STATUS, HABITAT UTTLIZATION AND CONSERVATION OF HIMALAYAN TAHR *Hemitragus jemlahicus* (H. SMITH, 1826) IN LANGTANG NATIONAL PARK, CENTRAL NEPAL

By

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A Dissertation Submitted in Partial Fulfillment of the Requirement for the Degree of Master's of Science in Zoology (Ecology)

Central Department of Zoology

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APPROVAL

This dissertation submitted by **Mr. Devendra Prasad Tiwari entitle "Status, Habitat Utilization and Conservation of Himalayan Tahr *Hamitragus jemlahicus* (H.Smith 1829) in Langtang National Park, Central Nepal"** has been accepted as a partial fulfillment of Master's Degree in Zoology Specializing in Ecology

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RECOMMENDATION

It is our pleasure to mention that **Mr. Devendra Pradad Tiwari** has carried out the Dissertation entitled **"Status, Habitat Utilization and Conservation of Himalayan tahr *Hamitragus jemlahicus* (H.Smith 1829) in Langtang National Park, Central Nepal"** Under our supervision and guidance. This is the condidate's original work, which brings out important findings essential for biodiversity conservation in remote mountain region. To the best of our knowledge, this dissertation has not bee submitted for any other degree in any institution. We recommend that the dissertation by accepted for the partial fulfillment of the requirement for the Degree of master's of Science in Zoology Specializing in Ecology.

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APPROVAL

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ABSTRACT

This study was carried out in the Langtang National park which is situated in the Northern Part of Central Nepal. The research work on "Status, Habitat utilization and conservation of Himalayan Tahr in Langtang National Park was conducted during February to October of 2005. Altogether 468.55 hours and of 80 days with aimed to estimate the population status and Habitat utilization of Himalayan Tahr and to recommend for appropriate management.

The study was carried out from Ghodatabela to Langsisa Kharka. The study area was divided into 5 survey blocks occupying a total of 25 sq. km. The fixed point count from ridge line vantage points were conducted for the Hamalayan Tahr count. Observed herds and individual were repeatedly counted and recorded. Local herders and key residents were interviewed.

A total of 218 individuals of different age and sex Himalayan Tahr were recorded during the study in 8 different herds. Three types of herds were recognized: Adult male - adult female - young (37.5%), Adult female - young (37.5%) and adult male (25%). Survey revealed that 50 percent of Tahr herds were observed in 4200m - 4900m and least (12%) were in 3700-4000m. Animals were not located in 3850m - 4200m. Stratified random sampling was done to analyze the vegetation in their habitat and identified 47 potential plant species.

The encroachment of their habitat is severe by the excessive livestock grazing and utilization for cowshed. Noticeable disturbance felt due to frequent poaching and tourist flow. The conservation of this species seems to be vital as it is prime prey species of snow Leopard in Langtang National Park.

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ABBREVIATIONS AND ACRONYMS

BPP	:	Biodiversity Profiles Project
m	:	Meter
DNPWC	:	Department of National Park and Wild Life Conservation
NARMSAP	:	Natural Resource Management Sector Assistance Programme
LNP	:	Langtang National Park
MCA	:	Musk Deer Conservation Area
Km	:	Kilometer
VDC	:	Village Development Committee

1. INTRODUCTION

1.1 Background

Nepal lies between China on the North and India on the east, south and west, with great natural beauty and of a rich cultural heritage. Its shape is long, rectangular with eastern line shorter than on the west. Nepal stands on a latitude of 26^0 22' to 30^0 27' north and has its longitude between 80^0 4' to 88^0 12' east. The east west length of the country is 800 km parallel to the Himalayan axis and the average northwest width is 140 km. It total area is about 147,181 sq. Km. Its altitude various from 60-220 m in the south rising to 8,848 m at the north. With this small area the country has all its possible landforms, features of the east except the volcanic and coral islands and marine. The physiography of the land is very interesting. The country has plain areas in the south, hills and valleys in the middle and lofty Himalayas in the north (Sharma 1999).

Nepal has been a source of great attractions for her mountains, landscape, lakes, green valleys, waterfalls and hillside serrated in the form of an endless series of terraces. The entire northern border has silvery peaks of the Himalayas and the country is the home of perpetual snow (Majupuria and Majupuria 1999).

Nepal is rich in its natural resources. The ideas of conserving natural resources, as protected areas were first started globally in USA in 1972 (Train 1985). In Nepal, its official implementation was started with the department of National parks and wild life conservation (DNPWC) Act of 1973. There are 16 protected areas in Nepal, among them 5 National parks and 3 conservation areas lies on northern mountainous zone. The major protected areas (12%) are situated in the mountainous region of the country (Anon 1994). Langtang National Park (LNP) is in the central Himalayan region of Nepal, designated in 1970-71 as the first

Himalayan National park and gazette in 26 march 1976 by His Majesty's Government of Nepal with assistance from the UNDP/FAO. The main purpose of the establishment of this park is to preserve the natural environment and to allow local inhabitations to follow traditional land use practices, which are compatible with resource protection. (Majupuria and Majupuria 1998). It is the second largest mountain national park of Nepal, covering 1710 sq. km. in three districts, Rasuwa, Nuwakot, and Sindhupalchowk of Bagmati zone in Nepal. LNP records 46 species of mammals including those typical of the area such as, Musk deer, Himalayan Tahr, Snow leopard, Pika, Himalayan Ghoral, Red panda, wild dog, Asiatic Black Bear, Leopard, Clouded Leopard and three species of monkeys (Chalise 2003). Besides, 345 species of Birds, 11 species of Herpetofauna, 30 species of fishes, 58 species of butterflies and 10 species of spiders are also recorded (BPP 1995, Khatiwada 2002).

These animal populations are characteristically dynamic over time for the development of conservation strategy especially in relation to changing human land use, the estimation of population size and structure is very important (Berry 1987). The selection of living areas by an animal can be determined through the study of ecological parameter and composition of the habitat. The changes in the habitat parameter tend to either increase or decrease in the population size.

1.2 Himalayan Tahr *(Hemitragus jemlahicus* H. Smith 1826)

The Himalayan Tahr (*Hemitragus jemlahicus*) is a primitive wild goat. They resemble typical goats in their strong body odour and in the absence of pre-orbital, inguinal and pedal glands on the forefeet (Lydekker 1924). In western Himalayas its local names are Tehr, Jehr, Kash, Jagla (Prater 1971). It is popularly known as Jharal in Nepal. Himalayan Tahr is widely hunted for sport, trophies and meat (Davys,

Forsyth and Hickling 1998, Forsyth 1998). Tahr is from thar, the Nepalese name for this animal, Hemi (Greek) half, tragos (Greek) a goat meaning "something like a goat" referring to the animals' combination of having certain goat like characteristics, where as, Jemla, probably from (sanskrit)- snow, icus (L), meaning, belonging to.

1.3 Classification of Himalayan Tahr

Kingdom	-	Animalia
Phylum	-	Chordata
Class	-	Mamalia
Order	-	Artiodactyla
Family	-	Bovidae
Sub-Family	-	Caprinae
Genus	-	*Hemitragus*
Species	-	*jemlahicus*

In Nepal, Himalayan Tahr is considered a game species and license is required for its hunting. The Department of National Park and Wildlife Conservation operates and regulate legal hunting. The Dhorpation Hunting Reserves in western Nepal is the only area designated for permitted hunting of this species (Austergard and Haugland 1993). The duration of the Tahrs rut in Himalayas is unknown but the gestation period is 6.5 months (Caughly 1971) and the young are born either in May and June (Stockley 1928, Prater 1971) or June and July Blanford, 1988-91, Lydekker 1924). The mating must take place between mid-October and mid-January. Tahr is found in either maternal herds of females and young or in male herds. The infants use to hide into bushes and cover for protection from predators such as snow leopard (*Uncia uncia*), Common Leopard (*Panthera pardus*), wild dog (*Cuon alpinus*) and Golden eagle (*Aquila chrysaetos*). Excessive hunting (poaching),

disease, male competition and accidental fall from the cliffs are the main causes of mortality (Green 1978).

1.4 Geographical Range

Himalayan Tahr is found from the Jhelum River in the Pir Panjal Range of Kashmir eastward along the Southern Flanks of the Himalayas to about central Bhutan (Burrard 1925). Tahr once ranged as far as central Europe, where it disappeared between 10,000 to 17, 000 years ago (Kurten 1968). It has been widely introduced elsewhere for hunting. After introduction to New Zealand in 1994, it spread out to entire suitable habitat there. A large number of introduced populations occur in New Mexico, California (USA), Ontario (Canada) and South Africa (Forsyth and Hickling 1998, Tustin 1990, Kingel and William 2001).

1.5 Habits and Habitat

Tahr is primarily a grazing animal, mostly active in the morning and evening, with a rest period around noon (Green 1978). During the winter, it eats less due to poor food quality and metabolic costs. It eats upon alpine herbs and sub-alpine scrubland plants (Tustin 1990; Forsyth 1998, Forsyth, Parkes and Hickling 2000). They are commonly found feeding on open grassland (Wegge 1976). Tahrs are good climbers and easily traverse ledges and rock faces (Sharma 1994). The literature contains conflicting opinions about habitat preference of Tahr. Tahrs are essentially forest animals but sometimes they may wander into the open areas (Leydekker 1924). The Tahrs habitat is the sub-alpine zone between 3900m and 5300m (Caughley 1969). Tahrs favorite habitat is precipitous terrain of towering cliffs, rocks, dense shrub and forest (Prater 1971). The favored habitat of Tahr at least from February to April, was the grassy cliffs broken by small stands of forest and bamboo below an attitude of 3500 m (Schaller 1973).

1.6 Physical Description

Himalayan Tahr has a finely found head, narrow erect ears, a heavy body and long robust limbs. The hair on head and face is stout. The body is covered with tangled masses of coarse, flowing hair. On the neck and shoulder it goes in a mane, which sweeps down to the knees. The coloring is very variable generally, it is a deep reddish brown, and there is a dark mid-dorsal streak, not always distinct. Old males are darker particularly about the back and quarters. Ewes and young males are lighter brown, kids much paler (Prater 1971). Thus horn touches base of the skull and is compressed. The structure of the horn is sub triangular. They are uniformly wrinkled except at the tip and curve slightly backwards. In female Tahrs horns are smaller and manes wanted (Shrestha 1997).

The adult male measures 90 -100 cm at the shoulder where as the female is 84-89 cm and weight ranges from 90-100 kg in males and 50 kg in female (Harris 1976, Schaller 1977).

1.7 Status and Distribution

The Himalayan Tahr is considered vulnerable by the IUCN (1996). The status and distribution of Tahr in Nepal has little information available, which indicates it will widely through patchy distributed across the country. So far the population status of Tahr is still indistinct throughout the country, even through the status of some population's is currently known (Table 1).

Table 1: Known Population of Tahr in Nepal

Location	Estimated population	Year of Survey	Sources
Hinku/Hongu	400-500	1987	Poudayal and Bauer, 1988
Sagarmatha	400-500	1987	Bauer
Langtang	300-400	1987	Bauer
Dhorpatan	>100	1993	Austergard and Haugland 1993
Khaptad	<50	1986	Tappa pers. com
Phoksundo	<50	1994	J.L. Fox pers. com.
Rara	>50	1992	N. Pradhan, pers.com
Langu (Dolpo)	>100	1987	K. Shah, pers.com
Total	1300-1800		

Source: Gurung 1995.

In its natural habitat, *Hemitragus jemlahicus* now survives as remnant populations due to hunting and habitat loss. In areas, where it was introduced it is doing well, but is often heavily managed (Tustin 1990, Forsyth, Parker and Hickling 2000).

1.8 Objective

The main objective of this study was to collect basic ecological data on status, habitat utilization and conservation of Himalayan Tahr in Langtang National Park (LNP). The specific objectives are

i. To explore the present status of Himalayan Tahr in Langtang valley.
ii. To identify the habitat use pattern.
iii. To describe the floral composition on the Tahr's gazing area.
iv. To explore the threats for Himalayan Tahr.

1.9 Limitation of the Study

1. Lack of Spotting-scope made difficulties in categorizing the Tahr into their sex.
2. Harsh and fluctuating environment of the study area created difficulties to follow the animal for long period.
3. Heavy tourist flows and freely left domestic animals in the park used to disturb the research work.
4. Our study was concentrated for the partial fulfillment of academic degree for masters in zoology (ecology).

1.10 Significance of the Study

1. There was previous study on Himalayan Tahr around 70s in LNP. Therefore, this exploration will establish recent status of the species in LNP.

2. This study will help the relevant government, researchers, and the planners and associated agencies for conducting management plan on Himalayan Tahr conservation that is directly or in directly helps for the conservation of snow leopard, as it is the principle prey species of snow leopard in LNP.

