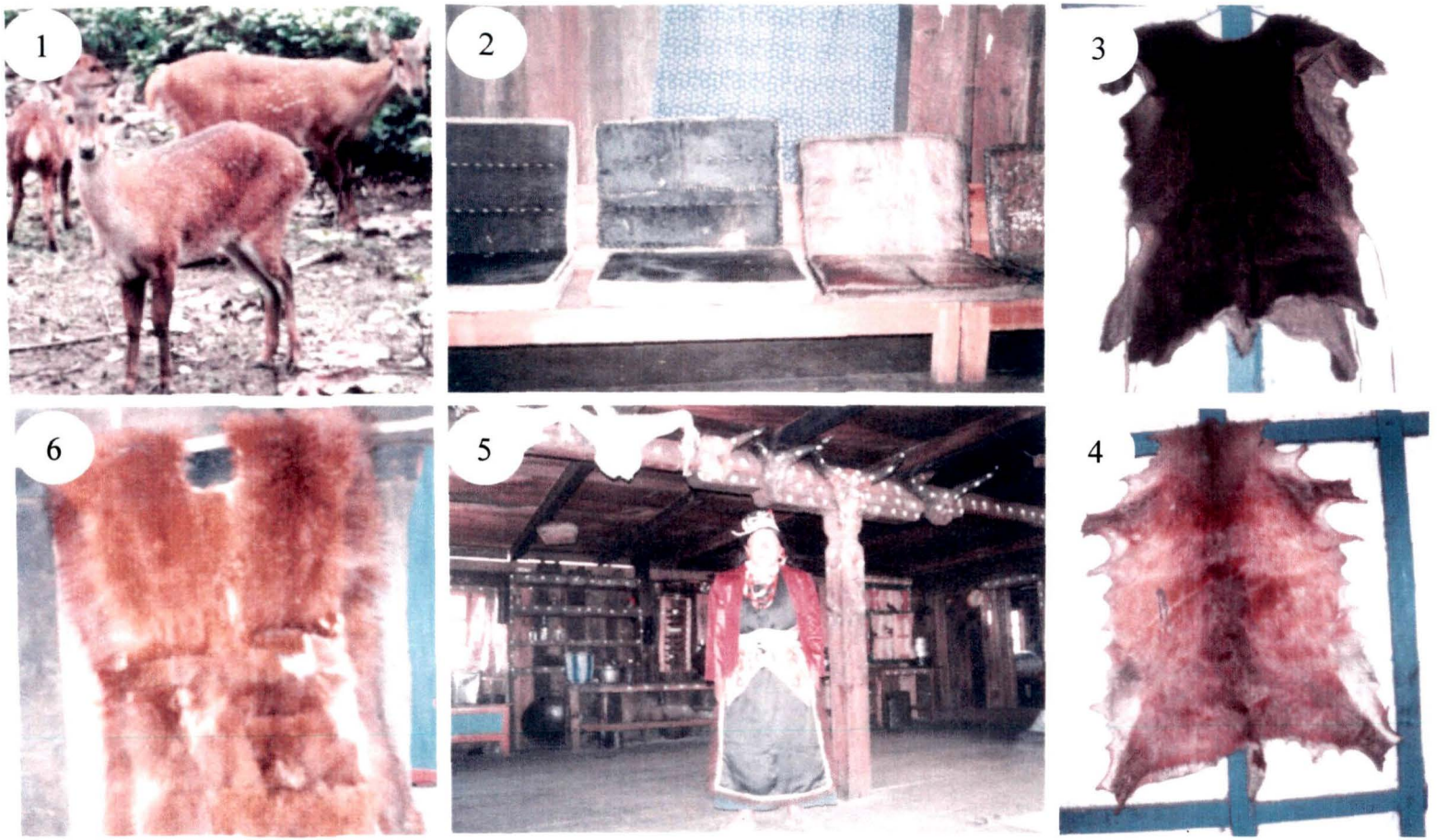


Plate VI: Items made of animal skins and used by Monpa tribe

1) Hog deers, 2) Black bear skin and samber skin use in cushion cover, 3) Hunter's coat made of hog deer skin, 4) Coat of deer skin for man, 5) Women with coat made up of deer skin and 6) 'Pakcha', a local coat.

CHAPTER 7

USE OF ANIMALS IN MAGICAL AND RELIGIOUS PRACTICES IN THE NYISHI, MONPA AND APATANI AREAS

Man's endeavour to restore health with magic and prayer is an age-old practice and spirituality is given highest importance. The remedial measures are implied through psychological effects. The tribal groups are firm believers of the magical or religious performances to deal with the soul of the patient and the evil sprit that has entered the body of the patient and caused sickness. The tribal society is guided by traditionally laid down customs and every member of the society is expected to conform to it. The fate of the individual and the community at large depends on their relationship with unseen forces, which intervene in human affairs. The people of the Tani group, including the Nyishi and Apatani tribes believe that if men offend supernatural powers the mystical powers punish them with illness, death or wth other natural calamities.

The usual theory of becoming sick in the tribal society is based on the breach of some taboos or believes. The sickness is the routine punishment for every laps and crime. The village priest performs religious functions and acts as the mediator between the people and the mystical powers. By propitiation and prayers he tries to maintain the good relationship between the people and the mystical powers. Thus the sickness is removed by magical and religious treatment. As a matter of fact the disease to a tribal mind is a multifaceted phenomenon of the natural world and essentially incomprehensible and no single

theory can cover all the known facts perfectly (Gupta 1986). The inherent links between the supernatural world and the medical belief system in tribal societies have been discussed in detail in various anthropological studies on the native people in North America, Egypt and Rome (Starbuck 1971; Lippold 1971; Toynbee 1973) and in India (Malik 1998; Barua 1998; Barman 1981; Khatanna 1992). The cultural behavior and their concept of disease, sickness, and illness are the related issues among the Nyishi and Apatani people. There is an intimate relationship among the people, their health and religious elements. The magical and religious practitioners are considered as specialists in this regard. The *Dony-Polo* (Sun-Moon) is the considered supreme authority by both the Apatani and the Nyishi and the tribes belong to the Tani group. There are a number of benevolent and malevolent deities and spirits are prohibited by them from time to time in their society. To propitiate Gods and Goddesses and to ward off evil spirits from the society, family, homestead land and from the field different religious rituals/festivals are observed. Offering rice beer and sacrifice of animals are common practices as the priest suggest on occasions. In Apatani society, the head portion of the animal that has been sacrificed on a particular magical and religious occasion goes to the chief of the village. It is also a common belief that the blood of the animal on the ground makes the soil fertile and suitable for cultivation. Thus, it has been observed that the various magical and religious practices among the ethnic people of the region are closely associated with animal resources. There is paucity of study on magical and religious practices observed by the ethnic people and its impacts of animal resources. Therefore, the

present study has been undertaken to understand this aspect and its impact on the biodiversity in the region.

MATERIALS AND METHODS

The details of the method of gathering information on these aspects have been given in chapter 4. To emphasize the magical religious aspects, elderly people and the priest particularly are interviewed and information gathered on the traditional uses of animals and animal parts in different magical and religious ceremonies. The head of the village of each tribe is also contacted for collection of quantitative information on animal category, animal number and kind of animal associated with different magical activities.

RESULTS

Both the Nyshis and the Apatanis sacrifice mainly nonhuman primate species (*Macaca mulatta*, *M. assamensis* and *Trachypithichus pileatus*) for the departed soul of the dead person. It is commonly believed among the Tanis that the animals so sacrificed would be a permanent companion to the departed soul in his journey to eternal world. The different deities are considered responsible for the proper growth and harvest of crops in specific season and specific animal species are sacrificed for their propitiation. The Apatani people always propitiate them for peace and prosperity of their tribe (Table 7.1).

