1. INTRODUCTION

1.1 Background

Nepal is located in the transitional zone of interpenetration between eastern and western Himalayas comprising complex mountain topography with wide altitudinal ranges. It serves as the meeting place or cross road of six floristic provinces of the Asia and Two major world realms (Joshi, 2000). Varied habitat condition ranges from low tropical wetlands and monsoon forest in the Terai to montane forest and alpine meadows in the high Himalaya are existed in Nepal, and support many endemic, rare and endangered species of plants and animals (MI and IUCN, 1995).

The habitat structure and climatic conditions plays a major role for the richness of the species. The presence or absence of an animal or plant in a certain region is determined by several ecological factors. Population of organisms can become established in a region only if the range of condition under which the species or individual can thrive (its ecological valance) is consistent with the sum of the conditions prevailing there.

Animals and plants are living indicators of the characteristic of their environment (Saharia, 1982). So, the habitat condition depends directly on a number of different factors, such as climatic factor (rainfall, temperature, humidity), physical factors (altitude, slopes, soil texture etc) and biological factors (animals and plants or vegetation). Vegetation is one of the biological factor that integrates the effects of parent material, soils slopes, aspect of elevations and local hydrological region and events such as fires and floods, provides food and hiding and thermal cover and serves as the biotic matrix for sock outcrops (~~Berwick and Saharia, 1995~~Stromberg, 1990).

The location and physiographic ruggedness of Nepal had generated a diverse flora in very diverse types of natural vegetation encompassing 35 types of forest (Stainton, 1972) 118 types of ecosystem and 75 types of vegetation under 11 bioclimatic zones (Dobremez 1972). The country cover only 0.1

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percent of the world's land but claims 4.5 percent of mammals, 9.3 percent of birds, 4.2 percent of butterflies, 2.2 percent of freshwater fishes and houses 2.7 percent of the worlds' flowering plant's (IUCN, 2005). Diversity is a keyword for defining Nepal (Shrestha, 1999) and is the most important wealth for the country.

Nepal ~~harbours~~harbors rich ~~mamalian~~mammalian diversity accounting to about 4.5 percent of world's mammalian species in it's 0.1 percent land of the world (~~REF~~IUCN, 2005). In diversification of the mammals, inter-penetration of Indo - Malayan and the Palearctic biogeographic realm along the ~~Himalays~~Himalayas plays striking roles (~~REF~~Shreshta, 1999). Nepal comprises 181 species of mammals belonging to the 12 orders and 33 families including endangered mammals such as one horned rhinoceros, the Bengal tiger, the red panda, the snow leopard and the musk deer.

~~According to the IUCN Red list of Threatened Animals (1996) and Checklist of CITES species (1988), O~~out of 181 species, 62 species are listed in CITES appendices (CITES, 1988), 51 species in IUCN Red List category (IUCN, 1996) comprising 30 species under threatened, 18 species under low Risk and 3 species under Data Deficient. Twenty seven~~27~~ species are given legal protection under the National P~~p~~ark and W~~w~~ildlife C~~e~~onservation Act (1973) (BPP 1995). Three mammalian species (Pygmy hog, Indian Chevrotain and cheetah) have already become extinct from Nepal, over the last century (~~REF~~BPP, 1995). One rodent species Himalayan field mouse (*Apodemus gurkha*), which occurs in central Nepal between 2200-3600m is endemic to Nepal.

~~Physiograophically~~The land of Nepal is divided into three physiographic regions~~arts:,~~ Terai and S~~s~~iwalik, Midhill, and higher ~~Himalays~~Himalayas.~~,~~ Distribution ~~and occurrence~~ of mammalian species in these three physiographic zones~~,~~ reveals that the highest number of mammalian order is found in the lower altitude below 1000m. In the Terai and S~~s~~iwaliks, 12~~,~~ mammalian orders

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including 91 species are represented (REFBPP, 1995). Highest number of mammals species is found at the Mid-hills between 100-3000m. In the Mid hills 110 mammal species of mammals belonging to within 9 orders are represented and i. In Highlands 8 mammalian orders including 80 species are represented (REFBPP, 1995). The orders Ceetacea and Pproboscidea occurs only in Terai and Ssiwaliks. Almost equal number of mammal species have their ranges restricted to one of Nepal's three main physiographic zones with 30 species in the High lands 32 species in the Mid hills and 30 species in the Terai Siwaliks denoting equal diversity for restricted species. in these three sub regions. (BPP, 1995).

1.2. Statement of the Problem

Mammals are an integral component of forests and grassland communities because they contribute in nutrient cycle and energy flow (Nembang, 2003) and large mammalian herbivores especially hoofed mammals possess a very important characteristic feature in the terrestrial environment Iodum, 1971).

Varied habitat condition ranges from low tropical wet lands and monsoon rainforest in the terai to montane forest and meadows in the high Himalaya are existed in Nepal, and support many endemic, rare and endangered species of plants and animals (MI and IUCN, 1995). Nepal's geographical, altitudinal and climatobiological variation taken together account for the country species richness. So, habitat structure and climatic conditions plays a major role for the richness of the species. The presence or absence of an animal or plant in a certain region is determined by ecological and historical factors. Population of organisms can become established in a region only if the range of condition under which the species or individual can thrive (its ecological valance) is consistent with the sum of the conditions prevailing there. Animals and plants, then are living indicators of the characteristic of their environment (Saharia, 1982). So, the habitat condition or habitat status depends directly on a number of different factors, such as climatic factor