2. STUDY AREA

2.1 Physical Description

The study area, Langtang National Park is located in between the Latitude 28^0 00'-$28^0$20' N and Longitude 85^0'15'-86^0 00' E along the Langtang river to the northern Himalayan range near the border with Tibet in the central region of Nepal. Langtang National Park was designated as the first Himalayan National Park in 1970-71 and was gazetted in 26 March 1976 by his Majesty's government of Nepal with assistance from the UNDP/FAO to conserve the unique flora and fauna of the region. It has an area of 1710 sq.km. and the attitude ranges from 792 on the Bhote Koshi to 7245 m on the peak of Langtang Lirung. In 1998, an area of 420 sq. km in and around the park was declared as buffer zone. This park extends over parts of the Nuwakot, Rasuwa and Sindupalchowk district (Chalise 2003).

The park represents a meeting point between Indo-Malayan and Palearctic realms and holds a rich biodiversity (DNPWC, 2004). The park lies in the central Himalayas and is bisected east west by the Gosainkunda lake and Dorje lakpa range in the north. Langtang Lirung 78,24m dominates the peak, Gosain Kunda Lake 4380m lies in the southwest and Dorje Lakpa at 6988m lies in the east. The park represents some of the best examples of the graded climatic conditions in the control Himalayan The park with diverse attitudinal range supports life zones from upper tropical forest to the permanent snow (Chaudhary 1998, DNPWC 2004).

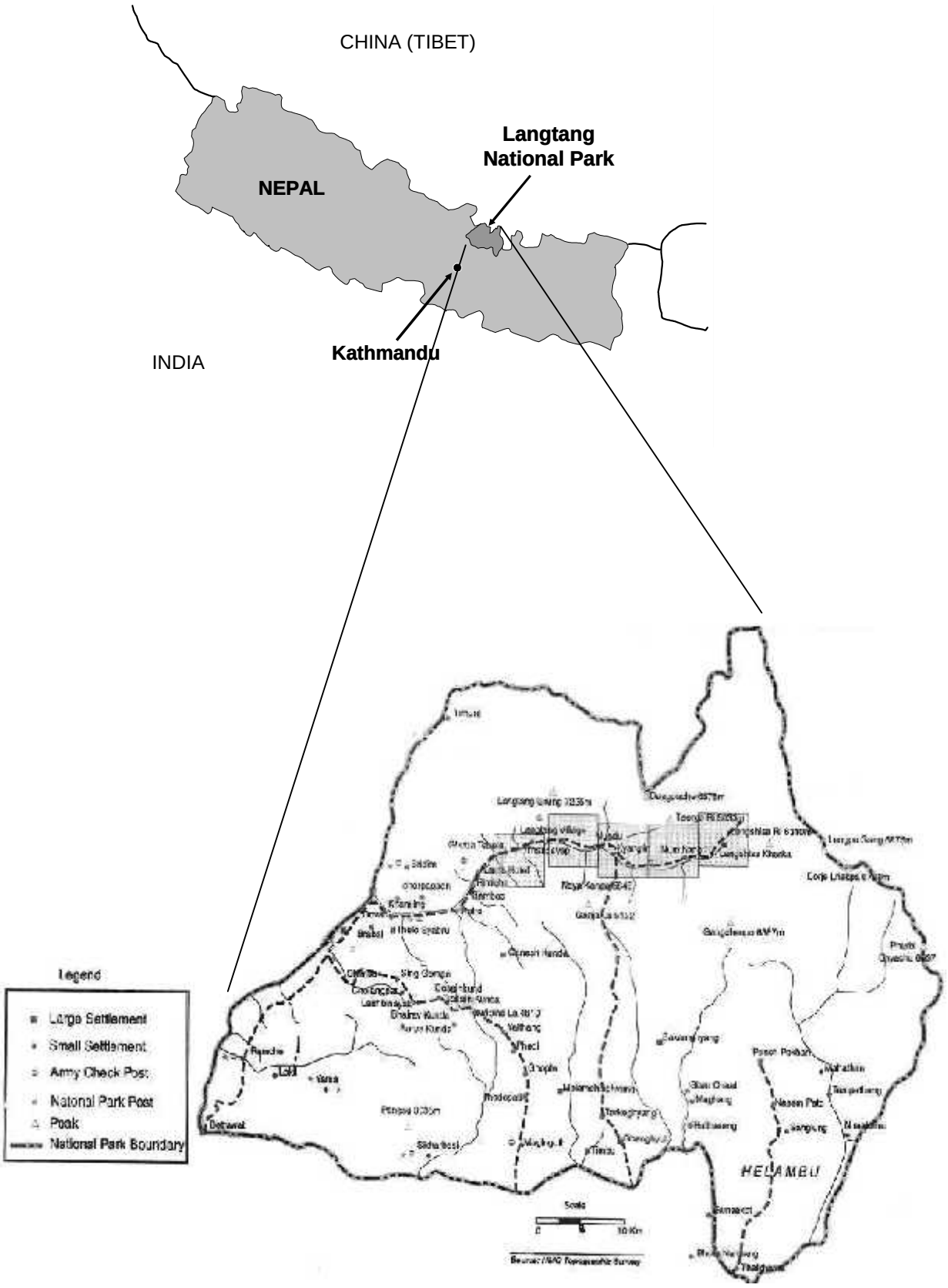
The LNP is the nearest mountain protected area from capital city Kathmandu and can be reached during the monsoon and winter by

vehicle to Dhunche and Syabrubensi via Trisuli and then trekking into Langtang valley. Alternate trek routes are from Gosainkunda or Ganja La, a 5100m pass negotiable during monsoon the autumn months and can be trekked from Sundarijal of Kathmandu.

Present study is focused on Langtang valley of Langtang National Park, located between the Latitude N $28^0$10'21.3" to N $28^0$14' 20.1" and Longitude E $85^0$27' 316" to E $85^0$42'16.9". The elevation varies from 3000 m. to 5578 m (Map 1 and 3).

Ghodatabela, Langtang valley, Kyanging valley, flood plains of Langtang Khola, Numthan, Chyadan, and Langsisa Kharka were the main sites for this study. These areas are surrounded by Langtang Lirung, Kyanjing Ri, Yala peak, Cherkhuri, Langtang, Ganja La, Lakpa Dorje, Nayakyang Himal. The Langtang valley is rich in glaciers such as Langtang glaciers, Langtang Lirung glacier, Yala glacier etc.

Map 1: Location of study area in LNP



2.2 Drainage

Torrential rivers exist in the park with two major sources types: those feed partially by glaciers (e.g. Langtang Khola, Bhote Koshi) and those, which do not have glaciated origins (e.g. Trisuli, Phalanga, Tadikhola). River discharge is greatly affected by the monsoon climate with five-fold increase in the Bhotekoshi at Syabrubensi. A seven-fold increase in the Langtang Khola at Syabrubensi and twenty four-fold increase in the Trisuli Khola at Dhunche (DNPWC /DUCHE 1977).

2.3 Topography

Dominantly rugged, steeply dissected terrain is the typical feature of the central Himalayan region. The Study area represents the great Himalayan Range (i.e. Langtang, Jugal Himal, Langsisa Himal, Nayakhyang Himal, Yala peak Himal) and the valley of the inner Himalaya (i.e. Langtang valley). The region to the south of the Kyanjing, Lakpa Dorje range and Langsisa range comprises the northeast - southwest curving watershed which seperatges the Langtang khola, catchments the western end of the Langtang Himal rises steeply to Langtang Lirung 7245m, the highest point in the park.

2.4 Geology and Soil

Although no economically viable minerals concentrations are reported to occur in Langtang, the park may be considerably affected indirectly. Topography vegetation and aspect severely affect local soil patterns. It is difficult to generalize. Mature soil occurs in the lower forested regions, mainly fertile Loams. It the upper Langtang valley, the most common textural component is sandy loam with a large proportion of rocks. The mean proportion of land decreases with elevation and

loamy sands become predominant below 2440m, where the practice of pasture burning occurs, the topsoil layer often comprise alternating dark and pale horizon due to ash accumulation and the pH is more homogenous between them. Solis are fairly acidic, pH 5-6 (Maire 1973).

A consideration for the park management, associating all the different aspects of climate, topography, hydrology, geology and soil is the incidence of erosion, both natural and accelerated. Livestock and lower growth rate and prevailing shorter growth periods affect the sub and alpine environments. Cattle that graze for much of the year on the higher slopes frequently create soil "bath" in which they rest and roll. Trails suffer from margin collapse each year, particularly at the time of mass transhumance before and after the monsoon. At lower forested elevations foraging and wood cutting activities, together with heavy rains, high run off and low evaporation during the monsoon, cause considerable soil transportation. Resultant land slide erosion was formerly concentrated in Nuwakot District but in the past decade has rapidly expanded in Rasuwa District, especially in areas of increasing population pressures and associated deforestation (Tantscher 1970).

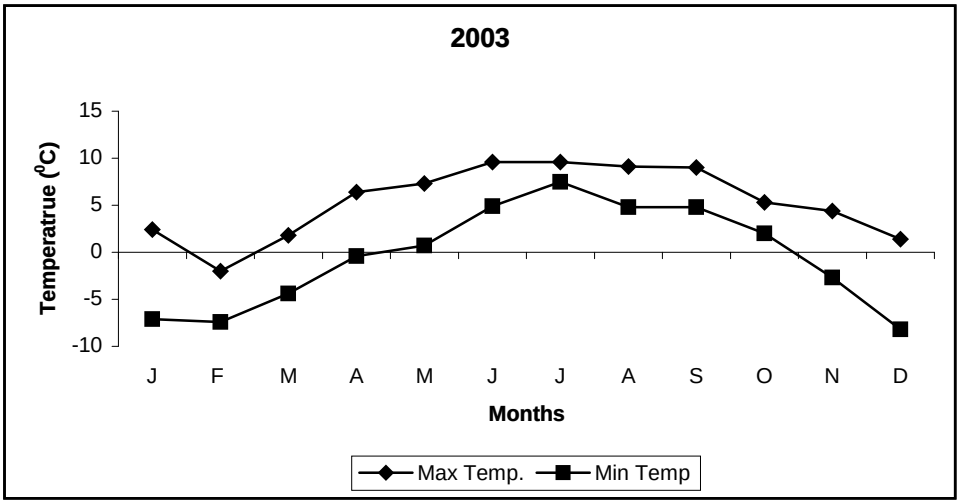
2.5 Climate

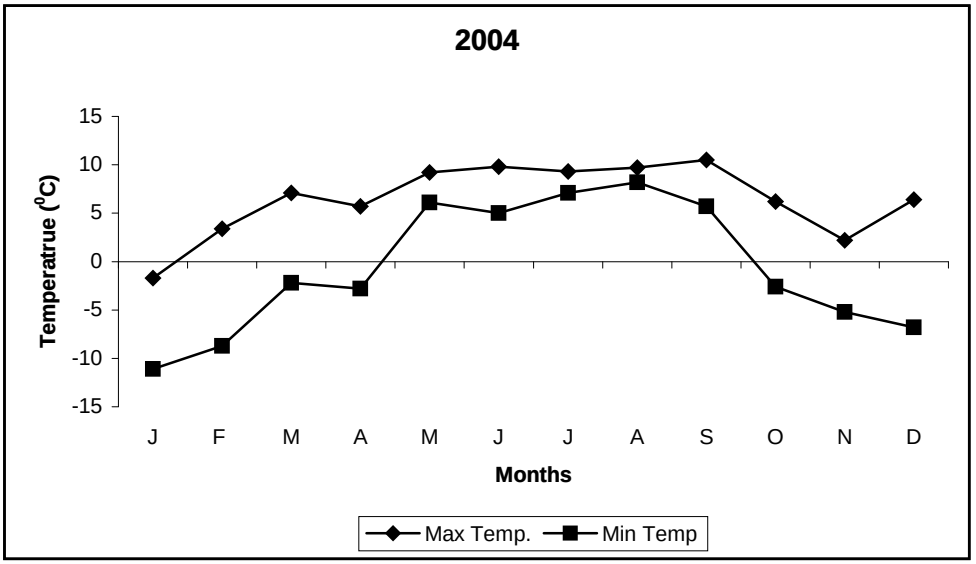
The seasonal climate is dominated by the southerly monsoon, which occurs June to September. The incidence and type of precipitation is mainly related to aspect, altitude and the presence of rain shadow effect. Total annual precipitation is estimated at 526.8 mm to 1041.5 mm, with more than half occurring as rain during the monsoon period (July-September). Date from Langtang the nearest wealthier station (which lies

inside the study block also), annual precipitation is extremely variable ranging from less than 526.8 mm in 1993 to about 1041.5 mm in 1995.