Table 7.1 Sacrifice of animals associated with deities of Apatani tribe

Name of the deities	Time of offering	Place of offering	Occasion of offering	Propitiatory activity
Chandii/ kiidi Munii	March (During seedling period)	Inside the village	Proper growth, protection and properly harvesting	Sacrifice and offer domestic fowl and egg
Chandii-Tamu	April-May	Outside the village	Healthy growth of crops	Fowl, eggs and rats sacrificed
Tamu and Mettii	During transplantation of crop from nursery	Inside the village	For the growth of of crop	Fowl, eggs and dog is sacrifice and offered
Su Myoro Gyunii	April	Inside the village by every clan of each village	Blessing and safety for people and crops	Cow, dog fowl and egg is sacrifice and offered
Yapung	September/ October	Inside the villages	Harvesting of matured crops	Goat, dog, pig sacrificed and fowl eggs are offered

Magical and religious ceremonies of Apatani tribe

Murung ceremony: The *Murung* is one of the highly religious festivals of the Apatani tribe and celebrated annually in the month of the January when the agricultural activities start. They sacrifice mithun for the well being of human society. The number of mithun sacrifice depends upon the capabilities. The meat of sacrificed animal is distributed to the community people. The distribution pattern of animal parts among the community people is given in the Table 7.2 (Plate VIII).

Myoko ceremony and monkey hunting: The Myoko is the oldest magical and religious festival of the Apatani celebrated for general welfare of the society. It is believed that by the myoko celebration society is protected from any type of epidemic and it brings elixir and prosperity to life and society. Wild fowls and non-human primates (*Macaca assamensis*, *M. mulatta*, and *Trachypithechus pileatus*) are sacrificed mainly during this ceremony. The use of skull and hands of the monkey is a must to celebrate the festival. So they are required to hunt monkey at any cost, their skull and hands are placed at the altar of the myoko during its ceremony. The hunting of monkey is the task undertaken by the male members and

Table 7.2 Distribution pattern of animal parts among invitees to '*murung*' ceremony of the Apatai tribe

Animal body parts	Local term	Gift recipient	Local term
Liver and chest bone	*Pahin-gimyo*	Parents of the bride	*Diirang aato-ayo*
Neck	*Lampo*	Immediate brother of the bride, who shares bride gift	*Lache*
Coccyx bone	*Ami*	The brother of the bride who shared bride gift with her	*Mechu*
Facial bone	*Solo*	Eldest or youngest brother of the bride	*Anu-abang*
Lung and liver	*Haru*	Priest	*Nyibu*
Spleen	*Alhing or Arpi*	The priest and eldest brother of the clan	*Nyibu / Anu*
Small intestine	*Khinjang*	Priest, elder brother and be-header	----
Large intestine	*Khiiro*	Mithun keeper	----
Fore head and shoulder	*Allii*	The elder sisters of both bride groom	*Ami-anu*
Thorax bone	*Gyasi*	Maternal and paternal uncles of the bride	*Nyimmi and Milonyanii*
Muscles of thorax	*Potii-flying*	Mithun keeper	*Subu kanii and*

bone and anus		(Reared)	*Yoharnii*
Thigh muscles	*Barmii pinii*	Nephew	*Yallang*
Cooked meat	*Liiha hanii*	Parents, brother and sisters husbands	*Diirang/lache*
Cooked meat, dried squirrel and one live cow	*Nyibu punii*	Priests (gift for their service in the ceremony)	*Nyibu*

hunting is done in particular forest demarcated by own clan or villages; others are not permitted to hunt therein.

In some village only one or two monkeys are hunted for a village during the myoko. The total number of monkeys hunted in the myoko ceremony per year is constant without any criterion, 8 for Hong village, 3 for Hija, 2 for both Hari and Michi-Bomin villages, 1 each for Tajang, Talyang, Dutta and Mudung-Tage. Thus, 19 primates are killed in every year. Killing percentage of primate is expressed in Figure 7.1.

The hunting of the monkey on the eve of the myoko ceremony has deep religious concern hence all sections (clan) of the Apatani society are not permitted to hunt but can use the body part of the monkeys killed by he authorized clan in the society. The different parts of the body are gifted to person of different social status (Table 7.2).

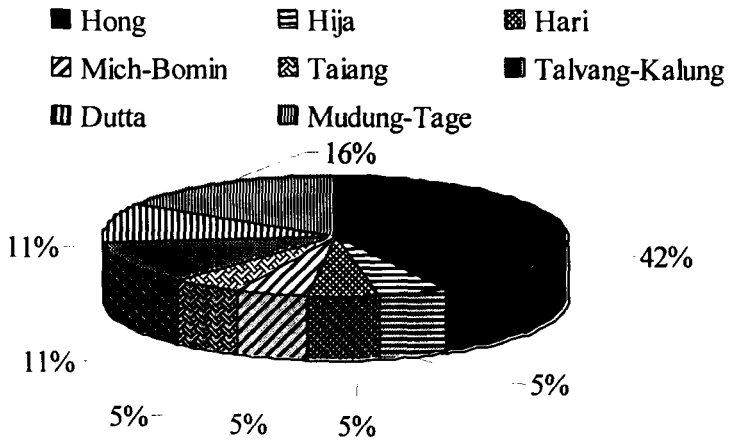


Figure 7.1 Relative percentage of primates hunted in different Apatani villages

Subu ceremony: This ceremony is sometimes called *'khempu'* and is solemnized during November to March or August to December. In this ceremony mithuns and cows are sacrificed for recovery from illness, for prosperity, or as the signs of good (Plate IV).

Burial system and use of animals by the Nyishi people: The People in the Nyishi community burry the dead body that is called '*debii biinaam*'. In the graveyard locally called nyubu, mithun, domestic boar and chicken are sacrificed for the dead person with chanting ritual hymns by the priest before dead body is put to rest. A chicken and a dog are buried in the graveyard with the dead body. It is believed that the chicken will eat up the worm, and the dog will help and guide the soul whenever necessary in its eternal journey. They decorate the graveyard with bamboos and a non human primate, a flying squirrel, or porcupine as per availability in the area to be sacrificed and hung ritually. The species of non-human primates are preferred. The number and categories of animals sacrificed in the burial ceremony are recorded during the study period (Table 7.3). On an average, 26.7 animals of different categories per village per year are sacrificed for the burial of dead bodies.

Table 7.3 Animal sacrifice in gravyard by the Nyishi people

Village	Number of dead person	Animal sacrifice	Number of animal
Karchingcha	5	*Macaca mulatta*	5
		Hystrix brachyuran	4
		Chicken	5
		Dog	5
Papu Nalah	6	*Macaca assamensis*	2
		M. mulatta	4
		Hystrix brachyuran	4
		Chicken	6
		Dog	6
Doimukh	4	*M. mulatto*	3
		M. assamensis	1
		Hystrix brachyuran	4
		Chicken	4
		Dog	4
Sejusa	10	*Trachypithechus pileatus*	6
		M. assamensis	2
		M.mulatta	2
		Hystrix brachyuran	6
		Chicken	10
		Dog	7
Paki Kessang	7	*Trachypithechus pileatus*	3
		M.mulatta	2
		M. assamensis	2
		Hystrix brachyuran	5
		Chicken	7
		Dog	7
Pachin	10	*M. mulatto*	8
		T. pileatus	3
		Hystrix brachyuran	10
		Ratufa bicolor	7
		Bos frontali	6
		Chicken	10

The rate of loss of each animal group is related to the loss of persons died in a particular village.

Ritual practice and animal sacrifices: There are some ritual practices, which are closely associated with the sacrifice of animals by the Nyishi and Apatani people. The domestic animals such as chickens, fowls, pigs, goats, and the mithuns are sacrificed (Table 7.4). The number of animals sacrificed in these practices range from one to five. These animals are sacrificed for the welfare of all the families and their mithuns and for protection of crops from the diseases and good yield. The practice of sacrificing domestic animals is common presently and it is due to difficult accessibility to wild animals. During earlier days they sacrificed the wild animals excessively and now those species have become rare (Plate VIII).