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~~(rainfall, temperature, humidity), physical factors (altitude, slopes, soil texture etc) and biological factors (animals and plants or vegetation. Vegetation is the total plant cover of a region (Fosberg, 1961). It is one of the biological factor that integrates the effects of parent material, soils slopes, aspect of elevations and local hydrological region and events such as fires and floods, provides food and hiding and thermal cover and serves as the biotic matrix for sock outcrops. (Berwick and Saharia, 1995). Vegetation one of the most important component of faunal habitat is subjected to govern mammals diversity. (Joshi 2000). For better exploration and utilization of natural resources scientific studies regarding the vegetation dynamics and habitat diversity necessary (Fosberg 1961). Vegetation analysis helps in evaluation of wildlife habitat and made easiest to know the ecosystem of the study area.~~

———Master Pplan for Fforestry Ssector (GN, 1988) promotes the community forestry program in Nepal for maintaining biodiversity through the involvement of local people as users. As of 2004 about 25% of the total National forest covering around 1.1 mha were being managed by community forestry user groups. (-Kanel 2004; cited in Karki et al. 2006). The biodiversity value of community forestry has not yet been assessed in terms of ecosystem diversity, species diversity and genetic diversity (Shrestha, 1999). Some studies advocates that there is a tremendous potential of biodiversity conservation ~~is~~ in community forestry outside the protected area ~~Network~~ system of Nepal (Jakson and Ingles 1994; Ingles. 1994; Barnney and Dev, 1994). Baskota (2006)~~,~~ reported that community forestry programme improved forest condition and numerous degraded ecosystem with positive impact on biodiversity conservation.

———As significant biological resource wealth exist outside protected areas, it is essential to study on biodiversity of these areas for the conservation management and sustainable use (Ghimire, 1996). The management of community forests have a positive results in the quality, composition and structure of habitats and fauna. Information on these areas outside the protected

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area system (PAS) can be obtained by regular monitoring and maintaining records collected from various scientific methods. Vegetation, one of the most important component of faunal habitat, is subjected to govern mammals diversity (Joshi 2000). For better exploration and utilization of natural resources scientific studies regarding the vegetation dynamics and habitat diversity necessary (Fosberg 1961). Vegetation analysis helps in evaluation of wildlife habitat and made easiest to know the ecosystem of the study area. An assessment of habitat and exploration of mammalian species is important preliminary to evaluate success of community forest in biodiversity conservation.

~~Information on these areas outside the protected area system (PAS) can be obtained by regular monitoring and maintaining records collected from various scientific methods.~~

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1.~~3~~ ~~2~~ Objectives

The goal ~~broad objective~~ of the study was to evaluate habitat condition and ~~is to~~ assess the status ~~explore the diversity and status~~ of mammal ~~and their habitat~~ in the Kankali community forest of Chitwan district. The specific objectives were:

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i. to assess the habitat condition,
ii. to explore the diversity, and
iii. to ~~assess~~ determine the status of mammalian fauna

1.4 Rationale

~~3 Justification and Limitations~~

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Exploration and evaluation ~~identification~~ of the biological ~~wealth~~ richness ~~diversity~~ outside PAS is essential for knowing their scientific, economic, developmental and environmental values ~~etc.~~ for ~~those~~ local ~~particular~~ areas

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and also for national level. Scientific study of the biodiversity is also necessary for conservation, management and proper utilization towards the direction of sustainability and stable environment. The Kankali community forest of Chainpur VDC, Chitwan is being representative of an inner Terai forest, so its biodiversity study could represents ~~shows~~ the biodiversity status of the south facing slopes ~~outer part~~ of the Mahabharat range. ~~Any part of Mahabharat range of Chitwan district has not been studied.~~ This ~~erefore the~~ study on the mammalian diversity has been done in the ~~of~~ KCF ~~tries~~ to evaluate the impact of community forest on mammalian species~~give valuable information on present condition of mammalian species of that area which will become pioneer for further study and fruitful from the scientific point of view. The study was conducted~~ at disturbed and unnatural environmental condition of the forest. This study provides information on the habitat conditions, effect of forest regeneration on the mammalian species. It is hoped that the result of the present study will be useful to monitor the mammals in the regenerating community forest ~~because of the human intervention, improper management and strategies of community forest.~~ .

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~~The data are based on diurnal survey and study much depends on indirect methods. The resources (i.e. manpower, budget, constraints equipment) were also limited for regular monitoring.~~

~~**Limitations**~~

~~You Should mention if you have any limitations~~

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2. STUDY AREA

2.1 Location ~~and Physiography~~

This study was conducted in the ~~t~~The Kankali Ceommunity ~~forest~~ Forest (KCF)~~area is~~ at Chainpur Village Development Committee (VDC) located in~~at~~ the North Eastern Side of Chitwan ~~dun~~ valley. The study area is s~~. It lies within the part of the Chainpur VDC S~~ituated in ~~outerfoothill~~outer foothill of Mahabharat ranges on the shape of inverted cone. The K.C.F ~~forest~~ situated 17 km east from Narayanghat on East-west highway and about 12 km North from Sauraha post of Chitwan National Park. The forest has been protecting from community level since 2048 M~~m~~argha ~~21~~. It was ~~declared~~declared as community forest on 2052 Shrawan 22. Five VDC's Shaktikhor, Siddhi, Birendranagar, Pithuwa and Jutpani are adjacent to KCF. KCF is bounded by Kair Khola towards South and western side, human settlement towards southern side, Ladarikhola towards eastern side and continuous mixed Sal forest towards Northern and eastern side. It lies between 84^0 32' to 84^0 37'E longitude and 27^0 37' to 27^0 42'N latitude. The community forest covers an area of 737 hectare (KCF 2003) and altitude ranges from ~~. The forest started from the altitude of~~ 220 masl to ~~above sea level and attend maximum altitude of~~ 606 masl near Deurali. (Fig 1 and 2)

~~(YOU NEED A MAP)~~

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2.2 ~~Physical Components~~Geology and Soils

Geologically, KCF area occupies the outer foothill of Mahabarat range and is occurred in ecologically low land (below 915 alt). Mahabharat range is composed of hard rocks like granite, quartzite and limestone (Sharma, 1984-85). The soils of the area ranges from sandy loam to loamy sand. The red colored soil is also found there. Entire area is characterized by its more or less steep topography. As its topography, small scale landslide and erosion hazards are found all over the area.