The coldest and driest months are January to March, November and December while the warmest and wettest months are May to September. In the summer, the main maximum temperature recorded was 14^0C in June 1998 and mean minimum annual temperature recorded since 1993 to 2005 was -14^0C in February 2001.

Snowfall rarely remained on the ground for more than a few days on south facing slopes, in contrast to northerly slopes, which retain their winter snow cover up to several months. The monsoon usually reaches the study area in late June or early July and lasts until the end of September. June to August tends to be the wettest month but precipitation varies greatly from year to year. The skies are clear in early morning. After the late of monsoon the skies covered by cloud and reduced visibility for the purpose of this study the seasons were defined as winter (December - Mid March), spring (mid March - May), summer (June-September) and autumn (October-November).





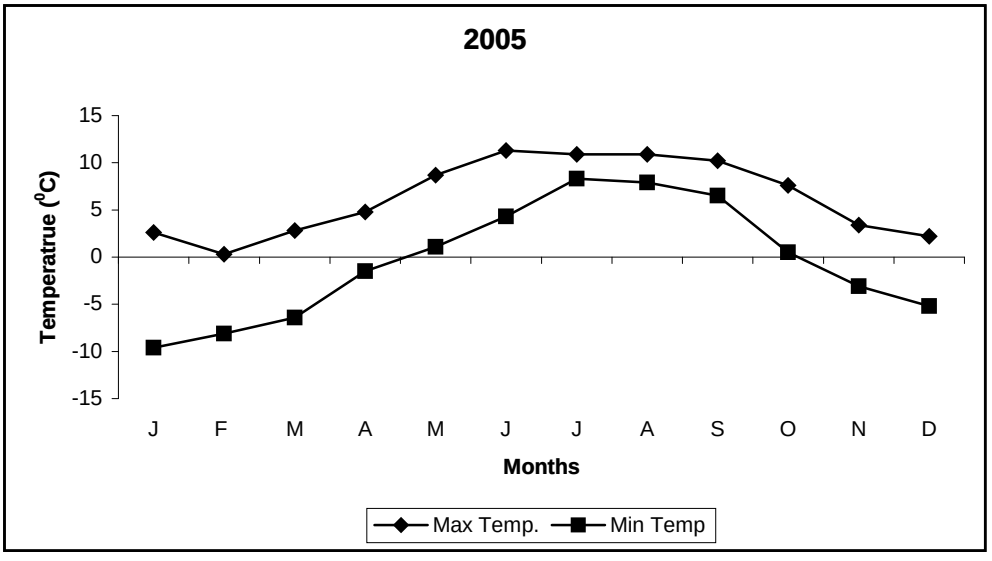
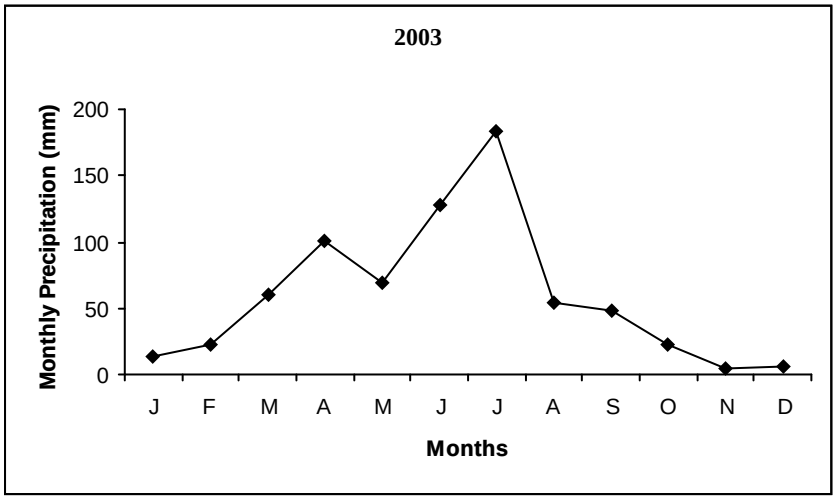
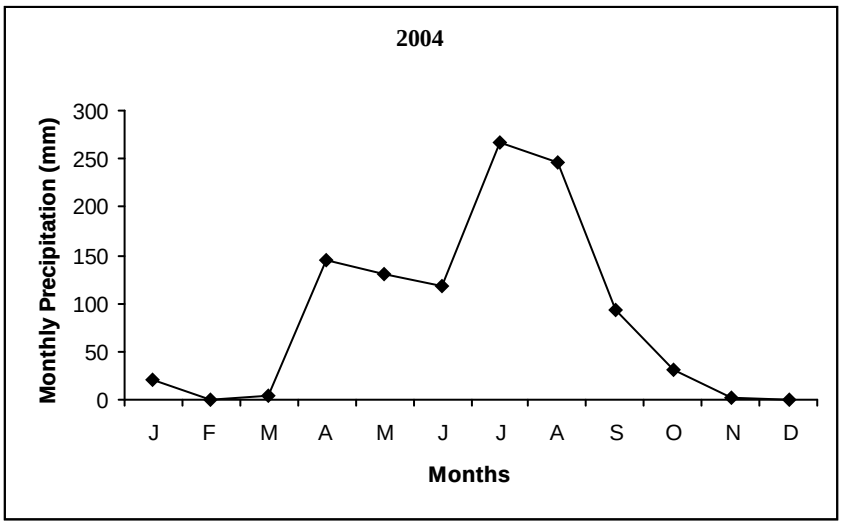


Figure: 1 Monthly Maximum and Minimum temperature (2003-2005) recorded at Kyanjing Gumba, Rasuwa.

The data of temperature clearly shows that December, January and February are very cold months and June, July and august are Warm months.





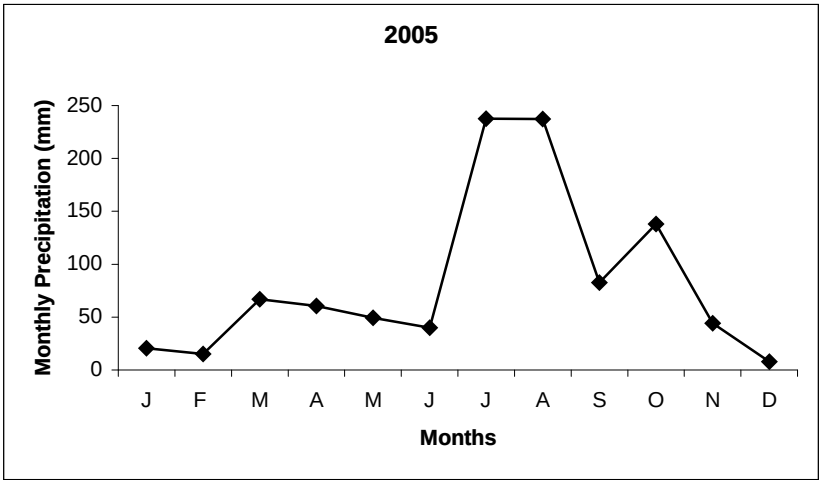


Figure 2: Monthly Precipitation (2003-2005) recorded at Kyanjing Gumba, Rasuwa.

May to August is rainy months with high precipitation rate and less in October to January (Fig 2). The more precipitation was in 1995 (i.e., 1041. 5 mm).

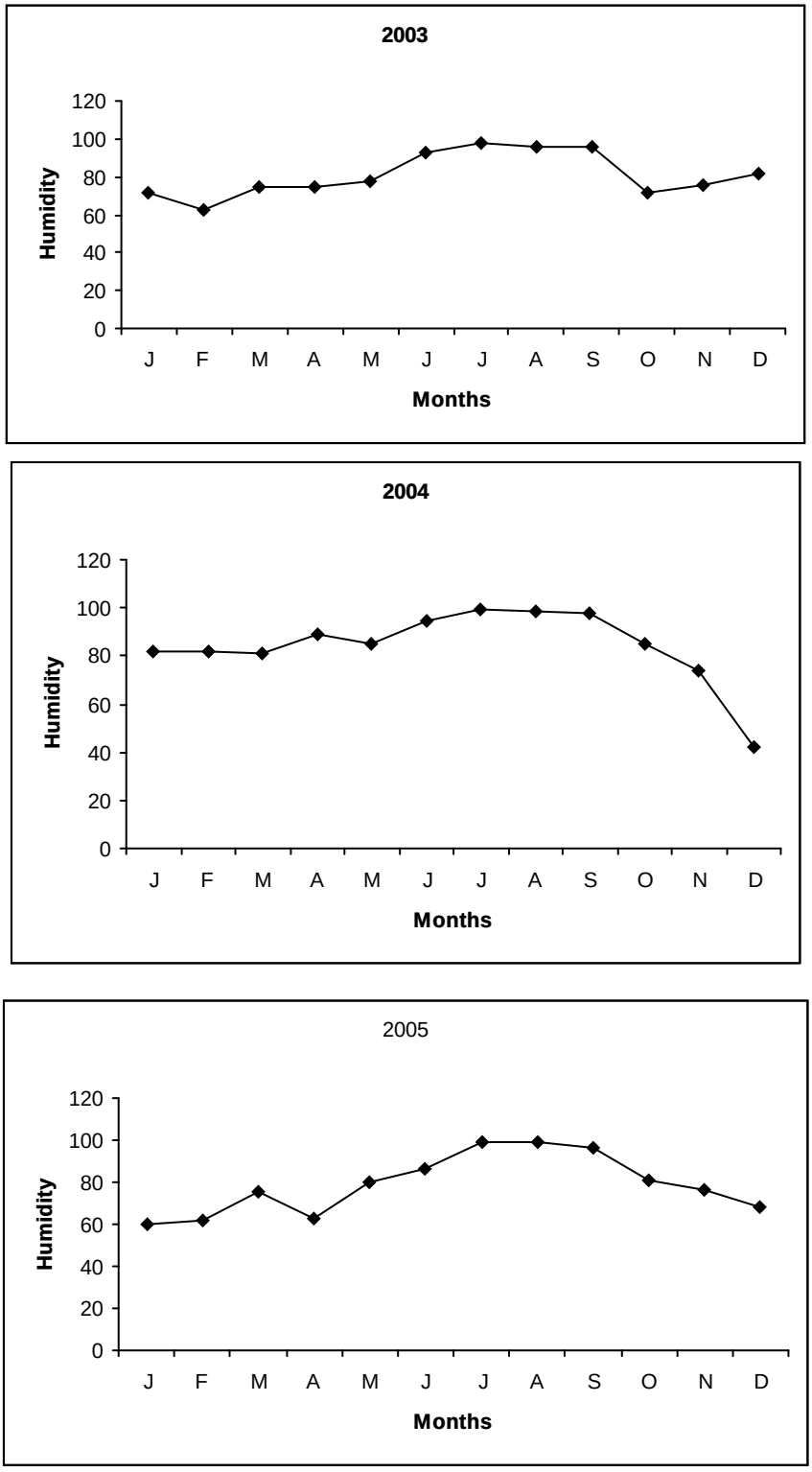


Figure 3: Monthly Minimum and Maximum Relative Humidity (2003-2005)

The June to September is the most humid months during three years (Fig 3).

2.6 Biological Description

2.6.1 Flora

More than 100 plant species inducing tree, shrubs and herbs are recorded in Langtang National Park. Twenty-one species were found to be endemic for that area. Land use classification revealed 29.87% grassland, and 1.70 percent cultivated land (Khatiwada 2002). The description and classification of the vegetation in the park has been described is detail in management plan. (DNPWC/DHUE 1977) Different vegetation zones of the LNP are as follow:

a. Upper Tropical zone (Below 1000m)
b. Sub - Tropical zone (1000-2000m).
c. Hill zone (2000 - 26000m)
d. Montane zone (26000-3000m)
e. Lower sub-Alpine zone (3000-36000m)
f. Upper sub - Alpine zone (36000m 4000m)
g. Lower Alpine zone (4000m-45000m)
h. Upper Alpine zone (45000m- 5000m).
i. Nival zone (Above 5000m)

a. Upper Tropical Zone (Below 1000m)

A very small area in the lower Bhote Koshi is covered by hill Sal (*Shorea robusta*) forest. However, the vegetation composition of this one is completely different from that of Sal forests of southern Terai plain. This zone is under heavy human pressure and corresponds to the wet Hill Sal forest (Champion 1968).

b. Sub - Tropical Zone (100-2000m)

In Nepal, this zone is under the greatest human pressure. However, a small pocket of forest remains relatively untouched on steep slopes.