Table 7.4 Some ritual practices and animal sacrifice of he Nyishi tribe

	Depending upon omen test	
Offering reason	Categories of animal Sacrificed	Number of animal sacrificed
Happy eternal journey	Chicken	4
All round welfare of families	Chicken	4
	Pig	1
Get rid of evil spirit	Fowl	4
	Pig	1
	Goat	1
Welfare for dissatisfying activities at home	Mithun	1
	Chicken and fowl	3
Lightning strikes	Mithun	1

Protect from enemy	Pig	1
	Goat	2
	Fowl	5
	Mithun	1
Increase of Yield and protection of crop	Mithun	1
	Pig and	2
	Fowl	3
Welfare from misfortune	Mithun	1
	Pig	2
	Fowl	3
	Goat	2
Welfare of Mithun	Mithun	1
	Fowl	3
	Pig	1
Guiding to right path	Pig	2
	Fowl	4
For welfare of the hunter and his family members	Pig	4
	Chicken	3

Animal and War dance: War dance is a ritual performed by priests where two villages/tribes use to fight. This is more common among the Nyishi tribe. They believe that it is originated from the two brothers called '*Nima*' and '*Niya*'. '*Nima*' became a tiger and the tiger in the forest started killing the human beings who are said to be the brothers of '*Nima*'. In retaliation, the human beings defeated the tigers in the fighting by many ways killed a large number. Thus, the war dance is said to be performed out of happiness on defeating tiger and to please the God for human

superiority over the tiger. The priest performs the ceremony and carries the message to the God that the evildoer has been punished.

The use of skin is common during war dance. Following are the animal species whose skin is commonly used.

1. Tiger (*Panthera tigris*): It is used to protect the shooting of an arrow, spear and sword from the enemy in the war operation.

2. Mithun (*Bos frontalis*): The dry skin of nearly half feet in breadth covers the stomach and back to protect the strike of an arrow or sword from the enemy. It also serves the purpose of belt, which is also used as a bag to store eatables as he has to walk a very long distance to fight the enemy.

3. Bear (*Selanactoe thibentus*): The dry skin of the bear is generally used on the head, to protect from rain and also from the enemy sword and arrow.

DISCUSSION

Religious importance of animals has been an age-old belief all over the world. Lippold (1971) has described the Egyptian and arctic ethnozoology and mentioned the religious importance of animals such as owls and eagles as sprits for prophesy of the shamans among the Native American groups like the Tingit and the Athebaskan. They worship the Gods and Goddesses, which have an intimate relationship with the animal world. The animals' shares in the after life with human beings have resulted

in the burial of animals in family tombs. Some animals are buried at the time of their natural death because of their special significance but many are killed and buried as part of funerary ritual or worship activities. It is thought that some deities represent themselves on earth in the form of a single representative of a specific species. The animals believed to be the incarnation of the Gods and Goddesses have lived a pampered life in and around the temples and religious centers. The animals like cats, cattle, mongooses, gazelles, and snakes are sacrificed to various deities. Toynbee (1973) has mentioned the sacrifice of domestic animals such as pigs, bulls and oxen by the prehistoric people of Rome for proper growth and production of crops. In Arunachal Pradesh various domestic, semi-domestic and wild animals are being sacrificed by the ethnic people to please the deities such as chandii/kiidi, munii,chandii tamu, tamu and mettii, sumyoro, gyunii and yapung. The animals such as cows, dogs, pigs, goats, mithuns and rats have been sacrificed to worship the Gods and Goddesses for proper growth and production of crops. These practices take a heavy toll of these animals during season of agricultural operation every year.

The primates are sacrificed during the murung and myoko ceremonies by the Apatani tribe. They have strong belief that each and every season each clan has to kill a specific number of primates, which pose a severe threat to primates in the region. The hunting of primates is found in different countries such as China, Vietnam, Yunnam, Indonesia, South America, West and Central Africa, (Mittermeier 1977; Daoying 1999; Eudey 1999; Malone *et al.* 2002). However, the hunting of

primates is common in north-east India but it is not frequently recorded in rest of the India (Kumar and Solanki 2004a; Solanki *et al.* 2004b). The primates are linked to the monkey God Hanuman, who occupies an important place in the Hindu religion. Religious phenomena in any region contribute to support and save biodiversity at the region. But in north eastern region of India and particularly in the Nyishi and the Apatani inhabiting areas in Arunachal Pradesh hunting of animals and sacrificing them for religious ceremonies are still continued affecting the biodiversity of the region.

Starbuck (1971) and Lippold (1971) mentioned the role of seashells in and around the graves of the inhabitants of Mexico. They believe to have symbolized the earth, the under world, the realm of the dead, and perhaps rebirth and renewal. Conch shells probably symbolize water and are associated with several Gods and Goddesses. Hawks, eagles and falcons are believed to have been sacrificed regularly in religious ceremonies.

The Nyishi people of Arunachal Pradesh have also sacrificed wild animals including primates in the graveyard. Assamese macaques (*Mcaca assamensis*), rhesus macaque (*M. mulatta*), caped langurs (*Trachypethichus pileatus*), squirrels, porcupine, mithun and dogs are sacrificed. This is a common and unique practice of the tribe. Those people who inhabit rural areas sacrifice animals and keep them in the graveyard along with the dead body. This activity again leads to loss of biodiversity in the

region. Barua (1998) has studied the magical and religious traditions of Tai khamyangs of Assam. They sacrifice a big black cock for daini-puja in order to get relief from prolonged diseases. The Nyishi and Apatanis also make talisman of skin, head and taws of primate and tiger, and it is used by the patient of undiagnosed prolonged diseases. The skulls and bones of hand are on the entry of the house door under magical and religious belief to prevent the entry of evil spirit. Skulls are tied around the neck of children during prolonged illness (Plate VII). Borang (1996) has reported that hanging the skull, palm with fingers of primates above the entrance door of a house propitiate evil spirits. Carpaneto and Germi (1989a) who leave studied on zoological culture of the Mbuti Pygmies (a local tribe) in North Eastern Zaire have reported that pregnant women eat meat of olive baboon because they believe that this will make their babies born with a beautiful nose. In north-eastern region this type of practice has been reported by Harit (200, 2001, 2002). The ethnic people of Arunachal Pradesh have also shown the use of monkey meat by pregnant women of the Nyishi and Apatani tribes during the time of childbirth. Such magical and religious beliefs also contribute in conservation of certain animal groups. There are some practices among the women of the ethnic people of Arunachal Pradesh that avoid any mammalian meat during menstruation time. They believe that the meat of mammals makes the body weak and the baby may be abnormal in their future pregnancy. Fortunately the Monpa tribe of the state has not used any animal sacrifice

in their ritual practices. This will definitely help in conservation of animal resources in the biodiversity of the region.

The animals are lost in the time of the practice when a person dies in a particular village. Since these magical and religious practices are an integral part of the ethnic culture and the belief is deep rooted. The scientific basis of the practices is yet to be proved and in the first hand these appear to be the psychological manipulation of the mind set of the tribal society. It is a very herculian task to get rd of this conception from the tribal philosophy. The negative impact due these practices on nature and nature system is far reaching. The awareness among the tribal society and appropriate medical facilities in such areas can only pave the way to come out of this situation, which may help to save the biodiversity in the region.