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2.3 River Systems

There are number of rivulets and streams that are the tributaries of spring fed rivers like Kair Khola and Ladari Khola at different side. Some of them are Kol Khola, Gaidakhola, Amara Kholsa. Thapa Kholsa, Patihani Khola, Baghdhara etc.

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~~i.~~ 2.4 Climates

The climate of the Chitwan is ranges from tropical ~~monsoon~~ to subtropical monsoon, with high humidity all through the year and characterized by three ~~and three~~ main seasons:~~.~~ (ia) Summer (Hottest and driest) season~~).~~ This season~~s~~ extending from March to early June (traditional hot month) with temperature raising progressively to a peak in May.~~.~~ (ii~~b~~) The monsoon season~~ :~~ This season occurring from early June to late September and ~~.~~ (c) Winter ~~season~~ (cold-dry) Season~~).~~ This seasons starts from October to the end of February.

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The ~~According to~~ climatic data (2001-2005) recorded at the Rampur meteorological station Chitwan reveals that the mean monthly temperatures ranged from 8.43^{0}c in January to ~~maximum temperature reached around~~ 35.13^{0}c during May ~~at Chitwan. The mean monthly minimum temperature reached around 8.43^{0}c during January. The lowest men monthly maximum temperature was 22.05 during January and the highest mean monthly minimum temperature was 25.59 during August at Chitwan~~ (F~~f~~ig. ~~1~~3).

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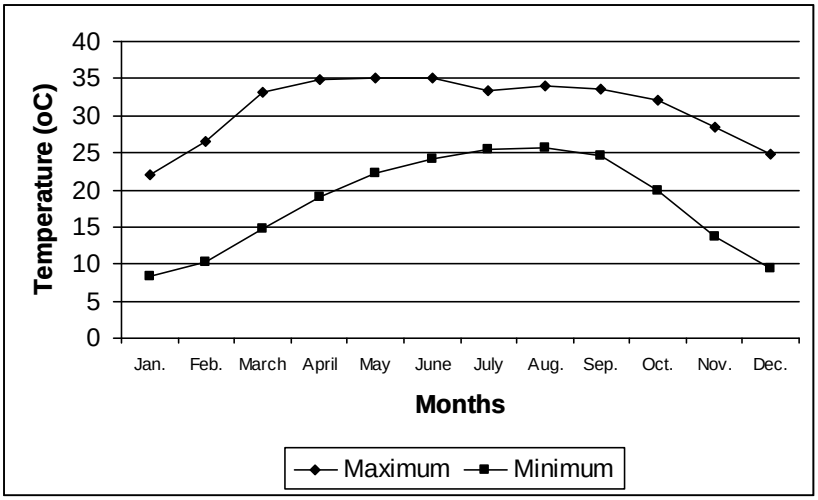

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Figure ~~1~~3: Mean ~~Average~~~~m~~Monthly ~~Maximum and Minimum~~ Temperature (^{0}C) recorded at Rampur Meteorological Station ~~at Chitwan~~ (2001-2005), Chitwan ~~(Rampur Station).~~

The mean monthly precipitation was highest 675.53 mm during July and lowest 2.14mm during December. Total annual ~~verage~~ rainfall ~~per year is about~~was 2393.6~~.6~~3mm ~~(CHECK IT)~~. More than 85 %~~percent~~ rainfall occurs during monsoon season~~.~~ (F~~f~~ig. ~~2~~4)

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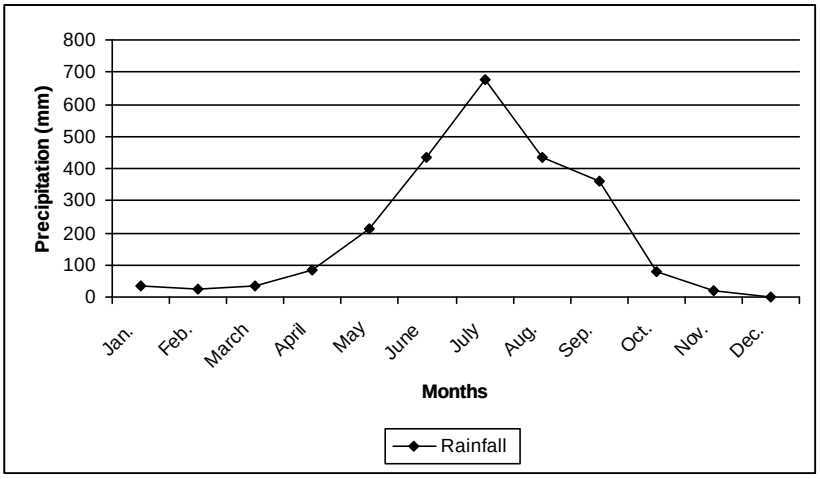

Figure ~~24~~: ~~Average Precipitation (mm) at Chitwan (2001-2005) (Ranpur Station).~~Mean Monthly Precipitation (mm) recorded at Rampur Meteorological Station (2001-2005), Chitwan.

The mean monthly relative humidity (Morning) reached maximum 99.04 during December and mean monthly relative humidity (Morning) reached minimum 67.52 during April at Chitwan. The Mean monthly relative humidity (Evening) reached maximum 81.57 during August and reached minimum54.27 during March (Fig. ~~3~~5).