Hydrophilic forest (*Schima wallichi, Lagerstroemia parviflora*) occurs in the wettest areas at the lower elevation of the park e.g. Panch Pokhari and Nasem Khola and the east bank of the Melamchi Khola. This appears to be the only vegetation type of this zone in which small areas have remained reasonably on spoilt in Nepal. Meso- hydrophilic forest (*Schima wallichi*, *Castanospsis indica*) occurs in the damper areas of the lower Trisuli, Melamchi, Larke, Panch Pokhari and Balephi Koha and the Bhote Koshi. Dobremez et al. (1974) states that "..Remarkable example.. of this forest type persist in the lower Trisuli Khola Valley". Meso-xerophyllic forest (*Pinus roxbughiii, Schima wallichii*) occurs along the Bhote Koshi in small pockets along the lower Trisuli and Langtang Khola and in the Tadi Khola.

Xerophyllic forest and heath *(Pinus roxburghii*) occurs on drier slopes, mainly in the upper Bhote Kosi valley, due to the rocky terrain and reduced rainfall, *P. roxburghii* is often the only tree species present. This vegetation type is frequently exposed to fires and the dense herb layer is poor in species. *Euphorbia rayleana* occurs in the dry, rocky habitats along the Bhote Koshi a Lower Langtang valley, in association with other strictly xerophylic plants such as *Agave mexicana.*

Often, the mesophyllic types have been replaced throughout the activities of local people and livestock Heaths characterized by shrubs and small trees (*Barberis aristata*, *Rubus ellipticus*) pre - dominate pasture represent the ultimate stage of degradation. A small number of species favored by overgrazing always dominate the heath and include

Eupatorium adenophorum, Artemisia vulgaris and B. asiatica. This corresponds to Bengal sub-topical hill forest and Himalayan sub tropical pine forest (Champion, 1968).

c. Hill Zone (2000 – 2600 m)

Within the park agricultural expansion has greatly affected the forest. Grazing throughout each year has impoverished the forest.

Hydrophyllic *Quercus lamellosa* forest occurs on South side of the park, although it is also present in the wetter parts of the Bhote Kosi and Trisuli Khola. Mesophyllic *Quercus-Lantara* forest on south- facing slopes together with *Rhododendron arboretum* and *Lyonia ovalifolia* occurs. Mesoxerophyllic *Pinus excelsa* and *R. arboreum*, forest lays in the upper Bhote Koshi; lower Langtang and other valleys. Due to human interferences *P. excelara* is now often the dominant or only species represented in this type. An interesting species, *Picea smithiana*, is scattered throughout the upper part of this forest. This is the eastern most distribution of this species recorded for Nepal (Fox 1974).

Degraded forest means intensive collection of field wood and fodder. The resulting heaths are, therefore, Plagioclimax communities where the stunted, sparse tree species present are associated with shrubs such as *Berberis Rubus* and *Lonicera* species. Gazing resistant species are *Anaphalis, Anemone, Potentiala* and *Lantana* species.

d. Montane Zone (2,600m-300m)

Mountain and hill zone are sometimes considered as temperate zone. Dobremez *et. al.* (1974) identified 6 types within this zone. These very from the damp *Q. semicarpifolia* and *Tsuga dumosa* type to the mesophyllic stands, which are almost pure *Q. semicarpifolia*. Other types

of forest include those, which have been burnt and now consist mainly of *Q. semicarpifolia*. The further degeneration of natural forest, due to the presence of livestock in spring and autumn, has resulted in heath, where *R. arboreum* is at a selective advantage and ultimately heath communities, where trees have been removed (Dobremez *et. al* 1974). This zone corresponds to the Himalayan wet temperate forest (Champion 1968).

e. Lower sub-Alpine Zone (3000-3600m)

This zone mainly characterized by the dominance of coniferous and rich varieties of associated species. *Rhododendron barbatum* is often present in pure stand on steep north-facing slopes. At the lower attitudes in this zone, *Acer* species is important associate on the North facing slopes. *Abies spectabilis* the high altitude fir is common in the upper forest. The *Rhododendron* occurring in *Abies* forest are limited to *Rhododendron barbatum*, *R. companulatum*, *R. arboretum* and in few places the Nepalese endemic *R. cowanianum* occurs. Other associate species are *Betula utilis*. This one corresponds to Alpine Fir-Birch Forest, Birch-Rhododendron forest. Moist temperate deciduous forest and eastern oak Hemlock forests occur in this area (NARMSAP 2002).

f. Upper sub-Alpine Zone (3600-4000m)

Betula utilis is the characteristic tree species of this zone. On the north-facing slopes, *B. utilis* is associated with *R. companulatum*, the latter being setter and stunted above the tree line. In drier habitats (southern face), *B. utilis* is absent and *R. companulatum* is associated with *Juniper indica* and *J. recurva*. This zone corresponds to the alpine fir-Birch forest and Birch-Rhododendron forest (Champion 1968, Shrestha 1988, NARMSAP 2002).

g. Lower Alpine Zone (4000m-4500m)

Above the tree line, scrub species such as *Rhododendron, Lonicera, Janiperus, Coloneaster* are present. This zone corresponds to the dry alpine scrub, moist scrub and grassland (Champion 1968, NARMSAP, 2002).

h. Upper-Alpine Zone (4500-5000m)

Species vary depending on the soil, aspect and degree of shelter, grasses, herbs and cushion plants occur in the favorable microhabitats. This region is dominated by four important grass species: *Carex, Calomogrostis*; *Agrotis micantha*, *Festnia leptogonum*, with a large number of alpine flowering plants belonging to the families of Primulacea, Rosacea, Gentianacea, Polygonacea and other (NARMSAP 2002).

i. Nival Zone (Above 5000 m)

This is an area with permanent snow and ice without any recognizable vegetation except some lichens and mosses on exposed rocks.

2.6.2 Fauna

a. Mammals

Forty-six species of mammals are found in LNP (Khatiwada, 2002). The common primates are Rhesus macaque (*Macaca mulatta*), Assamese monkey (*Macaca assamensis*), Common Langur (*Semnopithecus entellus*) (Chalise 2003). The carnivores mammals include Fox (*Vulpes vulpes*), wild dog (*Cuon alpinus*), Himalayan black bear (*Selenarctos thibetanus*), Red panda (*Ailures fulgens*), Martins

(*Martes focina*, *M. flavigula*), Leopard cat (*Felis bengalensis*), Leopard (*Panthera pardus)*, snow Leopard (*Uncia uncia*), the common ungulates are wild boar (*Sus scrofa*), Himalayan musk deer (*Moschus chrysogaster*), Barking deer (*Muntiacus muntijak*), Ghoral (*Naemorhedus goral*), Himalayan Tahr (*Hemitragus jemlahicus*). Small animals include royl's pika (*Ochotona royeli*), Himalayan squirrel (*Dremomys lokriati*), and Indian porcupine (*Hystrix indica* (DNPWC 2004, NTB 2001).

b. Birds

The avifauna diversity is rich in LNP, which includes 345 bird species. The notable bird species: Dark rumped rose finch (*Carpodacus edwardsi*), Satry tragopan (*Tragopen satyra*), Ibis bill (*Ibidorhynca struthersii*), Orange rumped honey guide (*Indicator xanthonotus*), Bay wood pecker (*Bhythipicus pyrrhotis*), snow pigeon (*Columba leuconata*), spotted dove (*Streptopelica chinensis*), golden eagle (*Aquila chrysacts*), Tibetan snow cock (*Telragoallus tibetanus*) snow partridge (*Lerwa lerwa*); Blood Pheasant (*Ithaginis cruentus*), Impeyan Pheasant (*Lophophorous impejenus*), etc (Karki and Thapa 2001, DNPWC 2002).

c. Reptiles and Amphibians

Eleven species of herpeto-fauna are found in LNP. Some reptiles are Rock agama, Green Pit viper, Himalayan Keel-back snake etc and amphibians such as: Himalayan toad (*Bufo himalayanus*), Frog (*Rana polunini*) is common (Chaudhary 1998, Shrestha 1998).

Besides these 30 species of fish, 10 species of spiders, (Khatiwada 2002) and 70 species of butterfly has been recorded in LNP (Karki *et. al* 2002).

2.6.3 Socio - Economic Aspects

The changing economics and social arrangements have mode it difficult for rural people to have assessed to the basic agricultural resources and remote places such as Langtang have begun to experience changes in their social and political structure, economic life and cultural values (Gurung, 1998).

Langtang National Park and its buffer zone covers whole or parts of 15 village development committees (VDC), among them 11 VDC's lies in Rasuwa district, 3 in Nuwakot and 1 in Sindhupalchowk. My Study area covers only one VDC of Langtang with six Villages (i.e. Ghodatabela, Thangceps, Langtang village, Sindom, Uundum, Kyanjin Gumpa). Altogether, there are 60 households, 44 hotels, and 13 teashops with a population of 521 individuals (VDC record 2003).

Langtang people are highly dominated by tradition and custom. The majority of the people living in Langtang belong to Sherpa (Bhotias), Lamas, and Tamang They celebrates their biggest festival 'Lohsar' (New Year) for 15 days. Other important festivals are 'Nehra' for 5 days 'Tohrpu' 'Hulbachheju' and 'Thakpachheju'' each for one day. Langtang people are always eager to celebrate those festivals in a magnificent way and hence; they keep some stock of ghee as much as possible. Besides, 'Ghyawa' is celebrated occasionally in a systematic way.

Livestock farming is the main occupation of people of Langtang for subsistence economy. Agriculture is the alternative occupation to make the living of people; however, the crop production is low. Besides, some people engage in tourism for their occupation as source of earning.

Livestock movement is between 3000m to 5000 m elevations and is held from May to September. In winter, they come down to lower elevation at 2000m. Sheep and goats are grouped into several herds for the summer grazing. These animals are usually grazed in the meadow or Kharka, which is the habitat of many wild ungulates like Himalayan Tahr, Musk deer etc In the summer, the herders make temporary shed or Goth for herding the yaks, sheep, horses, and goats to their respective Kharkas.

Diary Development Corporation opened the Nepal's first cheese factory in LNP. One lies in size Gumpa (Chandan Bari) and other in Kyanjing Gumpa. The cheese factory of Kyanjing Gumba collects the milk from 60 farmers and send to make 6000 kg cheese in a year (per. comm. with members of cheese factory).

The cheese factory established the deposit camp to their kharkas to collect the milk. The depots keep on shifting according to the shifting of both. Farmers also receive loan from cheese factory. Agricultural development Bank provides credit facilities to the farmer and cheese factory's recommendation (Khatiwada 2004).