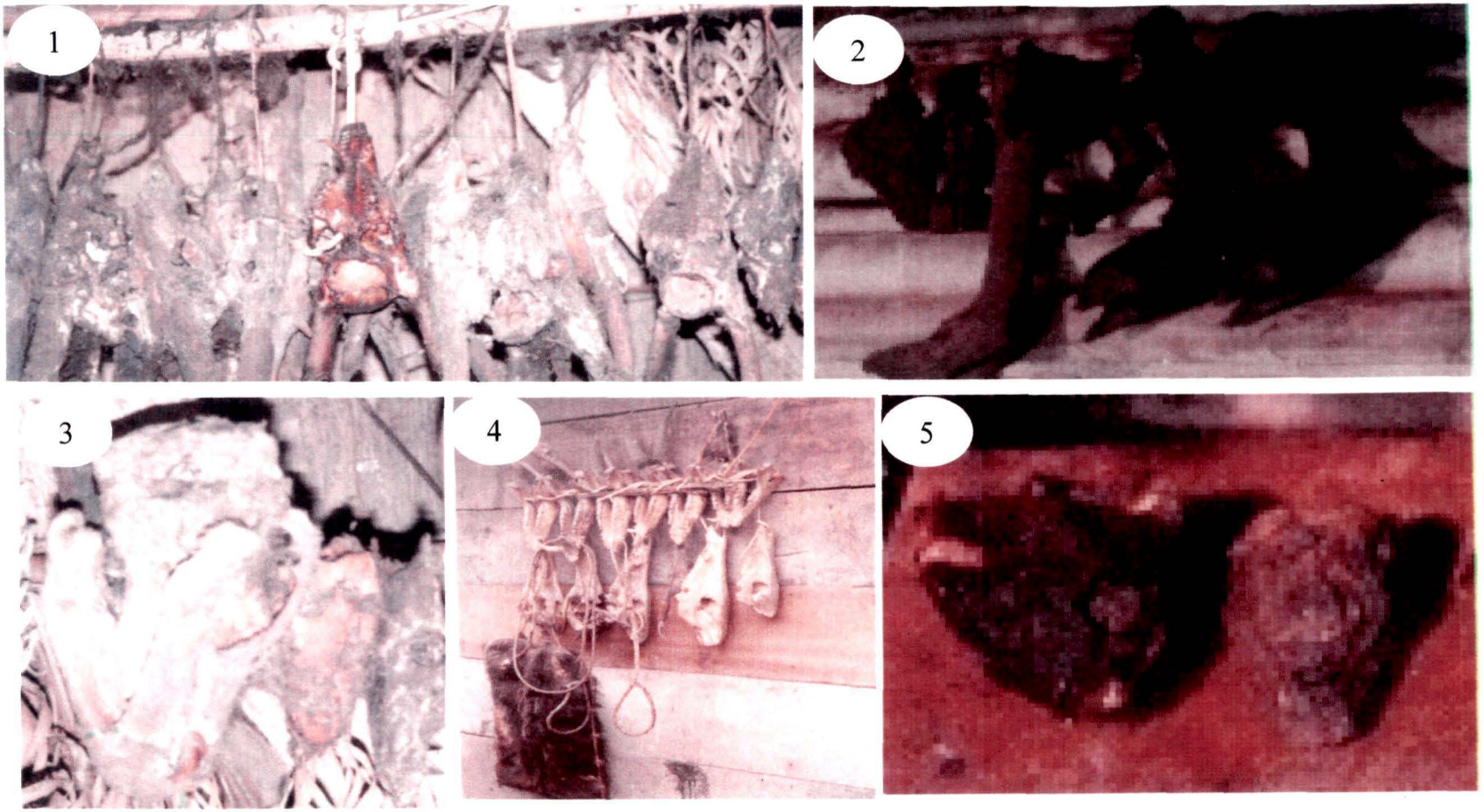


Plate VII: Animal parts used magical and religious practices.
1) Deer skull, 2) Skulls and dry legs of primate and deer, 3) Skull of bear, 4) Wild boar teeth (top row), skull of antelope (below) and suicide rope and 5) Skulls of deer and primates.

Plate VIII: Magical and religious practices in Apatani tribe.
1) 'Omen' test of Apatani, offering with Chicken liver and egg, 2) Animal meat and vodka being carried for 'murung' ceremony, 3) Sacrifice of chicken for 'murung' ceremony and 4) Sacrificed animal in murung ceremony.

Plate IX: Himalayan black bear in socio-cultural, magical and religious uses. 1) Himalayan black bear, 2) Claws of black bear, 3) Skulls of bear and 4) Skin of bear in head gear.

CHAPTER 8

GENERAL DISCUSSION

The humankind depends on biological resources for food, energy, medicine, cultural inspiration and for all other means of livelihood. Indeed, biodiversity and human beings have had a close and mutual relationship for tens of thousands of years. The biological resources upon which people depend have the critical character of being renewable at least when they are managed well. But the availability of biological resources and richness of biodiversity depend upon the ways the society use the resources, their productivity and ecological services. Biotic impoverishment of species, genes, and biological communities in a region is an almost inevitable consequence resulted due to overuse and misuse of the environment by the human kind in the course of its rise to the dominance. Thus the changes in attitudes towards nature, impact of global trade, expanding ecological niche of human beings have indirectly resulted in the loss of biodiversity.

The first colonizers and their new found homes have started showing quite negative impact on the biodiversity, culminating in the extinction of a number of larger birds and mammalian species (Martin 1985). Early human beings were not in a position to estimate sustainable level of harvest of the plants or animals that they used. Nor were they concerned for sustaining harvests since they mostly preferred seeing the option

of moving on to yet another area if the resource became depleted at one area (Gadgil 1987). They would have run into a land full of large mammals unaccustomed to being hunted by clever and well organized bipeds with bow and arrows, spears and other hunting technology. Such prey population was likely to have hunted without any special restraint, leading to the decline and perhaps extinction in some cases (Martin 1985). Subsequent colonization of people with more advanced technology further intensified the waves of exploitation. The impact of colonization of hunter-gathers was especially negative on biodiversity of islands mainly due to hunting of endemic species and occasionally by the introduction of alien species. In Madagascar, for instance, early colonization apparently led to the extinction of larger species of lemurs, elephant birds and in New Zealand to the extermination of flightless birds such as moa, a large duck, a giant coot and an enormous goose (Diamond 1984; Martin 1985). Forest dwellers in hilly areas in countries do the same hunting and pose threats to the biodiversity in the region. When the nutritional or other resource needs would not meet with the most desirable species, they would likely to turn to other less desirable resources.

The ethnic groups in Arunachal Pradesh do practice hunting and gathering system to utilize the animal resources for different purposes like therapeutic, socio-cultural, magical and religious uses and also to fulfill their customary needs. Hunting is the most crucial destructive activity of the ethnic people in the region. The large segment of population, 20-57% of the tribal mass depends on hunting for the various types of

requirements (Figure 4.1) with high hunting rate (Table 4.5 and 4.7) from one tribal group to another. Thus, the impact on biodiversity of Arunachal Pradesh by hunting is especially negative on the region. The tribal groups of the state hunted large numbers (43 species) of mammals and birds (53 species). Some of hunted animals come from the threatened categories viz., vulnerable (52%), endangered (24%), and lower risked/near threatened (20%) (Table 4.1 and Figure 4.6). The vulnerable mammals are leopard, clouded leopard, yellow bellied weasel, Siberian weasel, beak striped weasel, otter, musk deer, serow, porcupine, mithun, Assamese macaque, sloth bear and Himalayan black bear. The endangered mammals are tiger, takin, and hoolock gibbon. Most of them are endemic species of the North Eastern Region. Some of them are flagship species and are concerned with their conservation at the national and international forum. These data need to be authenticated by future contemporary studies. Because of the significantly low population of the endemic species and their fragmented habitats, the rate of extraction does not reflect their natural abundance.

Anestey (1991) has estimated the total wildlife off-take to be 1, 50,000 tones per year, one of the highest per capita off-take in Africa. However, the quantity of wildlife extraction in Arunachal Pradesh is not as large as in African countries, but the low numbers of extracted species of some animals that have been found in the study are significant. The wild animal harvest poses a potential long-term threat to the survival of the most vulnerable species. Wildlife management plans and policies

should focus on the species that are particularly vulnerable to over harvesting with an emphasis on the regions of the state giving priority for conservation. Local communities should also be involved in wildlife management activities and they should also be made away of the benefits of wildlife conservation.