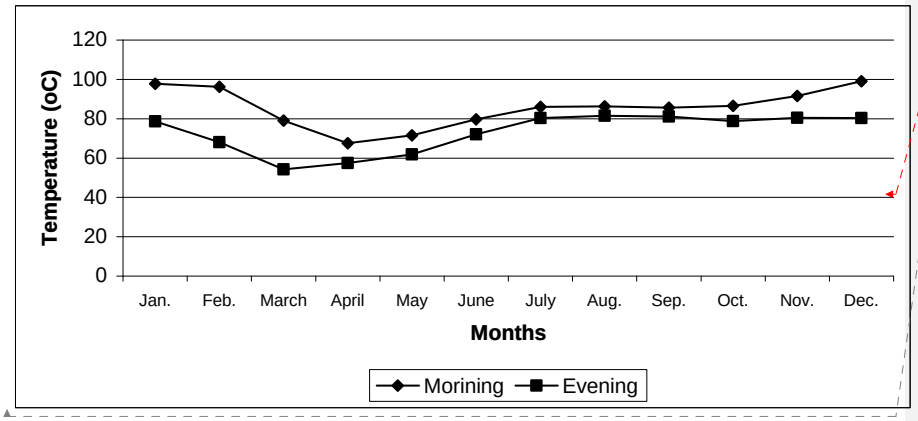

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Figure ~~3~~5: ~~Average Relative Humidity (%) at Chitwan (2001-2005) (Rampur Station).~~Mean Monthly Humidity (%) recorded at Rampur Meteorological Station (2001-2005), Chitwan.

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ii. Geology

Geologically, KCF area occupies the outer foothill of Mahabarat range and is occurred in ecologically low land (below 915 alt). Mahabharat range is compared of hard rocks like granite, quartzite and limestone. (Sharma, 1984-85). The soil is formed by the break down of the rocks. The soils of the area ranges from sandy loam to loamy sand. The red coloured soil is also found there. Entire area is characterized by its more or less steep topography. As its topography, small scale landslide and erosion hazards are found all over the area.

iii. River system

There are number of rivulets and streams that are the tributaries of spring fed rivers like Kair Khola and Ladari Khola at different side. Some of them are Kol Khola, Gaidakhola, Amara Kholsa. Thapa Kholsa, Patihani Khola, Baghdhara etc.

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2.53 Biological Components

2.53.1 Vegetation

K.C.F is the Dense mixed forest and Sal (*Shorea robusta*) is dominant to other species; mainly saj (*Terminalia tomentosa*) Botdhaero (*Lagerstroemia praviflora*), Bhalayo (*Semecarpus annacardium*), Rajbriksha (*Cassia fistula*) Khirro (*Sapium insigne*), Kayamuna (*Syzygium operculata*), Dhangeri (*Woodfordia fructicosa*). The entire forest is differentiated into three different and distinct zones according to the successional stage of plants and types of plant species occurred. They are:

i. Lower Planted Zone : This zone is occupied mainly by Sissoo (*Dalbergia sissoo*), (*Acacia catecha*) Khair, Bamboo and regenerated species Khirro (*Sapium insigne*).

ii. Regenerated Zone : This zone is occupied mainly by regenerated plants after protection in combination with old plants. *Shorea robusta* is dominant to other species; *Lagerstroemia praviflora*, *Cassia fistula*, *Woodfordia frucaticosa* etc.

iii. Upper old Mixed : This zone is occupied by old and matured plant species and is also dominated by Sal (*Shorea robusta*). Other associated plant species are Saj (*Terminalia tomentosa*), Latikath (*Golchidion velutinum*), Kayamuna (*Syzyginum operculata*), Bhalayo (*Semecarpus annacardium*), Chilaune (*Schima wallichi*), Jamun (*Syzygium cumini*), *Mallotus phillippinenisis*, *Zizyphus sp*.

2.53.2 Fauna

The forest area consists considerable number of species of wild faunas belonging to the class mammals, Aves, Reptiles, Amphibians and Fishes. and birds and also founds amphibian, Reptiles and fishes in good numbers. Present study (2006) has recorded more than 26 species of mammals in KCF. Wild boar (*Sus scrofa*), Barking deer (*Muntiacus muntajak*), Rhesus monkey

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(*Mac~~e~~aca mullata*), ~~.~~ Wild cat (*Felis chaus*) are some of the common species of the K~~.~~C~~.~~F. Similarly,

~~According to the record of the KCF more than~~ 140 species of birds were recorded by the expert of the Biodiversity Conservation Center (BCC) National Trust for Natural Conservation Shauraha Chitwan (KCF, 2003). Red Jungle fowl (*Gallus gallus~~l~~*), Peacock (*Pavo cristatus*), Kalij Pheasent (*Lophura leucomelana~~).~~*), Parakeet (*Psittacula eupatria*) are some of the common species of the K~~.~~C~~.~~F.

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3. METHODS

3.1 Reconnaissance Survey

A reconnaissance of the study sites was undertaken in the month of January 2006 to collect preliminary information and select sampling sites. The survey was done by visiting study sites, discussion with community forest authorities and interviewing local peoples or users around the forest. During survey information on the habitat structure, presence of mammal species and present condition of the study sites were taken.

3.2 Field Surveys

The field survey was conducted from March 2006 to March 2007, to assess habitat status and diversity of mammals. I divided the entire study site into three blocks on the basis of natural barriers and man made demarcation such as rivers, streams, and foot trails (Fig.6).

Block I- The block I includes the areas of the North western part of the forest from Nursery to Bhutayaha Dada. The northern belt is demarcated by boundary of Kankali Community Forest (KCF) to Satkanaya Community Forest (SCF) and the western belt is demarcated by Kair Khola. Eastern belt is demarcated by foot trails to Kankali temple.

Block II- It includes areas of the middle part of the community forest; from nursery to Chihan Dada. The western and eastern belt is demarcated by foot trails to Kankali Mandir. The southern belt is demarcated by human settlement.

Block III- It includes areas of the eastern part of the forest from Chihandada to Jogikuti. The northern belt is demarcated by boundary of KCF to SCF where as the eastern belt is demarcated by boundary of KCF to Agingare Community Forest (ACF). The western belt is demarcated by foot trails where as southern belt is demarcated by Rasauli Khola and human settlement.