3. METHODOLOGY

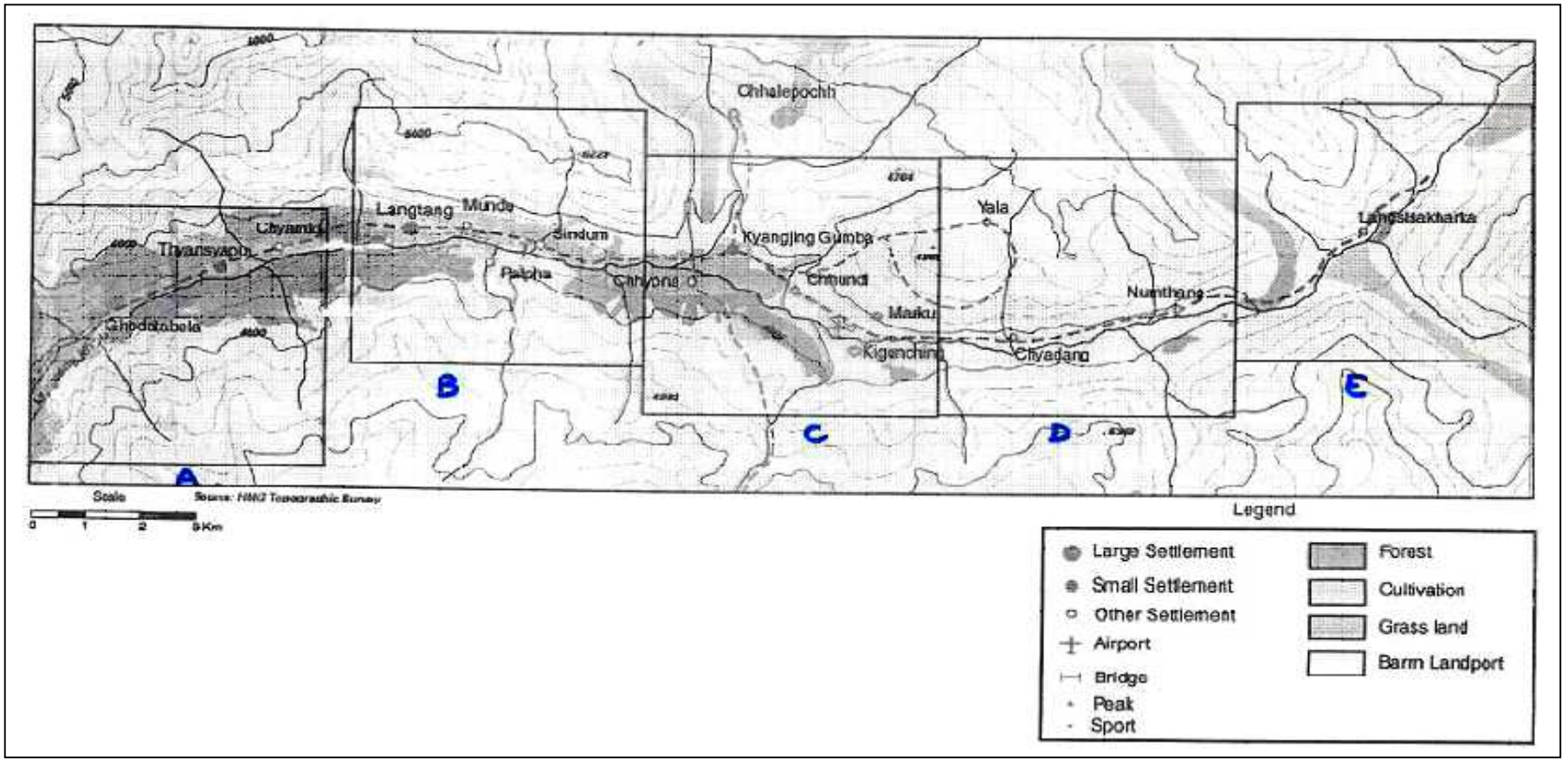
3.1 Reconnaissance Survey

The reconnaissance survey on Himalayan Tahr was conducted from February 17 to February 27, 2005 in Langtang National Park. During this period, a general survey was done for Himalayan Tahr's habitat. Participatory Rural Appraisal (PRA) method was applied during the survey before starting the actual fieldwork; the survey was targeted to the local people, hotel owners, yak herders, and staff of the Langtang National Park to collect information on Himalayan Tahr.

3.2 Habitat selection

The study was focused from Ghoda Tabela to Langsisa Kharka with an area of 25 sq. km. The entire study area was divided into five survey blocks on the basis of natural barriers such as deep gorges, and glaciers having an area of 5 sq km. each. The study blocks had given the names A, B, C, D and E. The first block A lies in Ghoda Tabela (Latitude N 28^0 10.213' to 28^0 12.286' Longitude E 85^0 27. 316' to E 85^0 29' 291' and Elevation 3000 m to 5058m), B Lies in Langtang village (Latitude N 28^0 12. 315' to N 28^0 12 60', Longitude E 85^0 30. 00' to E 85^0 32. 830' and elevation 3455 to 5572m), C lies in Kyanying gumpa (Latitude, N 28^0 12. 408' to N 28^0 14.057', Longitude E 85^0 52 972' to 85^0 35. 550' and elevation, 3900m to 4983m), D block lies in Numthan (Latitude N 28^0 11. 1.77' to N 28^0 13.37', Longitude E 85^0 35 811' to E 85^0 37.933' and elevation, 4000 m to 5163 m), E block lies in Langsisa Kharka (Latitude N 28^0 12 286' to N 28^0 14. 201' Longitude E 85^0 38.00' to E 85^0 42. 169' and elevation 4060 m to 5570 m (map 2). The fixed pocket counts from ridgeline vantage points were conducted using the method detailed by Jackson and Hunter (1996).

Map 2: Location of the study area.



3.3 Population Census

3.3.1 Fixed Point Count (Vantage Point Count)

A population is the assemblage of animals, which do not differ from one another and interbreed freely with one another to produce fertile offspring. Where as the term herd is applied to the portion of the population that occupy a specific area for a given period of time and behave as a unit (Gurung 1995). Observation stations for the different blocks were fixed through which the habitat of the Tahr could be scanned clearly. Five different stations were selected and searching the slopes of the study area with 10x40 binoculars did the census of the Tahr. Observation of animals was done 0700 hours to 1600 hours. Almost all slopes irrespective of the gradients were attempted. From the very beginning care was taken to avoid the duplication of counts in the Tahr herds. There were three district sizes of the individuals of the Thar. The bigger size with the mane was the adults male, bigger size without mane as adult female where as the remaining small in size was considered young of both sexes.

3.4 Habit of Utilization

To obtain the habitat data, only vegetated land surface were considered the Tahrs' habitat. Habitat types were recorded by dividing the study area into grassland, shrub land and vegetated cliffs. The possible slope used frequently by Tahr was recorded by dividing the mountain slope into equal thirds and classified as following.

1. Upper third (U): Animal Located in Upper portion of Slope near ridgeline.
2. Middle third (M): Animal Located in Middle Portion of the Slope

3. Lower third (L): Animal Located near in the bottom of slope or in the Valley.

The altitudinal distribution of Tahr was recorded by global positioning system (GPS) and then aspects that the Tahr utilizes were recorded. Mapping of the study area was based on 1:50,000 survey of His majesty's government of Nepal topography survey maps.

3.5 Floristic survey

The survey was one in the south facing and south east facing slopes to get the detail description of the forage species present in the area where Tahr most commonly grazed. Stratified Random sampling was done to analyze the vegetation in Tahr's habitat. During sampling 2 m x 2 m quadrate plot was used.

Through the use of vegetation data sheet, the number of individuals for each plant species in every plot was recorded. Most of the plants were identified in the field using the book "Concise Flowers of the Himalaya". The unidentified were collected and kept in herbarium sheet and later identified with experts at the National Herbarium Centre in Godawari, Lalitpur Nepal.

Floral diversity is measured by Shannon's Index of diversity (Krebs 1989), which is

$$\overline{H}\,1 = \Sigma\left(\frac{ni}{N}\right) \text{Loge}\left(\frac{ni}{n}\right)$$

$$= -\Sigma pi \text{ Loge } Pi$$

Where, ni = importance volume for each species

N = total important value.

pi = important probability for each species Pi = ni/n

3.6 Questionnaire Survey

A set of questionnaires was prepared to know the threats for the Himalayan Tahr. Following considerations were made during questionnaire survey.

People were briefed about the purpose of the study prior to survey. Interviews were taken from local people, herders and hotel owners. All together, 20 questionnaires were taken meeting altogether 30 households in group visiting in their village and in high meadow.

In the field before actual data collection from the locals, we were acquainted with their feelings about Himalayan Tahr and shed light of our main aim of study. With the support of local operation leader and lamas, we were able to collect our questionnaire form completely and satisfactory.

3.7 Data Analysis

The primary data were collected from the Fieldwork from February 2005 to October 2005; spending more than 80 days and 468.55 hours (Table 2).

Secondary data were collected from VDC office of Langtang, LNP office Dhunche; DNPWC, Kathmandu, Department of Hydrology and Meteorology, Babarmahal, journals, Newspaper and Books.

The collected data have processed by statistical methods; microsoft excel was used to analyze the data and the result were presented in table and charts. To examine the significance of data- X^2 test (chi-square) was employed at 95^0 confidence limit and (n-1) degree of freedom.

$$X^2 = \sum \frac{(O-E)^2}{E}$$ Where, O = Observed Value

E = Expected value

3.8 Study Period

The study period included spring months, onset of rain and latter part of rainy season and autumn. The harsh winter months were excluded as some of the winter part can be experienced in February and also impossible for this short period study time. Total working schedule allocated for the field is described below (Table 2).

Table 2: Schedule of field in Langtang Valley Study area in 2005

S.N	**Field duration**	**Total working day**	**Total working hours**
1	17 February to 27 February 2005	11	Preliminary survey
2	14 April to 8 June 2005	54	378.34
3	20 Sept. to 5 October 2005	15	90.21
Total		**80**	**468.55**

4. RESULT

4.1 Population size and composition

4.1.1 Population size

A total of 8 herds comprising 218 individuals were recoded in the study area of 25 sq. km in the Langtang Valley of Langtang National Park. Population density was therefore 8.72 Tahrs/km^2. Population census in detail is shown below for the five census blocks (Table 3).

Table 3: Herd composition of Tahr in five census blocks in 2005, LNP

Census Blocks	Number of Herds	Adults male	Adult female	Young (male + female)	Total
A	1	3	36	7	46
B	3	2	18	4	24
		4	-	-	4
		-	28	5	33
C	-	-	-	-	-
D	4	-	10	3	13
		-	42	6	48
		6	-	-	6
		5	29	10	44
E		-	-	-	-
5 Blocks	**8 herds**	**20**	**163**	**35**	**218**

The average herd size was 27.25. The herd size varied from 4 individuals to mixed herds of 48 individuals.

4.2 Block wise Distribution of Himalayan Tahr

The herds were recorded only in three census blocks ie. A,B and D. Herds were not recorded in two census blocks i.e. C and E. Maximum heards were observed in Block D where as least herds were observed in Block A. The block wise distribution of herds is presented below (Fig: 4). There were significant difference in the distribution of Tahr in the block (X^2 = 32.80, P<0.05 at 2.df) was observed statistically.

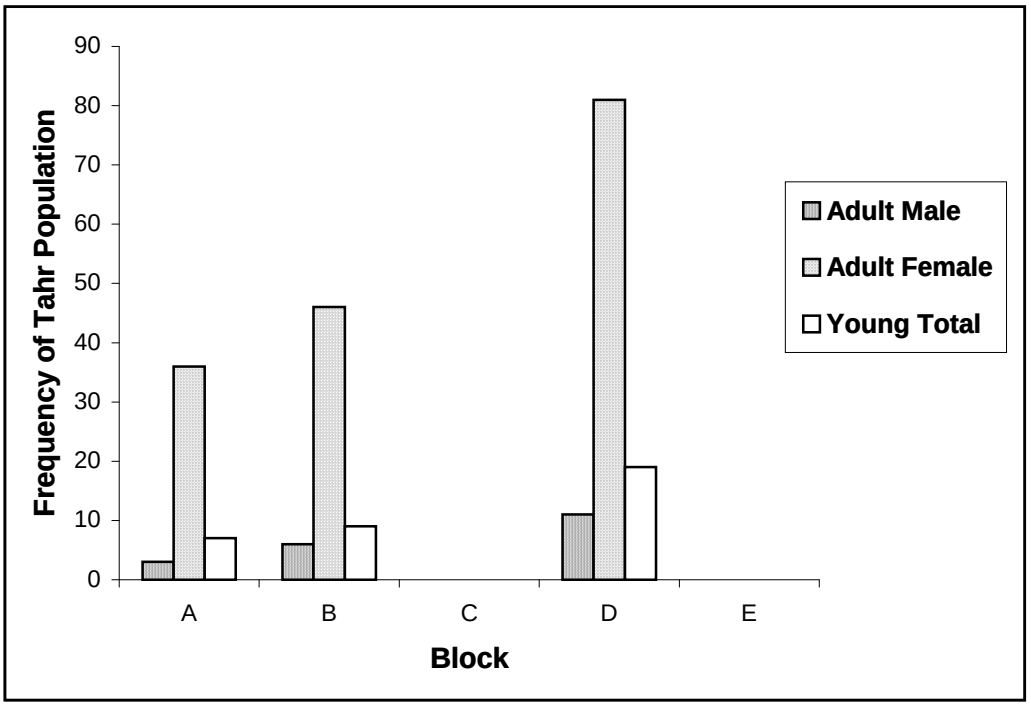


Figure 4 : Block wise distribution of Tahr in Langtang Valley in 2005.

4.3 Types of Herd

Three types of herds were recognized where Adult male-Adult Female-Young (37.5%), adult female and young (37.5%) and all male (25%). Among 8 herds three herds observed were mixed with male, female and young; three herds mixed with female and young and two male herds were also recorded during the study period.