The bush meat is an important source of protein in regular diet and also a source of income to local hunters and to the national economy in the many regions in the developing countries (Ntiamoa-Baidu 1987). The dependence on bush meat trade needs to be reduced by finding alternatives for livelihood and cheap sources of protein for the communities that depend on bushmeat. Increasing the availability of domestic livestock to rural villages is a frequently mentioned option. Villagers in Arunachal Pradesh typically keep chicken, pigs, mithuns and cows to meet their daily meat protein needs; they still prefer wild animal meat/protein without any scientific reason, simply to add delicacy to their taste. This mind set of the people need to be changed and awareness has to be generated in the society to adopt the other available alternatives. The alternatives may be generated by accessing to the natural resources other than the animal species and also by sharing the benefits with the communities. Therefore the demand for meat consumption as well as other body parts for socio-cultural needs can be satisfied in order to keep up the ethnicity.

Widely practiced 'Jhuming' in the natural habitat of wild animals has led to habitat fragmentation and destruction and the population of endemic species is at great risk.

Sustainable use of biological resources is found among the tribal people of the world (McNeely *et al.* 1990). There are, undoubtedly, other factors such as trade in wild meat and other body parts have been identified as the greatest threat to the biodiversity next to habitat destruction through "Jhum Cultivation".

In Arunachal Pradesh, hunting is seasonal. In the winter, months of October-December, before going to jhuming and pre monsoon/monsoon months of April-May, most animals are hunted when they come down to lower altitudes and disturb the crop field. The Himalayan black bears and hornbills are mostly hunted during this season. Another animal species mainly lesser cats which disturb the live-stocks of the villages are also hunted during this season.

Hunters prefer large and medium sized animals for meat consumption. They are semi-domesticated animals such as mithun and wild herbivorous animals such as deer. Chadonnet *et al.* (1995) and Caspary (2001) have showed that large sized herbivores have high economic value and are therefore mostly hunted in Africa, North America and in Europe as well as in India (Kaul *et al.* 2004). The use of modern hunting tools such as cartridge guns are more effective than the indigenous tools. More animals can be extracted with less effort and in a little time. Easy accessibility and low accountability for this fire arm have proved very harmful to the biodiversity of the region. The rate of hunting of mammals and birds in different tribal groups namely the Nyishi is 722/year and 5,100/year, the Apatani 568/year and

3,331/year and the Monpa 363/year and 2,525/year (Table 4.5 and 4.7). If this hunting spree continues at this rate, it may intensify. Hunting areas are mostly in villages/community forests adjoining to the 'jhum' fields. Increasing distance of hunting areas from the villages (Figure 4.18 to 4.23) is a clear indication of depletion of wildlife resources of the region. The ethnological practices and their impact on wild population need a deep understanding in the present context. The present study shows that socio-cultural, therapeutic, magical and religious uses, meat consumption and economic subsistence are some reasons for the exploitation of wild animals.

The ethnic culture has its place in the tribal societies but their mode of celebration needs to be readdressed in the present scenario. Wildlife farming may be explored as an alternative source to meet out the ethnic identity as well as to maintain ecological balance. Knowledge of resource availability, preparation, processing and formulation for therapeutic purpose also continues a part of the Indigenous Knowledge System in the tribal community (Posey 1987). The use of plants and plants derivatives has been a common practice in all human society since ages but the animal use for therapeutic purposes and curing various body ailments has been the practice mostly in the tribal communities. Wild species both plants and animals are important components of traditional medicines upon which an estimated 80% of the world's population has been said to rely for primary health care (WHO/IUCN/WWF 1993). As per assessment of the Food and Agricultural Organization (2001), medicines are considered among the most important NWFPs throughout the world. A variety of

animal species is used for medicinal purposes, ranging from tiger (*Panthera tigris*) to medicinal leeches (*Hirdinaria medicinalis*). The therapeutic use of animals and body parts is common practices among the ethnic people of Arunachal Pradesh. Various diseases, body ailments and zoo-therapeutics activities are mentioned in Table 5.2. Large numbers of animal species are utilized as therapeutic species, 48% mammal, 25% birds and 17% insects. It makes a faunal spectrum used in therapeutic activities. Among mammalian species, Carnivores, Ungulates, Rodents, Primates and Bears are predominantly used more (Table 5.1) by the Nyishi tribe in therapeutic activities than the Apatani and the Monpa. Some of the species utilized in therapeutic activities belongs to the threatened categories and they are regrouped as 50% Vulnerable, 22% Endangered and 28% Lower Risked categories. Majority people inhabiting the rural areas believe in the traditional medicine system. Therefore, the local people utilize the animal resources and as a result impact on biodiversity.

The therapeutic use value (UV) of species range from 0.02–0.20. The more use value the animals like the Himalayan black bears and the tigers have the higher is the risk of their extinction. The use pattern of various components of animal body such as meat 100%, fat 51.4%, gall bladder 42.9%, bone 37.7%, horn 20%, for therapeutic purposes and the animal species extracted for traditional medicine are a significant aspect of this study. Thus, the practice of zootherapy implies additional pressure over the critical wild population. Many animal species have been overexploited as sources of medicine trade (tiger and black bear) and many species are depleting. Majority of

animals who's body parts are come from the extracted list of CITES (Figure 5.3). As per wildlife (Protection) Act, 1972 the hunting of CITES listed animal is legally prohibited but the ethnic people of the region continues hunting the wild species. This is a very critical issue that is related to the sentiments of the tribal people on the one hand and the sustaining of the balance of the ecosystem on other hand. At this critical juncture the ecological balance should be given priority over the people's sentiments. TRAFFIC East Asia (1998) has created law enforcement personnel in China with the capacity to stop illegal trade in tiger bone and other medicinal parts and derivation of endangered species. They proceed on CITES enforcement for the forensic identification of the body parts. TRAFFIC India also actively supports the wildlife Institute of India at Dehra Dun in the development of the forensic techniques for identification of parts and derivatives of animals including musk of musk deer bear bile, tiger bone, and leopard bone used in traditional medicines. The results are used extensively during the awareness cum training workshops at different levels.

At the same time livelihood issue and health care system should also be addressed in right perspectives for the welfare of the tribal communities. In north eastern region including Arunachal Pradesh, it has to develop techniques, including the application of forensic science, for identifying parts and derivatives used in traditional medicines. A large section of the ethnic people (80%) of the region still believes on the traditional medicine system that is medically effective and has no side affects in their views. The modern medicines are costly and have more side effects. It is

observed in this study that 80% of old aged and illiterate persons do not use modern medicine. TRAFFIC East Asia (1999) has reported that the Chinese and the Americans use 38% traditional medicine in place of western medicine. In Hong Kong, 80% believe that the Chinese medicine can cure illness whereas western medicine can't.

The sustainable use of animal species is a well accepted principle for biological conservation. The species which are widely utilized in traditional medicines should be placed in the highest priority list for conservation (Kunin and Lawton 1989). The research on animal products of therapeutic importance should be compatible with the welfare of the society and the use of the by-products should occur under a sustainable manner (Clark 1997) and the conservation of such taxa should be at place. Therefore zootherapy should be viewed within its cultural dimensions. The cultural perspectives include the way people perceive, use, allocate, transfer and manage their natural resources. Since people have been using animals for a long time, suppression of use will not save them from extinction.

The integrity of socio-ecological system with its cultural and spiritual dimensions is strong among many traditional societies (living close to nature and natural resources).The biophysical and human dimensions here are linked with the rich 'Traditional Ecological knowledge' that these societies have evolved over a period of time. Therefore it is significant for forest resource management. Many traditional

societies of the world have institutionalized a variety of cultural landscapes, as part of their belief system. In the Indian context too, the culture-linked ecosystem management is to be found in many of the mountain societies. But culture-linked ecosystem of Arunachal Pradesh has gone in the opposite direction for conservation of biodiversity. The use of animals and animal parts in socio-cultural activities of ethnic people also has a large impact on animal diversity of the region. The cultural diversity of the state has close relationship with biodiversity. Specific animal species (Table 6.3) are important and essential for observing socio-cultural ceremonies in the tribal communities studied.