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3.3 Habitat Assessment

3.3.1 Vegetation Surveys

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Vegetation survey and analysis was done to evaluate the habitat condition of the KCF. The study on vegetation was carried out in all blocks and analysis was done through following parameters such as Density, Frequency, Basal area and Importance value index.

3.3.1.1 Line transect

A line transect method was adopted to collect the vegetation data covering 11.5 km distance, 3.7 km in block I, 3.5 km in block II and 4.3 Km in block III. Quadrates of 10m x 10m were laid at fixed intervals of approximately 200 m along the line transect for trees. Nested plots of 2m x 2m and 1m x 1m were developed for shrubs and ground vegetation respectively and all the vegetation falling within these plots were recorded. All together 50 quadrates for each vegetation types (trees, shrubs and herbs) were laid down. Out of those 50 quadrates 15 quadrates were laid in block I, 15 quadrates in block II and 20 quadrates in block III. Each species of plants presents in each quadrates were counted separately. The diameter of each trees at its breast height (1.3 cm) was also measured using measuring tape. The plant species having > 10cm cbh and 1.37m height were counted and recorded as trees. Plants were identified in the fields with their local names through local peoples and their scientific names were identified through the book of Shrestha (1998). The Herbarium of the all unidentified plants species were made and identified at the Central Department of Botany, Tribhuvan University.

3.3.1.2 Vegetation Data Analysis

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The density and relative density, Frequency and relative frequency, Basal Area and Importance Value Index (IVI) of ,the vegetation were analyzed using Zobel et al. (1987).

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(i) Density and Relative Density

$$\text{Density/ha} = \frac{\text{no. of individuals of a species}}{\text{Total no. of plots sampled x sized of the plot}} \times 100000$$

$$\text{Relative Density (\%) (RD)} = \frac{\text{Density of individual species}}{\text{Total Density of the all species}} \times 100$$

(ii) Frequency and relative frequency

$$\text{Frequency (\%)} = \frac{\text{No. of Sampling Units in which the species occurred}}{\text{Total No. of Sampling unit Studied}} \times 100$$

$$\text{Relative Frequency (\%) (RF)} = \frac{\text{Frequency of a species}}{\text{Total frequency of all species}} \times 100$$

(iii) Basal Area and Relative Basal Area

$$\text{Basal area } (m^2) = \pi r^2 = \frac{\pi d^2}{4}$$

where r = d/2 ® = 31416

d = diameter of tree at breast height.

(iv) Importance Value Index (IVI)

IVI = RD + RF + RB (RC)

(v) Species diversity Index

The species diversity index was calculated using Shannon and weaver (1949) index.

$$H = -\sum\left(\frac{ni}{N}\right)\log\left(\frac{ni}{N}\right)$$

Where,

H = Shannon's index for species diversity

ni = importance value for each species

N = total importance value.

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(vi) Dominance

The Simpson's (1945) index was used to determine dominance of plant species.

$$C = \sum\left(\frac{ni}{N}\right)^2$$

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Where,

C = index of Dominance

ni = importance value for each species

N = total of importance value.

3.4 Mammal Survey

3.4.1 Line Transect

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Line transect method described by Sutherland (1997) was adopted for the survey of mammals. Survey on mammalian species in each block was done by diurnal walking through line transect set up in each block, depending on the availability of track. The total length of line transect walked was 138km under 12 days survey in each transect. Besides the survey of transect, random search was also carried out to record the occurrence of mammalian species. During survey binocular and camera were also used for visual aid and photography respectively.

During transect surveys the mammals seen or heard on either side of the line transects were recorded and identified with the help of field guide books (Prater, 1998, Shrestha, 1997, Gurung and Singh, 1996).

3.4.2 Collection and identification of indirect evidences

Presence of mammals were also confirmed by the identification of indirect evidences. Indirect evidences such as feces (scats, pellet groups, droppings), foot prints (pugmarks or tracks), scratches, materials left after feeding, shelters and call or vocalization presence on both sides of line transects within ten meters were collected.

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3.4.2.1 Feces (Scats or pellets or droppings)

The fecal matter gives clear idea about the presence and abundance of species. The fresh fecal samples were collected at first by wrapping with newspaper and then put it in air tight plastic bags with care for maintaining their original shape. All the collected samples were labeled and sundries separately until they dried properly. After proper drying, their length and diameter were measured using calipers and weighted using digital balance. Different shape, size, color, dour and signs associated with feces, such as scratches and foot prints were also used to distinguish the feces. The measurements of the feces of different species were also compared with the measurements given by Shrestha and Basnet (2005). Help of local people, forest guards, forest dwellers and wildlife technician of Biodiversity Conservation Center (BCC), National Trust for Nature Conservation (NTNC), Chitwan was taken for the identification of feces. For further confirmation of identified feces and identification of unidentified feces, the collected samples were tallied with feces of mammals of the Central Zoo and with sample feces placed in the museum of BCC, NTNC.

3.4.2.2 Footprint (Pugmarks or tracks)

Each species of mammals have their own types of footprint with distinct characters in their shape, size and presence or absence of claws. The exact structure of footprint was obtained by using tracing and casting methods and photography (WWF, 1998). For tracing of footprint of jungle cat, Civets and crab eating mongoose, an A_4 size transparent glass plate was placed over the track and the out line of the track was traced with a free flowing permanent marker pen. The traced footprint was identified with the help of wildlife technician of BCC. For the measurement of exact structure of footprint, identification and confirmation, Gurung and Singh (1996), Singh (1999), WWF (1998) and WWF (2001) were used as reference. The total length (TL), total width (TW), Pad width (PW) and Pad length (PL) of pugmark were measured. The footprint of ungulates (e.g. wild boar and barking deer) were identified on

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the basis of different shape, size, appearance, and signs associated with footprints, such as scratches and pellets. For the recording of information on each footprint (Pugmarks) data forms were prepared and filled (Appendix VIII).