The block wise distributions of three types of herds are presented below. (Fig: 5)

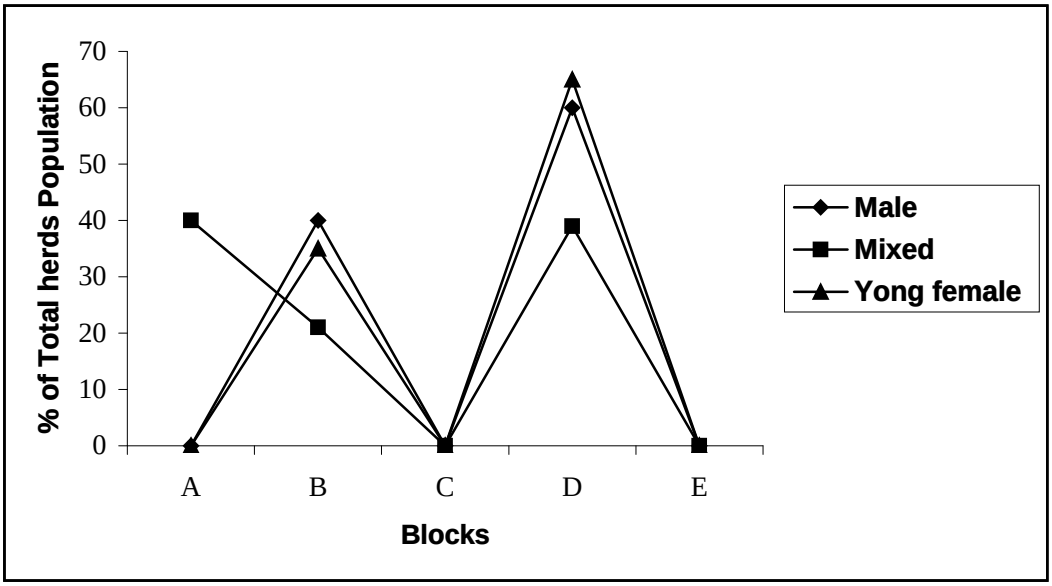


Figure 5: Composition of Himalayan Tahr herd types.

4.3 Age, Sex, Ratio

Altogether, 218 individuals were classified to their respective sex and age classes in 2005. The average adult sex ratio was 1 male per 8 adult female. Young to adult female ratio was 1 young per 5 females.

4.4 Habitat Utilization:

4.4.1 Habitat of Type

Himalayan Tahr showed a preference towards grassland and vegetated rock in Langtang valley of LNP. (Fig 6). 46.55 percent of the observation was in grassland where as 44.82 percent were in vegetated rocks.

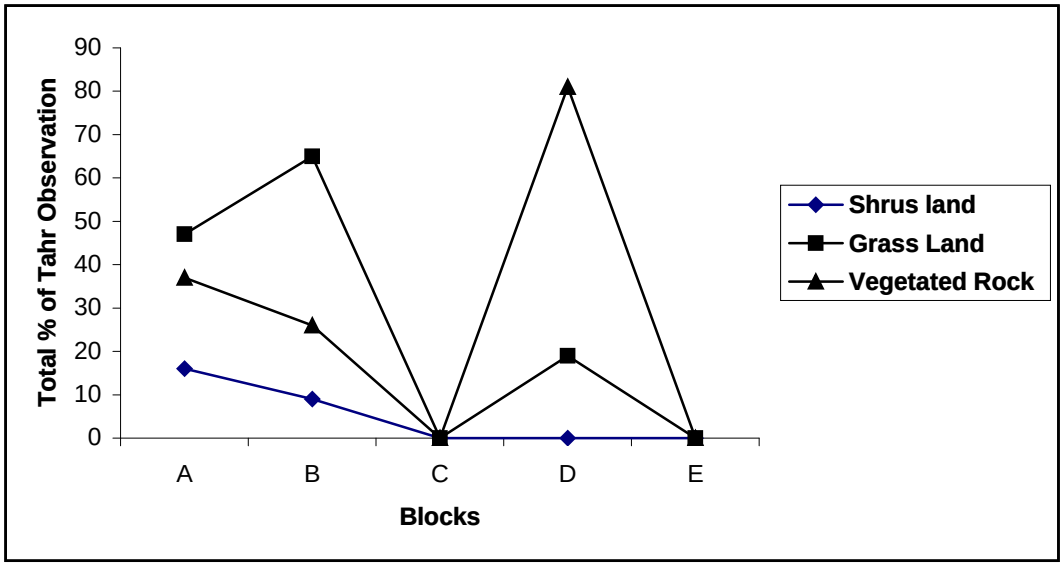


Figure 6: Distribution of Himalayan Tahr according to habitat type

4.4.2 Slope type

Distribution of the Himalayan tahr heads with respect to slope is illustrated in fig 7, which shows Tahr shows the preference for upper and middle portion of the slopes in Langtang valley. Altogether 38 percent were is upper slope and 34 percent in the middle slopes were observed. In block D herds were not recorded in lower portion of the slope.

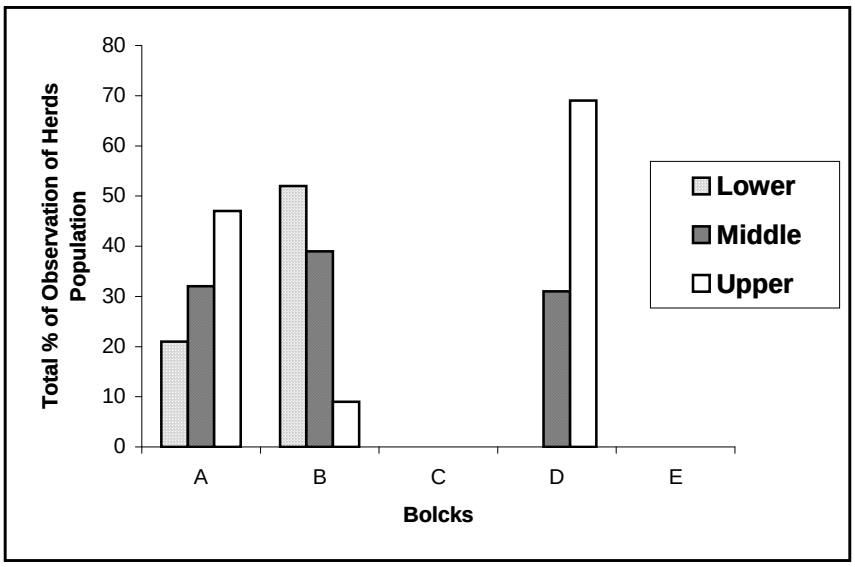


Figure 7: Distribution of Himalayan Tahr according to the position on slope.

4.4.3 Elevation

The vertical of distribution range of the entire population was quite wide (3700-4900m) with mean elevation of 4300 m. Most of the heads were observed around 4100m - 4300m (fig 8)

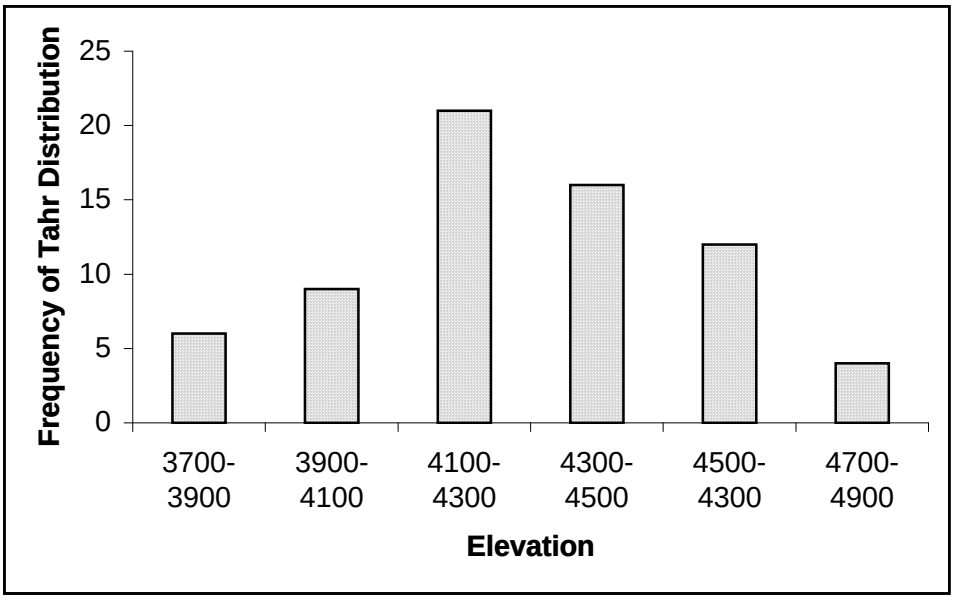


Figure 8: Altitudinal distribution of Himalayan Tahr in Langtang Valley.

The herds were occurred in between 3700m to 4900m in langtang valley.

4.5 Floristic Composition of Tahr's grazing area

The vegetation sampling was mainly concentrated around the census block A, B, and D where, tahr frequently graze. In census block C and E the sampling of vegetation was not done, as there was no recording of the Tahr. Altogether 36 quadrates were laid to identify the vegetations composition among them 6, 14 and 16 were laid on Block A, B and D respectively. During the survey, 91 individual plant samples were collected in total only 47 species were identified which were distributed in 21 different families. Approximately 8 percent of samples were

unidentified due to lack of proper identification (taxonomic) parts of plants.

Table 4 : List of Plant family and species number under the quadrate

S.N	Family	No. of Species
1	Compositae	9
2	Polygonaceae	3
3	Papitionoideae	3
4	Caryophylaceae	2
5	Rosaceae	2
6	Cupressaceae	2
7	Ericaceae	4
8	Barberidaceae	2
9	Lequminosae	1
10	Ephedraceae	1
11	Euphorbiaceae	1
12	Merinaceae	1
13	Primulaceae	2
14	Irideceae	2
15	Umbelliferae	4
16	Pernassiaceae	1
17	Labiateae	1
18	Elacagnaceae	1
19	Gentianaceae	1
20	Companulaceae	3
21	Amaryllidaceae	1
	Total	47

Anaphalis Sp, Rhododendron Lepidoton, R. anthopogan R. Setosom, Primula sp, Potential sp., Berberis angulosa were abundantly present in Tahrs grazing area.

4.6 People's attitude towards Himalayan Tahrs:

Public attitude towards the Himalayan Tahr greatly affects the Himalayan Tahr conservation. In the interview it was found that, people were happy due to many tourists came to study see, Tahr and they were benefited due to these tourists. Among 20 respondents replied as good fig (9). they wanted to conserve Tahr which support their economic of daily life and 5 percent had bad operation because Tahr graze on their kharkas i.e. Alpine meadows.

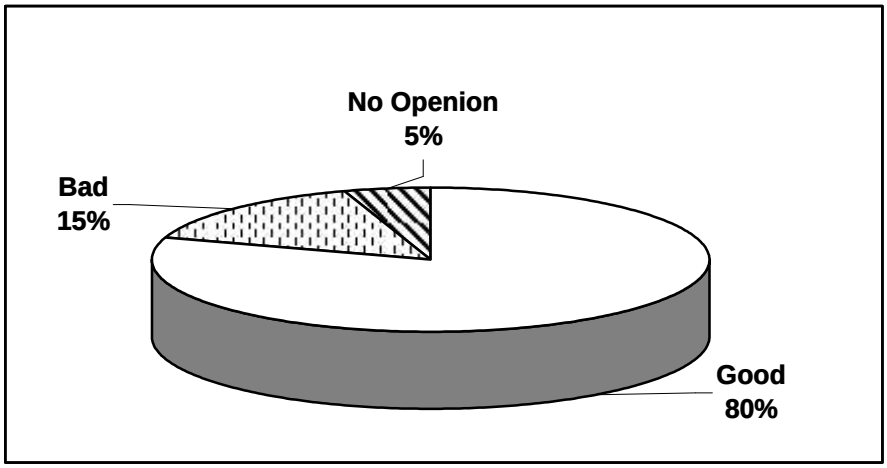


Figure 9: Peoples attitude towards Himalayan Tahr

4.7 Places and months where Himalayan Tahrs had seen by the Villagers

Out of 20 respondents interviewed all of them saw Himalayan Tahr in various places (Table 4).

Table 5: Respondents Response on Sighting place and months of Himalayan Tahr

S.N	Name of Place (location)	Months	Respondents response
1	Langtang village	April /May	25%
		Oct/Nov	10%
2	Mundu village	March/April	15%
3	Way to Yalapeak	March/April	25%
4	Numthang	March/April	15%
5	Thangsep	March/April	10%

This result shows that 10 percent of them in March/April and it was found that there was no any kind of belief or any interesting stories about Himalayan Tahr.

4.8 Human Population Statistics of the Study area

In the Langtang VDC there are 143 households and population was 521 during study period.

More than 44 percent of lodges, 42 percent of ordinary household and 13 percent of tea shops were recorded during study period in Langtang V.D.C, where 521 people have been dwelling (Fig.:14).