The prevalent socio-cultural and magical religious activities among the indigenous communities involve the killing of mithun, an endemic and prized animal of the society. The society has its sovereignty where the socio-cultural practices are age old practices inherited from the ancestors. The cultural use of this animal is proving disasters for the survival of the animal due to these practices. The mithun, a rare bovine species of this region, has low reproductive potential. In addition to this, other natural factors like disease, predation and land slides also cause the animal killing (Figure 6.3). Other cultural activities during various social occasions also require different artifacts that are made of animal body parts. Such animals are extracted from natural (wild) habitat. The skins of about 21 animal species are utilized for different purposes such as carpet, coat, bag and decorative part of dao cover. About 5 animal species are utilized by the Nyishi and the Apatani tribes for

their teeth as the ornaments of necklaces and finger rings. The teeth of wild animals are used by the Monpa tribe (Table 6.3). The headgear is a cultural artifact invariably used during socio-cultural events by the tribal people of Arunachal Pradesh. It is decorated with different body parts of various animals (25 animals). Putting this artifact on cultural occasions is the custom among the all tribes. The use pattern is 68% among the Nyishi, 36% among the Adi, 28% among the Apatani, 24% among the Monpa, 16% among the Wancho, 12% among the Nocte and 4% among the Hill Miri. Most of the items used for the purpose are derived from the threatened animals (Table 6.2). The amount of loss of species under the different threatened categories is found to be 50.6% for Schedule I / Appendix I and 38.6% for Schedule II / Appendix II and 10.6% are recorded during 2002-2005. As indicated by this cultural usage, the loss of the threatened categories has its impact on the total loss of biodiversity of the region.

In other Asian countries the cultural use of hornbill and other animal is common (Bennet *et al.* 1997). It is shown that the hornbill is the most threatened species due to hunting all over the north-eastern part of India including Arunachal Pradesh (Datta 1998, 2001, 2002, 2004). Thus the excessive use in different socio-cultural practices and the hunting in animals of the region directly contribute to the loss of diversity of wilderness. It would be appropriate to preserve both cultural heritage as well as conservation of animal resources of the region. Therefore, sustainable uses of animal parts or alternatives have to be introduced among the tribal societies.

Magical and religious practices among the ethnic people of the region are another such activity where animals are used. Different tribal groups have different religious beliefs and practices, hence the impact of biodiversity is not only varied but also serious. The sacrifice of animals associated with various deities is common among the Nyishi and the Apatani tribes. However the Monpa tribe has not used the animal in magical and religious practices due to their Buddhist culture that prohibits the sacrifice of animals. Borang (1996) has reported the primate skull and palm with fingers are hung above the entrance the door of houses to propitiate evil sprit. Besides, the tribal groups in Arunachal Pradesh, the magical and religious traditions of Assam (Barua 1998) and various other parts of the country have traditions based on the animals (Malik 1998, Asari 1998, Khatanaa 1992). During the prehistoric period magical and religious practices and animal sacrifices are found to have carried out in various literature (Starbck 1971; Toynbee 1973; Mittermeier 1977; Eudey 1999) which caused the loss of animal diversity. Inspite of the negative impacts of harvesting of animal resources on biodiversity conservation, some tribes utilize their traditional knowledge of harvesting to restrain the hunting of animal species where they are at critical stages if in order to prevent them from being over harvested. Thus a nomadic hunting tribe of western India has the tradition of releasing any pregnant does or fawns of antelope or deer caught in their snares; and egrets, storks, herons, pelicans, ibises and cormorants at their colonial nesting colonies are given immunity from hunting over most of India (Gadgil 1997). The traditional conservation

practices indicate that they have been a common feature of many cultures over many years. Some conservation practices based on traditions have also been found in the present study. Certain community forests of the Nyishis have been restricted for hornbill hunting during their breeding season and primate meat consumption is prohibited during pregnancy period of women as part of the traditions which contribute to the conservation of these animals. Similarly the Apatanis also conserve the primates through customary traditions where they do not allow outsiders as well as people from other communities during the myoko festival. It has been a common feature of the culture of the Apatani tribe, which indicates traditional conservation practice of animal resources. Such conservation activity needs to be included in a much wider way to generate awareness among other tribal groups.

During the present study it has been seen that the flesh of all wild animal has been utilized as meat by the ethnic people of the region. Extracted wild species range from insects to large mammals. Some of edible insects are seasonally extracted and sometimes daily extracted. The religious attachments play an important role in restraining killing and eating the animals. The Monpas do not eat primate meat because they believe that primates and human beings evolved from the same race. Buddhism does not believe in animal killing. Such kinds of practice by the Monpa people have contributed to the conservation of primates in the region. The religion of "Save Nature" should be inculcated in the mind and heart of the tribal community at large.

Giving local communities the right to control their wildlife resources would thus not be a promising strategy in Arunachal Pradesh. There are frequent conflicts between hunters linked to natural resource extraction. Professional hunters share a large portion of the rural community's income from wildlife resources, as they harvest wildlife grossly in an unsustainable rate without the benefit sharing with the community. Governmental and Non Governmental Organizations should make necessary policy changes to address and to deal with this practice of professional hunting. Beyond this there is also a need for a change in the management approach to the regional biodiversity. Managers must be aware of both the biological and economic impacts of the harvest when setting the policy and developing the management plans.

Public awareness campaign may educate people as to why these species need protection and why they should not be eaten. However, it must also be recognized that the protected species represent a significant portion of the harvest and sale for some rural villages. In the longer term, Non Governmental Organizations involved in the conservation activities can assist the targeted communities in finding alternative sources of meat protein, body parts use in therapeutic activities and cultural tradition and income.

The Government needs to make wildlife resources a central component of its broader natural resource management planning system. Development agencies must also

recognize the impact of wildlife harvesting on biodiversity of the region as well as the economic development of the rural people and incorporate wildlife management in their programs. The development of protected area network should be a more emphatic protection measure for these species but it cannot be relied entirely upon to meet conservation goals. Protection should also be given to the target species outside the protected areas through cooperative management plans that include communities. Wildlife management must be central goal for the Forestry Development agencies. Forestry Development agencies must bring wildlife research to the forefront, and implement programmes that monitor harvest rates, the bush meat trade and consumption and species status as an on-going part of their research agenda.

The study has generated scientific information on ethnozoology on the Nyishi, the Monpa and the Apatani tribes of Arunachal Pradesh and has provided a deeper insight in to the hunting impacts on wild population of the animals. This study has opened a door to undertake a pharmacological investigation of animal body parts that have been used in therapeutic purposes through indigenous knowledge. Economics of subsistence involved in animal hunting also, needs to be carried out by the policy making agencies. The present study can initiate further studies on the following lines to make it more quantitative.

1. Extensive studies on hunting impacts on wild population of the species.

2. Pharmacological studies on animal body parts used for therapeutic activities.

3. Studies on economics of subsistence involved in animal hunting in other tribal groups.

The findings of the present study will be helpful to understand the importance of wild animal species in ecological, biological, pharmacological, socio-cultural as well as conservational aspects. The alternatives of animal based medicines such as plant derivatives and modern medicines can be applied. Based on the findings of the present studies action plan can be applied for proper conservation of the threatened categories of animals.

SUMMARY

The study entitled "Ethnozoological study of Nyishi, Monpa and Apatani Tribes of Arunachal Pradesh" has been carried out in Tawang, West Kameng, East Kameng, Papumpare, Lower Subansiri districts of Arunachal Pradesh.

Arunachal Pradesh (83,743 km^2) is the biodiversity rich region, situated between 26°28′ to 29°30′ N. and 91°51′ to 97°30′ E. in northeastern region of India. It is divided into sixteen districts, and the inhabitants belong to 26 major tribes and 110 sub-tribes. All tribes are grouped into three broad categories on the basis of socio-cultural affinities viz.

A – The Abotoni group which included the Adi, Aka, Apatani, Nyishi, Tagin, Hillmiri, Mishimi, and Sulong tribes.

B – The Buddhist group which included the Monpa, Sherdukpen, Miji, Memba, Khemba and khamti tribes.