3.4.2.3 Scratches, feeding signs, shelters and vocalizations

The scratches of wild boars was identified, which is like digging and ploughing and damaged comparatively larger area on the way of searching food inside and outside the forest. Calls and vocals of some mammals such as barking deer, monkeys, jackals and wild cat were recognized, identified home or shelters e.g. burrow of pangolin and bedding of hare shelter of wild boar), used feeding sings (carcass left by predator e.g. hair and bones of hare, and wild boar, outer body parts and covers of crustaceans and mollusks) and quills were recorded for occurrence of porcupine.

3.4.3 Questionnaire Survey

Mammalian species present in KCF were also confirmed through questionnaire survey with local people and discussion with members of Community Forest Group (CFG). Respondents were asked to tell about the species they observed or saw using photographs. The special question about abundance (low medium, high), frequency of encounters (rarely, sometimes, and frequently), location (habitat and area), time (day or night) and the date of the last sighting in questionnaire survey (Appendix IX).

3.5 Status of Mammals

Conservation status of mammals was determined on the basis of national and international literature published (BPP 1995, Aryal 2004, Dhakal and Chapagain 2002, CITES 1998, IUCN 2002). Sign encounter rate was calculated on the basis of findings of signs like fecal matter and foot print during line transect survey. Mammals presents and their category in the list of

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IUCN, CITES, NRDB were examined and confirmed the status of mammals present in the study area.

The local status or abundance of mammals (eg. least abundant, intermediate abundant, most common and rare) were identified and generalized on the basis of findings through questionnaire survey, visual observation and indirect evidences encounter rates. The data on sings were expressed as total count, encounter rate (number/km/day) following Jhonsingh and Negi (2003) and Singh (2001 and 2003).

The base line made for the determination of local status of mammals according to encounter rate was as follows:

Common : Encounter rate (no/km/day)> 0.35

Intermediate: Encounter rate (no/km/day)<0.35

Least abundant: Encounter rate (no/km/day)< 0.25

Rare : Encounter rate (no/km/day)<0.05

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4. RESULTS

4.1 Vegetation Analysis

Throughout the study period a total of seventy six plant species were recorded. Among the recorded plant species, thirty five were trees, twenty one were shrubs and twenty were herbs. The density, frequency, basal area, IVI dominance index and diversity index of the recorded plant species were calculated and presented below.

4.1.1 Tree: Species Composition

Thirty-five tree species with 1771.60 no/ha density was recorded in the KCF (Table 1). The density and frequency of tree species in KCF ranged between (948.30 no/ha, 85%) to (1.60 no/ha, 1.66%). The *Shorea robusta* was the dominant tree species with highest density and frequency (948.30 no/ha, 85%) and was followed by *Lagerstroemia praviflora* (203.30 no/ha, 60%), *Syzygium operculata* (115.00 no/ha, 36.66%), *Semecarpus annacardium* (98.30 no/ha, 35.0%), *Sapium insigne* (80.00 no/ha, 23.33%), *Dalbergia sissoo* (58.30 no/ha, 11.66%), *Cassia fistula* (38.30 no/ha, 18.33%) and *Terminalia tomentosa* (38.30 no/ha, 20%). These are the main species of the composition and are also followed by other 28 tree species. The lowest density and frequency (1.60 no/ha, 1.66) was of *Trewia nudiflora*, *Albizia sp. Magnifera indica*, *Myrsine semiserrata*, *Mussaenda erythrophylda*, *Carea arborea*, *Terminalia chebula*, *Acacia auriculiformes Schleichera trijuga* and Karauto (Appendix I).

The highest values of relative density and Relative frequency were estimated for *Shorea robusta* and the least values were found for *Acacia auriculiformes*, *Schleichera trijuga*, *Mussenda erythrophylda* and *Magnifera indica* (Appendix I).

The *Shorea robusta* showed the highest IVI values (136.65) followed by *Lagerstroemia praviflora* (32.65), *Semecarpus annacardium* (20.68), *Syzygium operculata* (19.67) *Terminatia tomentosa* (14.39), *Sapium insigne* (11.8), *Dalbergia Sissoo* (8.76), *Cassia fistula* (7.36). The lowest IVI of 0.497 was for *Mussaenda erythrophylda* (Appendix I)

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4.1.2. Shrubs: Species Composition, Density and Frequency

Twenty one shrub species with 24550 no/ha density was recorded in the KCF. The density and frequency of shrub species in KCF ranged between (4900 pl/ha, 54%) to (50 pl/ha, 20%). Among the recorded species *Phoenix humilis* was the dominant shrub species with highest density and frequency (4900 pl/ha, 54%) and was followed by *Clerodendron viscosum* (3850.00 no/ha, 24%), *Indigofera cyclindrica* (2800.00, 48%), *Milleta extensa* (2050.00, 42%), *Flemingia strobilifera* (2000.00, 24%). The density and frequency of *Grewia sclerophylla* and *Desmodium concinum* were lowest (50.00 no/ha, 2.0%) (Appendix II).

The highest Relative frequency and Relative density were of *Phoenix humilis* (19.95, 15.08) and the lowest of *Grewia sclerophylla* (0.20, 0.55) and *Desmodium concinum* (0.20, 0.55) (Appendix II)

4.1.3 Herbs: Species Composition

In the low vegetation the density and frequency of *Gramineae sp.* 1 (unidentified sp) were highest (13 no. /m^2, 82%) which was followed by *Pogonatherum crinitum* (10 no/m^2, 40%), *Brachiaria racemiosa* (8.5 no/m^2, 50%), *Carex cruciata* (4.42 no/m^2, 32%), *Hypoxin aurea* (2.68no/m^2, 20%), *Eupatorium oedenophorum* (2.20 no/m^2, 72%), *Elusine indica* (2.0, 2.0%). The lowest density and frequency was of *Asparagus filicinus* (0.08) and *Apios carnea* (2.0%) respectively (Appendix III).