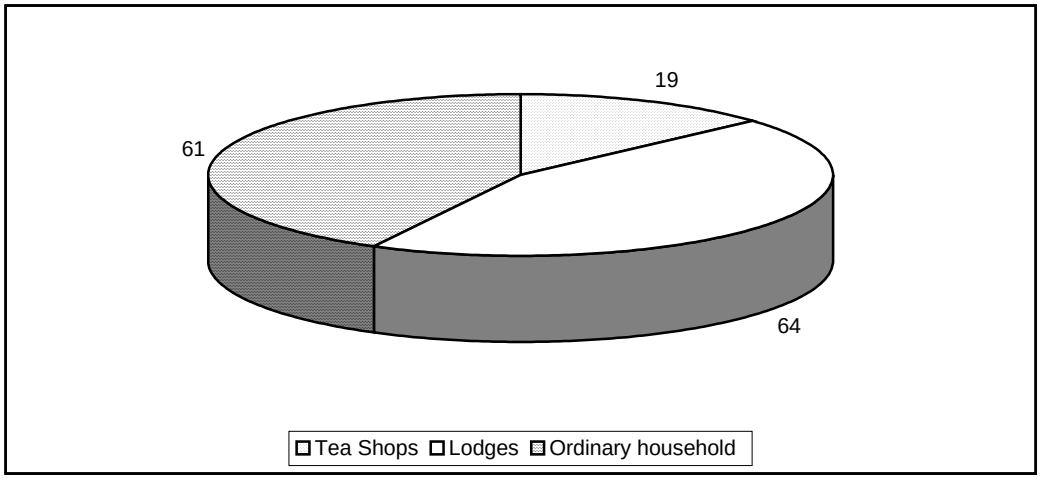


Figure 10 : Number of human residence in LNP.

4.9 Conservation of Himalayan Tahr

Table 6: Respondent Logic for Conservation of Himalayan Tahr

S.N.	Reasons	Respondents
1	Religious belief	15.8%
2	for future generation	30%
3	For tourists industry	30%
4	Looks good	10%
5	Don't know	14.2%

Data collected from the interview with local people showed that they were in favour of the conservation of Himalayan Tahr. Thirty percent of them wanted it to conserve for their future generation and to enhance tourism industry. More than 15 percent of the respondents should their importance from religious point of view. However, around 15 percent of the respondents didn't have any idea about the conservation of the Himalyan Tahr

4.10 Threats to Himalayan Tahr

4.10.1 Poaching

People poach wild animals for financial gain. During interview 90 percent respondent agreed about existence of poaching in Langtang (Table5) where leg snares and gun were used for parching and the respondents affirmed that preaching was due to several hunting groups from Helambu through Ganjala pass (5100m) and from Dhading as tourists.

Table 7: Opinion of the villagers in the present situation of Hunting in LNP

Opinion	Respondents	Percentage
Himalayan Tahr	2	10%
Musk deer	14	70%
snow Leopard	4	20%
Total	20	100%

It was also observed of the trapped Musk deer through leg snare, in musk deer conservation area (MCA) and it was informed immediately to the park people, when park people came to rescue the dead deer poachers fired gun and ran towards Gangala pass (high attitude)

There was least poaching for Himalayan Tahr and high poaching of musk deer.

4.10.2 Habitat destruction

4.10.2.1 Livestock rearing

Live stock rearing is the main source of economy in Langtang valley. A total of 858 livestock were owned with Yak and Chauri Comprising 63.37 percent, horses 31.12 percent and sheep and goats 5.01 percent.

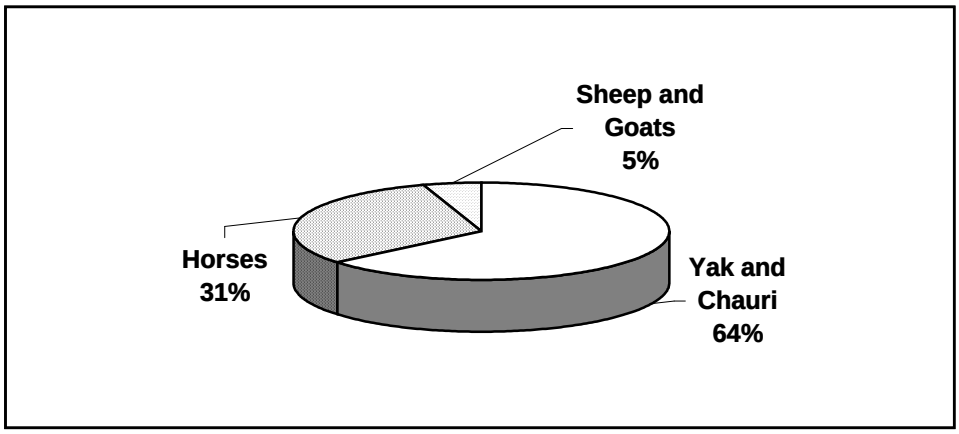


Figure 11 : Percentage of live stock holding in Langtang.

They use 8 different pasturelands. Among them 50 percent of the pasture lies in block D where 50 percent of the Himalayan Tahr herd were observed. Seasonal grazing is prevalent in the area. So livestock occupies the Himalayan Tahr habitat during the rainy season, (July to September). No single individual of Tahr were observed during this season in block D.

4.10.2.2 Tourism

There is no restricted area for tourists in Langtang National Park (LNP). Every one can go everywhere and every place. Since 1977/78 the rate of flow of tourist has been increasing in langtang area (Fig12). Most of the places where tourist generally prefers are the places of Tahr habitat.

In 1978 flow of tourist was less than two thousand where as it increased upto 1992 and reached more than eight thousand and after it decreased upto 1996 to less than eight thousand and again increased gradually to 2001.

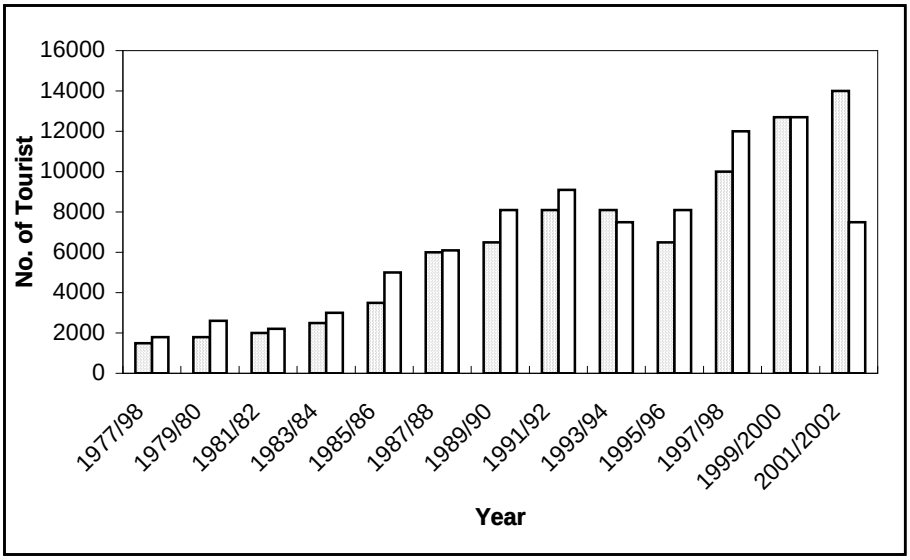


Figure 12: Flow to Tourist in LNP Source: DNPWC

Plates

Plate 1: Habitat of Himalayan Tahr

Plate 2: Herd at grassland

Plate 3: Herd at Numthang Base

Plate 4: Scanning Himalayan Tahr

Plate 5: Tahr's herd at Langtang

Plate 6: Tahr's herd at Markhu

Plate 7: Tahr's herd at Mundu

Plate 8: Tahr's herd at Numthang

Plate 9: Tahr's herd on the way to Yala Peak

Plate 10: Anaphalis Sp.

Plate 11: Interviewing Local People

Plate 12: Snares of Musk Deer

Plate 13: Trapped Musk Deer

Plate 14 : Skin of Snow Leopard

Plate 15: Yaks grazing

Plate 16: Yaks management

Plate 17: Setting camera Trap

Plate 18: Kyanjen Village

Plate 19: Lantang Glacier

Plate 20: Ganjala Pass

Plate 21: Cherkhuri Mountain

Plate 22: Cheese Production in Kyanje

Plate 23 :Camping during the study

Plate 24: Tahr herd in between Markhu and Numthang

5. DISCUSSION

5.1 Population size and composition

Himalayan Tahr a trophy animal lives in social herds. Fixed-point counts from ridgeline vantage points were conducted using the methods detailed by Jackson and Hunter (1996). In this study 218 individuals of Tahr were recorded. Similar methods were applied by Ale (2005) in Sagarmatha area. Each block was scanned and all Tahr counted thoroughly and assigned to sex and age class as adult male, adult female and young of both the sexes where as Schaller (1977) assigned the herd composition of Tahr as male (male.1, male 2, male 3), female yearling and kids. Such category indicates the recognition of different age groups by the data of long-term study. During a short-term study in a harsh ecological condition some time it may not so easy as this study.

Three types of herds were recognized during this study in 8 different herds such as- Adult male-adult female- young (37.5%), Adult female Young (37.5%) and Adult male (25%). The herd size varied from 4 individuals to mixed herds of 48 individuals. Where as Green (1978), in Langtang valley recorded average group size of 15 and largest 77 in maternal herds, in Annapurana sanctuary in maternal groups ranged in size 1-57 where male herds were 1-13 (Gurung 1995), in Dhorpatan average group size of Tahr varied from 3-16 in different sub-habitats holding different number of Tahrs Austergard and Haugland, (1993). In the Kangchu valley of east Nepal, the average group size was 7 in winter and 23 was the largest group in a maternal herd (Schaller 1973).

Clutton-Brock *et. al* (1982) suggested that there are various advantages to living in group. Group size and structure is to some extent heriditary. Group size reflects both predator pressure and food supply.

Larger groups help both in flight and defence. If there are more eyes, ears, and nose to detect the predator or more teeth and hands to confront it, a larger group pays off (Chalise 1995). The average adult sex ratio was 1 male per 8 female and adult female and Young to adult female ratio was 1 young per 5 female. This low proportion of male suggests that observes bias may have been a problem in failing to detect groups of males in remote and difficult terrain. The adult female out numbered males, in contrast to most ungulate species, which show 1:1 ratios. Such low male to female ratio is not surprising outside the rutting season, when males wander widely while females are localized in small home ranges (Schaller 1973). The male to female ratio increased favoring males (1.2 in Namche, at the end of November) when males from neighboring areas may have joined the female groups. Young to female ratio was very low both in Phortse and Namche (Ale 2005).

Tahr herds in Langtang valley Himalayan Tahr were only recorded in the south facing slopes. There were no records in the north-facing slopes. This might be due to the presence of Human and livestock. However, musk deer was observed in the North facing slopes where *Betula utilis* forest was prominent.

5.2 Habitat Utilization

Tahr showed a preference towards grassland and vegetated rocks in Langtang valley. 46.55% of the observation was in grassland where as 44.82 percent were in the vegetated rocks. Gurung (1995) found that the grazing of Tahr in grassland were high than shrub land and vegetated rocks in Annapurna sanctuary. Harris (1973) described that grassland were highly preferred by Tahr in New Zealand and were found to use grassland and vegetated rocks.

In Langtang valley, Tahr preferred the upper and middle portion of the slopes. 38 percent of the observation was in upper slope where as 34 percent were in middle slopes. Tahr in Langtang less utilized lower portion. Maximum herds were recorded between 3700 m to 4900 m in Langtang valley. Schaller (1997) reported that Tahr was observed at 2500 to 4400 m elevation in Kanchu valley in Eastern Nepal. Tahr was observed in between 3800 m and 4850 m elevation in Nepal (Caughly 1970). Lovari (1992) sighted Tahr at 2700-4500m elevations in Pangboche in Sagarmatha National Park Tahr never come down below 3800 (Caughly 1970 c). Observations of Tahr reported from upper Langtang valley were with the elevation 3000 m to 5200 m (Fox 1974). The observation was beyond our observation limit in Langtang valley. Tahrs were also reported to occur between 3500 m -4000 m in the Oak-conifer forest near Rara Lake (Fox 1975).

The plant collected during the survey from Tahr's grazing area were identified belong to 47 plant species. *Anophalis* sp. *Rhododendron. Setosum, R. anthopogan, Potentilla* sp, *Primula* sp. were observed that were recorded by Green (1978) too in the same localities.

5.3 Threats to Himalayan Tahr

Local peoples' attitude affects the conservation activity. In Langtang valley local people were highly responsive for the conservation of wild animals. Interview showed that people were happy due to many people come to study, see, Tahr and were benefited due to these tourists. Among 20 respondents 80 percent replied Tahr as good and wanted to conserve Tahr and wanted to conserve as it helped to support people’s economy of daily life and 5 percent had bad opinion as Tahr graze on their kharkas (Alpine meadow).

Respondents' response on sighting place of Tahr in Langtang valley was 35 percent in Langtang village, 15 percent in Mundu village, 25 percent in way to Yalapeak, 15 percent in Numthang and 10 percent were in Thangsep. 10 percent of the Tahr occurs sighted in October/November and 90 percent were sighted in April/March. People had no any kind of belief or interesting tale about Tahr in the valley where as Gurung (1995) in Annapurna sancturary reported that local people believed and also used, the Tahr bones soup as a good treatment against Malaria. If fresh bone was not available in the village they used old bones for malarial treatment.