C – The Head-hunting group included the Tangsha, Nocte and Wangchoo tribes

The use pattern of animal resources by these three groups is different. The tribes included in each group utilize similar categories of animals differently as per their own cultural practices and ceremonies. Within the group every tribe has their own and unique traditions and identity. Animals used by different tribal groups have been

categorized such as invertebrates (mainly annelids and insects), amphibian, reptiles, birds and mammals.

For the convenience of study only three major tribes namely the Nyishi, the Monpa and the Apatani have been selected. All of these three tribes maintain their own and unique social, cultural, magical and religious activities related with the biological diversity of the region.

Hunting tools and techniques used by different tribal groups and extraction of various animal categories have been studied. Some of the animals of the threatened categories such as tiger (*Panthera tigris*), leopard (*P. paradus*), Himalayan black bear (*Selanactos thibetanus*), sloth bear (*Ursus ursinus*), hornbill (*Buceros bicornis*) are utilized by the tribal people and the quantity of disappearance of animal groups and the rate of loss of faunal diversity are also studied.

The therapeutic activities and the use of animal body parts in the traditional folk medicine system to cure body ailments and disturbances have been studied. All the three tribal groups have shown the use of animal body parts in varied quantity in different therapeutic activities. Some animals mainly Himalayan black bear (*Selanactos thibetanus*), hornbill (*Buceros bicornis*), musk dear (*Moschus moschiferus*) and larger cats including tiger are threatened due to therapeutic use value.

The socio-cultural activities of the tribal people are also animal based practices. Various body parts such as beak and feather of hornbill, teeth and skin of tiger, leopard and Himalayan black bear are found to be used to decorate head gears, and for making overcoat in different tribal societies. The system of marriage ceremony of different tribes is associated with animals. Mithun (*Bos frontalis*), flying squirrels, hornbills, porcupines, and primates are commonly used in these practices.

The magical and religious practices observed by the tribal people are also studied. The sacrifice of animals in the religious ceremonies of the tribal people is common. Domestic animals such as dog, pig, cow, goat, chick and fowl; semi-domesticated animal such as mithun and yak, wild animals such as primates, porcupines and squirrel are common. The sacrifice of these animals in burial ceremonies is also found in the present study.

Highlights of the findings

Arunachal Pradesh is geographically highly diversified and rich in biological and socio-cultural diversity. The tribal people of the state have deep faith in animism. They believe that the world around them is full of malevolent and benevolent spirits /deities. The tribal people of the region are Indo-Mongoloid, Mongoloid in origin and have varied food habits. All of them are meat eaters without much deviation in choice of food item. Various animals are recorded to be used for food, therapeutic purpose, and in religious and socio-cultural practices. The animal population is

dwindling due to these anthropogenic pressures of different magnitude depending upon the type of use and the culture of the tribal group. Widespread hunting and poaching of wild animals for food, alleged medicinal properties, socio-cultural practices and habitat destruction for agriculture, permanent settlement are the main causes for the endangered status of the animal species studied here. Considering the factors that have threatened the survival of the animal species in their natural habitat, evaluation of actual reasons of animal disappearance have carried out so that the animal population may recover. So an effort has been made to formulate appropriate conservation measures and strategies for the animal species.

Keeping the conservation aspects of the animal species in the wild habitat in mind, the study has been focused on the following aspects:

1. Extraction of animals and its impacts on biodiversity.
2. Utilization of animals in therapeutic activities.
3. Utilization of animals in socio-cultural practices.
4. Utilization of animals in magical and religious practices.

The findings of the study are summarized as below:

Extraction of animals and its impacts on biodiversity

The tribal people of almost all age groups participate in hunting exercise. The mean age of the hunter is found to be 35.5 (±12.3) years, the age group ranges from 16 – 57 years (N= 157). A total of 43 mammalian species have been extracted from

natural habitat that includes 36% carnivores, 26% ungulates, 14% rodents, 12% primates, 5% each of bear and chiropterans and only 2.3% of pholiodota. Among the three tribal groups, the Nyishi has extracted a maximum 44% of mammals followed by the Apatani 34% of mammals, and the Monpa 22%, which is the least.

All together 53 bird species are extracted for a variety of use. The group of bird species extracted is composed of Passeriformes (42%), Ciconiformes (20%), Strigiformes (10%), Buceriformes and Piciformes, 8% each, and Galliformes and Cuculiformes 6% each.

Extraction of threatened animals

The composition of the threatened group of mammals among the extracted one is Vulnerable (52%), Endangered (24%), Lower-Risked/Near threatened (20%), and Data deficit (4%). While the composition of the threatened group of birds among the extracted ones are Endangered (9%), Vulnerable (9%), and Critically Endangered categories (2%) as per IUCN Red List (2003)

Hunting tools used by hunters

Hunting tools are categorized as traditional and modern ones. Mechanical trap, spear, and bow and arrow are among the traditional hunting tools and the cartridge gun and explosives are the modern hunting tools. The rate of hunting with guns is 41% by the Nyishi, 51% by the Apatani and 50% by the Monpa. The rate of hunting animals is

high among the Nyishi, and the Apatani (2.5 animal/hunter/year) as compare to the Monpa (1.9 animal/hunter/years) for mammals.

Hunting site distances

The distances to different forests from the villages are one factor of animal hunting. Forest dwellers generally hunt more frequently than others, because they can devote more time in hunting. Thus it is found that the distances from the villages have negative correlation with hunting.

Animals used in therapeutic activities

The mini-faunas including annelids, arthropods mainly insects, mollusk, and some lower vertebrates including fishes and amphibians, larger vertebrate including reptiles, birds and mammals are utilized for the therapeutic purposes. The major faunal categories used for therapeutic activities includ mammals (48%), birds (28%), and insects (17%). Out of 43 mammalian species utilized as source for the therapeutic activities, 18 species are threatened species as per the IUCN Red List 2000 and Wildlife (Protection) Act 1972. The threatened categories of mammalian species are composed of endangered category (22%), Vulnerable (50%), and Lower Risked category (28%).

Study revealed that 7 different body parts namely meat, gall bladder, bone, fat, penis, alimentary canal and horns from mammals, 5 number of body parts from birds namely meat fat, feather, bone and legs are used for therapeutic purposes.

The therapeutic use value base on the number of body parts used from each species is calculated. Large use value indicates extensive use of animal. The therapeutic use value (UV) of tiger and Himalayan black bear is 0.20, hornbill is 0.1, both leopard and sloth bear are calculated to be and 0.09 indicating the extensive use of these animal categories.

Use of animals in socio-cultural practices of the Tribal groups

Besides their ornaments, the mithun is the most possessed and valued animal of thevNyishi and the Apatani. This animal is sacrificed at the altar during the main festivals, the Nyokm Yello of the Nyishi, the Mykoh and the Murung of the Apatani tribe. The other animals sacrificed by all the tribal groups are goat, cow, chicken and fowl, primates where they are used for appeasing the deities, considered to be the supreme in matter of harvest and crop yield. The slain body is used for consumption.

Animal utilization in headgear decoration

About 25 animals have been identified, whose body parts are used to decorate headgears-a symbol for cultural identity. The highest numbers of animal species are used by the Nyishi followed by the Apatani and the Monpa. The Nyishi tribe use 17 animal species to decorate the head gears and followed by the Apatani (7 animal species). The Monpas use 6 animal species. Some of the animal body parts used for the purpose are derived from animals of the threatened category. The fourteen animal species used belong to Schedule I categories and 9 animals to schedule II (as per

IUCN Red list, 2003, and Wildlife (Protection) Act, 1972). Ten (10) species of 25 are included in Appendix I and other 11 species are in Appendix II and the rest 4 species in Appendix III as per CITES. The animal species whose bodies are utilized in headgear decoration belong to different threatened categories; 50.6% fals under Schedule I / Appendix I and 38.6% under Schedule II / Appendix II and 10.6% under other categories. This may also be considered as an amount of the loss of species due to this cultural practice.

Use of animals in magical and religious practices

For the magical and religious practices of the Nyishis and the Apatani, they sacrifice animals, mainly nonhuman primate species (*Macaca mulatta*, *M. assamensis*, or *Trachypithicas pileatus*) and bury with the departed soul of the dead person. It is a common belief among the Tani groups that the animals so sacrificed would be permanent companions of the departed soul in his journey to the other world.