4.1.4 Diversity and Dominance

Shannon winner diversity indices was highest for shrub Vegetation (1.03) followed by grass vegetation (0.916) and lowest for tree vegetation (0.793). Simpson's index of dominance for tree species was highest (0.21) and most dominant tree species was *Shorea robusta*. This was followed by grass vegetation (0.164) with dominant sp. (*Graminence* sp.1) and *Pogonatherum crinitum*), and Shrub vegetation (0.105) with dominant species (*Phoexix humilis*) (Figure 7 & 8 and Appendices IV & V).

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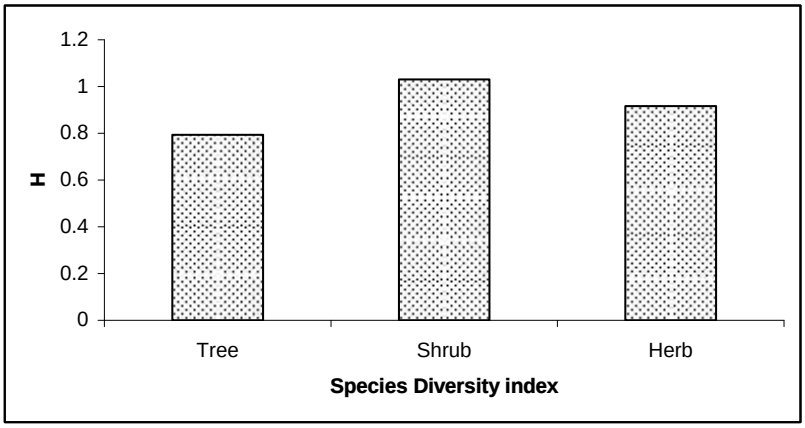

Figure. 7 : Species Diversity Index of Different Vegetation.

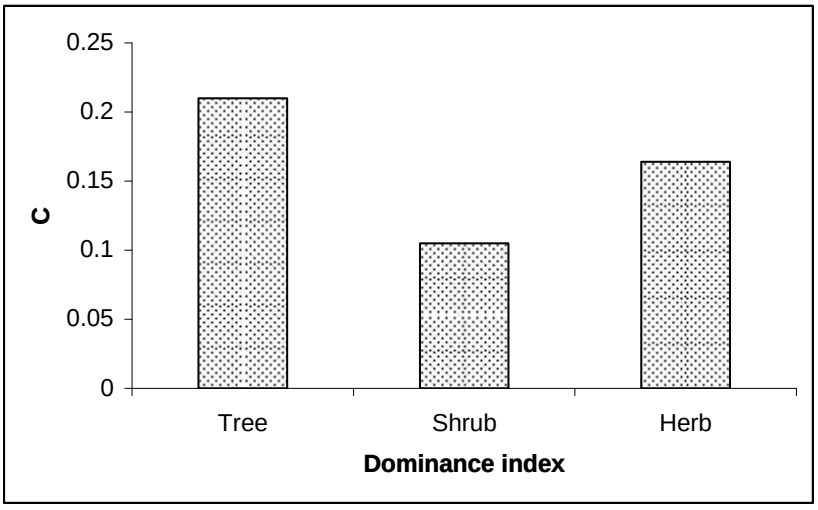

Figure. 8 : Dominance index of different vegetation.

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4.2 Mammal Diversity

Altogether 26 species of mammals were recorded during the study period. Recorded mammalian species belongs to seven order and fourteen families. Among 26 recorded species, 21 species were confirmed by all the methods applied (visual observation, indirect evidences and questionnaire survey) and remaining five are confirmed only through questionnaire survey (Leopard cat, Small clawed otter, Wild Dog, spotted deer, and Samber deer). Indirect signs such as feces (Scat/pellet/droppings), foot prints (Pugmark/track), scratches, burrows, quills showed evidence of their presence. Among the recorded 26 mammalian species 13 (50%) species belonged to the order carnivora, four species (15.3%) belonged to in each of order Artiodactyla and Rodentia, two species (7.69%) belonged to order Primates, one species (3.84%) belonged to in each order Chiroptera, Pholiodota and Logomorpha.

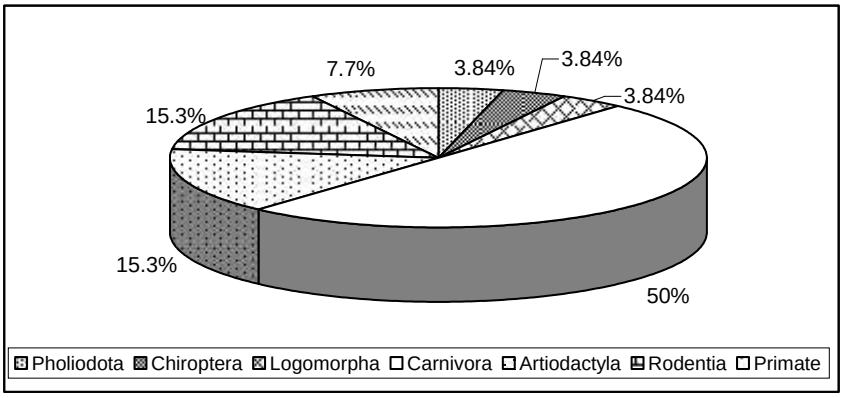

Figure 9: Percentage distribution of order of mammalian species in Kankali Community Forest, 2006.