In Langtang valley, during interview 90 percent respondent agreed about the existence of poaching. The poaching was least for Himalayan Tahr (10%) and high for snow leopard (20%) and severe for musk deer (70%). The trapped musk deer through leg snare in musk deer conservation area (MCA) was observed and immediately the local people informed park people. Adhikari (2004) reported that the government officials killed 14 Himaiayan Tahr in Langtang area in 2002 and 26 musk deer were also found on dead condition on Musk deer conservation area (MCA) in 2001. People of Langtang valley used 8 different pasturelands. Among them 50 percent of the pastures lies in D block where 50% of the Tahr herds were observed. Seasonal grazing is prevalent in the area. Livestock occupies Himalayan Tahrs habitat during the rainy season (July to September). No single individuals of Tahr were observed during this season in block D.

6. CONCLUSION

Himialayan Tahr has a patchy distribution on the Tibetan plateau and marginal mountains of Nepal. It is the principal prey species of snow leopard in LNP and is declining locally. A total of 218 individuals of different age and sex Himalayan Tahr were recorded during the study in 8 different herds in 25 sq. km area. Three types of herds were recognized. Survey revealed that 50 percent of herds were observed in 4200m - 4900m (fourth block) and least in 3700m - 4000m (first block), animals were not located in 3850m - 42000m (third and fifth block). Tahr preferred grassland and vegetated rocks in the Langtang valley. Upper and middle slopes were highly utilized by Tahr.

Forty-seven plant species were identified in 21 families in Tahr grazing areas. *Anaphahis sp., Rhododendron lepidotion, R. anthopogan., R setosom primula sp., Potential sp., Berberis angulosa* were the most abundant species in the Tahrs grazing area into the Langtang valley.

The Himalayan Tahr population in the Langtang valley has probably been affected by human activities, such as tourism, over grazing and over stocking.

At present, there is apparently no serious threat for Tahrs conservation in Langtang valley, however, strong management is still necessary for continued conservation the present Tahrs population seems to be good. For the sustainable conservation of Himalayan Tahr, conservation awareness programme and income generation programme are needed.

7. RECOMMENDATION

Based on the experiences of this short-term study, it is suggested the following recommendation as a solution to the problem.

1. Declaration of grazing and non-grazing areas (hot spot zone for Tahr) will have to be practiced so that the livestock grazing can be managed with less risk zone, which supports the population of Himalayan Tahr.
2. Regular monitoring of the population status of the Tahr is essential in yearly basis through which we can ensure the support for the endangered species snow leopard for its existence.
3. Inter governmental organization and NGOs should offer advice and assistance to concern authorities for drafting legislation relevant to the protection of Himalayan Tahr.
4. Illegal hunting from the park security person and authority should be stopped.
5. Herders and their voices need to be addressed for the effective conservation of national resources including Himalayan Tahr.
6. Government resource managers, conservation NGOs and development agencies should undertake efforts that will help to promote livestock grazing and reduce impacts to wildlife.
7. The conservation based tourism programme should be promoted.
8. Massive formal and non-formal education program is recommended to conserve the Himalayan Tahr and their habitat in the wild.
9. Local herders and opinion leaders should be organized and find out benefits related to Himalayan Tahr to human society.

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Annex I

Recorded temperature, relative humidity, precipitation for 1995-2005 at Kyanjing Gumba, Rasuwa. (Soruce: HMG/N Department of Hydrology and Meteorology).

a. Monthly mean Air Maximum Temperature (^{0}C)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1995	0.8	3.0	4.8	6.5	10.8	12.0	11.8	12.0	10.5	7.8	5.8	3.3
1996	3.7	3.5	7.3	9.0	12.2	12.4	13.9	12.9	12.2	9.7	9.3	8.8
1997	3.3	2.0	4.5	6.0	7.8	11.3	12.3	12.0	10.7	7.0	8.3	0.5
1998	2.5	3.5	3.8	7.5	11.8	14.0	11.6	12.3	11.0	8.8	7.5	6.8
1999	2.0	4.5	6.3	9.3	10.8	11.5	12.5	13.3	10.8	8.5	7.0	3.5
2000	3.0	-1.5	6.2	6.5	10.5	11.3	12.0	11.5	9.7	6.8	3.8	1.0
2001	0.5	-2.3	-4.3	-2.3	2.3	0.9	12.3	12.3	11.	11.0	9.0	6.1
2002	0.8	-0.6	-3.2	2.6	7.3	10.2	12.4	12.3	9.2	101	8.3	5.4
2003	2.4	-2	1.8	6.4	7.3	9.6	9.6	9.1	9	5.3	4.4	1.4
2004	-1.7	3.4	7.1	5.7	9.2	9.8	9.3	9.7	10.5	6.2	2.2	6.4
2005	2.6	0.3	2.8	4.8	8.7	11.3	10.9	10.9	10.2	7.6	3.4	2.2

b. Monthly Mean Air Minimum Temperature (^{0}C)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1995	-9.5	-7.6	-3.5	-1.8	4.5	7.5	8.8	8.5	6.5	3.0	-3.5	-5.3
1996	-7.6	-6.5	-2.4	-0.6	2.9	2.8	8.2	7.3	5.7	1.4	-1.3	-2.5
1997	-10.0	-8.0	-3.4	-4.6	2.8	5.3	9.5	4.5	4.8	-3.8	-4.3	-8.3
1998	-6.8	-7.0	-3.8	0.3	2.3	8.3	8.8	9.3	6.3	3.5	-1.3	-3.5
1999	-7.5	-4.0	-0.8	2.8	3.5	5.8	8.3	7.9	7.9	1.0	-1.0	-5.5
2000	-6.8	-8.0	-4.0	2.8	3.3	7.3	9.0	9.3	3.3	-4.8	-5.0	-9.5
2001	-13.0	-14.0	-10.5	-9.6	-4.9	-4.3	-2.0	8.8	8.3	5.0	1.3	-13.0
2002	-14.1	-10.2	-8.3	-9.1	-5.1	-0.3	-2.0	3.3	2.8	-1.6	-27	-11.3
2003	-7.1	-7.4	-4.4	-0.4	0.7	4.9	7.5	4.8	4.8	2	-2.7	-8.2
2004	-11.1	-8.7	-2.2	-2.8	6.1	5	7.1	8.2	5.7	-2.6	-5.2	-6.8
2005	-9.6	-8.1	-6.4	-1.5	1.1	4.3	8.3	7.9	6.5	0.5	-3.1	-5.2

c. Monthly Mean Relative Humidity (^{0}C)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1995	36	43	40	43	49	64	64	66	62	41	28	27
1996	63	68	70	68	74	88	88	91	90	74	55	48
1997	21	29	28	37	34	40	40	47	45	32	23	-
1998	70	81	81	67	73	70	70	81	81	66	47	38
1999	47	51	46	47	92	91	91	87	82	60	46	47
2000	59	44	59	54	67	79	79	79	79	57	50	41
2001	49	63	63	72	88	94	94	96	97	80	57	46
2002	55	59	63	67	69	82	82	91	93	76	61	53
2003	71.5	62.4	75	75	77.3	92.6	97.6	96.3	96.2	72	75.5	82
2004	82	81.8	81.3	88.8	85	94.7	99.3	98.2	97.8	85.4	73.6	42
2005	60.4	61.7	75.3	63	80.3	86.8	99	99.4	96.5	80.5	76.3	68.2

d. Monthly Precipitation (mm)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Yearly
1995	42.7	53.0	65.0	40.6	29.3	82.7	124.8	139.3	87.1	0.0	5.7	5.9	1041.5
1996	25.7	9.2	0.0	18.1	17.7	84.7	140.6	175.3	67.8	66.7	0.0	0.0	605.8
1997	6.9	11.3	21.5	24.5	29.6	119.7	153.7	111.7	65.2	17	35.7	0.0	596.7
1998	0.0	38.4	40.8	14.9	35.5	97.7	149.0	183.6	43.1	21.0	4.2	0.0	628.2
1999	6.9	4.0	21.8	27.0	59.3	147.8	232.4	145.6	6.3	26.7	4.2	0.0	682
2000	0.0	8.9	13.0	22.6	54.5	125.9	216.6	172.1	115.8	0.0	1.2	0.0	730.6
2001	3.5	7.5	15.7	52.3	57.1	149.3	158.9	142.1	48.1	6.5	0.0	0.0	641
2002	5.1	6.3	13.2	56.1	73.1	139.7	168.8	98.4	59.2	73.1	0.0	0.9	693.9
2003	14.2	22.6	60.8	100.4	68.8	127.2	183.2	54.1	47.8	23	4	6.4	712.5
2004	20.4	1	4.4	144.8	131.2	117	266.8	245.8	93.6	32	2.8	0	1059.8
2005	20.6	15.2	66.8	60.6	49.4	40	237.6	237.2	82.6	138	44.3	8	1000.3

Annex 2

Himalayan Tahr's Survey Questionnaires

(for interviewing Local resident about Hamalayan Tahr in LNP)

i. Name of Interviewer :

2. Interview Date:

3. Village Name :

   GPS reading

   Elevation (m)

4. Respondent's Gender: 5 Age : 6 : Occupation

7. Do Himalayan Tahr occur here or in near by area?

8. If so, where? (List places, where seen in past year).

9. When was the evidence seen last time?

10. Indicate kinds of evidence found with tick below

    a. faces b. sighting c. foot markets d. other

11. Describe the place where sign found.

12. What habitat types?

13. Describe distinctive physical features ?

14. What is your opinion about Himalayan Tahr ?

    a. good b. bad c. non connects

15. Do local people have any kinds of belief or some interesting tale about Himalayan Tahr ?

16. What are the predator of Himalayan Tahr ?

17. Should Himalayan Tahr be protected or not ?

18. Is there any poaching in your area ?

    a. Yes b. No c. Don't Know

19. If yes, which wild life species?

20. What kinds of weapons / methods used for poaching ?

21. Who are the persons responsible for poaching ?

22. Are local people interested in conserving Himalayan Tahr ?

23. For what reason, Himalayan Tahr are poached ?

24. What are the reasons for conserving Himalayan thar ?

25. If exported, where do they go?

26. Which months is regarded favorable to poach Himalayan Tahr ?

27. What are the threats to Himalayan Tahr apart from poaching?

28. Do other wild animals occur in the area?

29. Do their predator occur there?

Sps.	Frequency	Rarely	Sometime	Often

31. Have Himalayan Tahr's number declined over the past 5-10 years.

Annex 3

Floral Species found in Himalayan Tahr Habitat

S.No.	Scientific name	Total (in 36 quadrate)
1	*Anaphilis sp.*	201
2	*Saxifera sp.*	12
3	*Arenaria densissima*	4
4	*Iris kemaenensis*	49
5	*Primula calderena*	120
6	*primula denticulata*	146
7	*Dubyaea hispida*	30
8	*Potentilla plurijuga*	102
9	*Cryptothaladia polyphylla*	40
10	*Dyopterus sp.*	20
11	*Thermopsis barbata*	10
12	*Euphorbia wallichi*	2
13	*Arenaria glanduligera*	42
14	*Ephedra gerardiana*	62
15	*Leontopodium jalotanum*	5
16	*Cotoneaster microphyllus*	100
17	*Lonicera rupicola*	22
18	*Berberis angulosa*	112
19	*Rhododendron setosum*	150
20	*Berberis erythroclada*	89
21	*Caragana gerardina*	31
22	*Rhododendron lepidoton*	136
23	*Juniper sqnamata*	18
24	*Rhododendron anthopogan*	102
25	*Juniperus recurva*	1

26	*Astragalus candolleanus*	3
27	*Allium wallichil*	8
28	*Aster albescens*	20
29	*Bistorta offinis*	24
30	*Bistorta macrophylla*	1
31	*Cassiope fastigiata*	13
32	*Aster humalaicus*	2
33	*Cynanthus Lobatus*	2
34	*Gaultheria trichophylla*	9
35	*Gentiana ornata*	10
36	*Heracleum Lallii*	1
37	*Hippophae tibetana*	1
38	*Phlomis spectadilis*	3
39	*Parnassia cabulica*	15
40	*Selinum tenuifolium*	14
41	*Rheum australe*	26
42	*Cirsium falconeri*	18
43	*Saussurea fastuosa*	4
44	*Saussurea graminifolia*	2
45	*Leontopodium himalayanum*	11
46	*Astragalus candolleanus*	7
47	*Astrogalus rhizanthus*	2