Some important magical and religious ceremonies observed in some tribes have been given below:

The *Murung* is one of the highly religious festivals of the Apatani tribe, which is celebrated annually in the month of the January when the agricultural activities start. They sacrificed mithuns for the happiness of human beings. The meat of the sacrificed animal is distributed to the members of the community.

The People of the Nyishi community practice to bury the human dead body which is called '*debii biinaam*'. Before the dead body is taken to the burial ground (nyubu), mithun, domestic boars or chicken are sacrificed for the dead person with the chanting of the ritual hymns by the priest. A chick and a dog usually are buried in the graveyard with the dead body. It is believed that the chick will eat up the worm, and the dog will help to guide the soul whenever necessary in its eternal journey.

RECOMMENDATION FOR SUSTAINABLE UTILIZATION OF ANIMAL RESOURCES

Ethnic practices are intricately woven in the life styles of the tribal groups. Because of their association with socio-cultural and religious practices are insensitive to the conservation of species. The present socio-cultural and religious practices are more harmful to the wild population than the earlier ones because of the gorgeous nature of the present practices, the destruction of wild habitats, the decline of wild population in contrast to the growth and extension of the human population as well as their habitat. The important anthropogenic activities like hunting and deforestation have led to the declines of wild animals from the natural habitat. The rapid increase of human population has initiated the clearing of the forest areas for cultivation and shelters, which increase the declining of the wild animal species and increase the demand of daily needs related to forest. The effects of anthropogenic pressure has been reflected clearly from the present study, which shows that many bird and

mammal species have disappeared every year from the study sites. If these practices are continued for a few years without any proper conservational measures we will lose many of the valuable wild animal species including some threatened categories of animal species.

Conservation awareness and Strategies

Intensive conservation education and awareness programmes should be initiated among the local people throughout the state. The need of the hour is to create and interest and also a sense of pride for having a rich wildlife asset among the students which among also help to change the adult attitude and likely to bring abut a long term change in the conservation of the wildlife resources. Seminars and workshops have to be organized to educate, motivate and promote awareness among the youths of colleges and universities.

The following conservational strategies have to be introduced:

1) Cultural diversity may be maintained by the use of animals and their body parts in a sustainable manner.

2) Alternatives of animal body parts should be introduced to maintain their culture.

3) Animal based-traditional medicine should be banned and modern medicines or herbal medicines should be introduced as alternative.

4) Hunting of wild animals should be strictly prohibited among the ethnic people of the state.

5) More Research Works on wildlife Resources should be emphasized in the region.

Conservation through Indigenous knowledge System

Conservation oriented programme should be developed for the region which must have some scope to utilize the knowledge of the tribal community in this field. Their age old traditional knowledge can add success to the conservation of the animal species. People should be given due benefits for that.

Law enforcement

The forest department and other wildlife authorities often fail to implement laws available for the protection and conservation of wildlife. Proper awareness about Wildlife Protection Acts should be given to the ethnic people. Proper coordination between the law enforcing agency and the custodians of wildlife should be established for the effective protection of species. The present study has shown that the effective hunting tools like guns are widely used to kill the wild animals. Thus the issuing of license for gun should be discouraged. The properly trained stuff of the forest department can restrain hunting and poaching.

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Appendix I

Proforma designed to collected information on pattern of utilization of animal resources

Name of person interviewed: Tribe/sub-tribe
2. Occupation :
3. Strength of family :
4. Place of interview : (i) Name of place :
(ii) Location:
(iii) Other details:
5. Name of the animal : Local / English
& its description.
6. Uses of animal: (a) Meat / Flesh, Fur, bones, Nails, body organs, medicinal, any other.
7. Use of animal hide/body organs:
(a) Medicinal, use to cure/treat

(b) Decoration purpose

(c) Cultural practices, name of practice
(d) Offering to grace the religious occasion
(e) Any other
8. Average kill in a month or year :
9. who kills the animal / which section of society :
10. How the animal is killed (use of killing method) :
(a) Trap – Mechanical (description of trap or photograph)
Chemical (name of chemical and mode of use)
Any othe
(b) Shooting – Gun
- Bow/ arrow.
- Explosion material and its kind

- Any other device

11. How many person participate in one kill:
12. Killing takes place in night or day and how much time is taken in killing operation:
13. Are these animal products marketed: Yes / No.
If yes: (i) Marketing place:
(ii) Rate of selling:
(iii) Basis of fixing the price

(iv) Total income from all category of product:

If No: Are these products utilized for domestic use to supplement regular diet or dish is prepared on special occasion such as ----------

14. If the animal so important any conservation measures are being initiated by:
    (i) The community
    (ii) NGO
    (iii) Government agencies like forest department etc.
15. How the value system has changed in last ten year :
16. Availability of animal at present (how far is available), five years and ten years back.
17. Is there any check over killing of animal by government? If yes, is it effective? Any action taken against any offender?
18. Is new generation also taking interest in the customs that necessitate killing of animal?
19. Season during which killing is done maximum :
    - during agriculture operations (before burning the forest for Jhuming or after burning)
    - during festival
    - killing remains constant
20. Suggestions to find out alternatives in light of :
    - government restrictions
    - depleting animals
    - increasing human populations(demand of animal use)
21. Role of institutions (educational/Govt./NGOs/ village levels etc.) in checking the Un restrained killing of the animals.

Appendix II

List of Research Papers/Published/Accepted/Presented in Conference, Seminar and Symposium in the research work done under the Scheme

Published papers:-

1. G. S. Solanki and P. Chutia (2004). Ethnozoological and Socio-cultural Aspects of Monpas of Arunachal Pradesh. *J. Hum. Ecol.*, 15(4): 251-254.
2. P. Chutia, G.S. Solanki and O. P Singh (2004). Ethos and Culture of Nyishi tribe and use pattern of common Indian monitor lizard, *Varanous bengalensis*. Indian *J. Forestry*, 28(4):421-424.
3. G. S. Solanki, P.Chutia and O.P. Singh (2005). Head gear - A cultural Artifact and its impact on Biodiversity. *AU RJ.* 7 (1): 35-44.
4. G.S. Solanki, P.Chutia and O.P. Singh, (2005). Ethnozoology of Nhishi tribe and its impacts on Biodiversity. *AU RJ. 8* (1): 89-100.

Presented:-

1. P. Chutia and G. S. Solanki (2003). Paper presented on "Use of Head gear by Nyishi tribe and its impact on Biodiversity of Arunachal Pradesh" in National Conference on Zoology at Vivekananda College, Kanayakumary, Tamil Nadu, 21st, 22nd & 23rd December,2003.
2. P. Chutia, G. S. Solanki and O. P. Singh (2004). Paper presented on "Ethnozoology and biodiversity Conservation in Arunachal Pradesh" in International Symposium on Recent Trends.....Biodiversity Research, at NEHU, Shillong. 20-22nd May, 2004.
3. P. Chutia and G.S. Solanki (2004). Paper presented on "Recent Trends in Environment and Sustainable Development" at NERIST, Nirjuli, Arunachal Pradesh. 11th Sept. 2004
4. P. Chutia and G. S. Solanki (2005). Poster presentation on "Ethno-medicine of Nyishi tribe of Arunachal Pradesh" at National Conference on Arunachal Pradesh: Tradition in Transition.....Economics and Ethics. 13-16th Sept. 2005.
5. P. Chutia and G. S. Solanki (2005). Paper presented on "Traditional Knowledge, Use value of faunal resources and Biodiversity of Arunachal Pradesh" at Kathmandu, Nepal, 17 – 20 November, 2005
6. P. Chutia, G. S. Solanki and O. P. Singh (2005). Paper presentation on "A Zootherapeutic analysis of bushmeat in Arunachal Pradesh" at Department of zoology, DBMAM University, Aurangabad, 21st to 23rd October, 2005.