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Table 1: Mammalian Diversity and their Validation Method

S.N.	Common/Scientific Name	Order	Family	Validation method	Remarks
1	Common Leopard (*Panthera pardus*)	Carnivora	Felidae	Fe.	*
2	Jungle Cat (*Felis chaus*)	Carnivora	Felidae	Fe., Ft., V.	*
3	Large Indian Civet (*Viverra zibetha*)	Carnivora	Viverridae	Fe., Ft., V.	*
4	Small Indian Civet(*Viverricula indica*)	Carnivora	Viverridae	Ft., V.	*
5	Toddy Cat (*Paradoxurus hermaphrodites*)	Carnivora		Ft., Fe	*
6	Yellowthroated Marten (*Martes flavigula*)	Carnivora	Mustelidae	Fe., V.	*
7	Small Indian Mongoose (*Herpestes auropunctatus*)	Carnivora	Herpestidae	V.	*
8	Crabeating Mongoose (*Herpestes urva*)	Carnivora	Herpestidae	Fe., Ft., V.	*
9	Common Mongoose (*Herpestes edwardsi*)	Carnivora	Herpestidae	V.	*
10	Wild Boar (*Sus scrofa*)	Artiodactyla	Suidae	Fe., Sh., Ft.,V.	*
11	Barking Deer (*Muntiacus muntjak*)	Artiodactyla	Cervidae	Fe., Ft., V., C.	*
12	Rhesus Monkey (*Macaca mulatta*)	Primates	Cercopithecidae	C.,V.	*
13	Hanuman Langur (*Presbytis entellus*)	Primates	Cercopithecidae	Fe., V.,C.	*
14	Porcupine (*Hystrix indica*)	Rodentia	Hystricidae	Br.,Q.	*
15	Pangolin (*Manis crassicaudata*)	Pholiodota	Manidae	Br.	*
16	Three Striped Palm Squirrel (*Funambulus palmarum*)	Rodentia	Sciuridae	V., Fe.	*
17	Orangebilled Himalayan Squirrel (*Dermomys lokriah*)	Rodentia	Sciuridae	V.	
18	Golden Jackel (*Canis aureus*)	Carnivora	Canidae	Fe., V. Fl.,C	*
19	Bat (*Pipistrellus babu*)	Chiroptera	Vespertilioridae	V.	*
20	Lesser Bamboo Rat (*Cannomys badius*)	Rodentia	Rhizomyidae	Piles	*
21	Indian Hare (*Lepus nigricollis*)	Logomorpha	Leporidae	V.,Fe.	*
Occasionally seen (come to know or discovered through interviewing people around forest)					
22	Wild Dog (*Cuon alpinus*)	Carnivora	Canidae	Int.	Not Confirmed
23	Spotted Deer (*Axis axis*)	Artiodactyala	Cervidae	Int	Not Confirmed
24	Samber Deer (*Cervus unicolor*)	Artiodactyla	Cervidae	Int.	Not Confirmed
25	Leopard Cat (*Felis bengalensis*)	Carnivora	Felidae	Int.	Not Confirmed
26	Small Clawed Otter (*Aonyx cinera*)	Carmivora	Mustiledae	Int.	Not Confirmed

Note : Fe = Feces (Scat/pellet/Dropping) Ft = Footprint (Pugmark/track)
Sh = Scratches C = Call or visual
Q = Quill V = Visual observation Int. = Interview

* denotes presence of species in Chitwan district and Terai and Siwalik physiographic zone by previous literature (Shrestha 1997, BPP 1995, Joshi, 2000, Majpuria and Majpuria 1998).

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4.4 Status of Mammals

Four hundred and sixty sign's of eleven mammal species were encountered on the survey of fixed three transects. Among these eleven mammals Barking deer had the highest sign encounter rate (0.95) of the total signs. This was followed by Wild Boar (0.55), Jungle Cat (0.40), Jackal (0.31), Toddy Cat (0.30), Crabeating Mongoose (0.28), Small Civet (0.21), Indian Hare (0.13) Large Civet (0.10), Yellowthroated Marten (0.05) and Common Leopard (0.007) (Table 2).

Table 2: Encounters Rates (no/km) of Signs of Mammals Species

S.N.	Name of mammal	Total counts	Encounter rate no./km
1.	Common Leopard (*Panthera pardus*)	1	0.007
2.	Jungle Cat (*Felis chaus*)	56	0.40
3.	Large Indian Civet (*Viverra zibetha*)	15	0.10
4.	Small Indian Civet(*Viverricula indica*)	29	0.21
5.	Toddy Cat (*Paradoxurus hermaphrodites*)	42	0.30
6.	Yellowthroated Marten (*Martes flavigula*)	8	0.05
7.	Crabeating Mongoose (*Herpestus urva*)	39	0.28
8.	Wild Boar (*Sus scrofa*)	77	0.55
9.	Barking Deer (*Muintacus muntjak*)	132	0.95
10.	Jackal *(Canis aureus)*	43	0.31
11.	Indian hare *(Lepus nigricollis)*	18	0.13
	Total	460	3.287

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The total of 245 individuals of fifteen mammalian species were seen during the field survey. Among these fifteen mammalian species, the highest number of individuals seen was of Rhesus Monkey (61.2%). Rhesus Monkey was followed by Hanuman Langur 40 (16.32%), Common Mongoose, 10 (4.0%), Barking deer 8 (3.2%), Three Striped Palm Squirrel 6 (4%), Golden Jackal 11 (4.48%) and Orange Billed Himalayan Squirrel and Small Indian Civet (0.4%) (Table 3).

Table 3: Number of Individual and Percentage of Mammals Directly Observed

S.N.	Name of Mammals	No. of Individuals seen	Transects where observed
1.	Jungle Cat	4 (1.6%)	I, II
2.	Small Indian Civet	1 (0.4%)	II
3.	Toddy Cat	2 (0.8%)	II
4.	Yellowthroated Marten	2 (0.8%)	II
5.	Small Indian Mongoose	2 (0.8%)	II
6.	Crab eating Mongoose	3 (1.2%)	III
7.	Common Mongoose	10 (4.0%)	I, II, III
8.	Wild Boar	1 (0.4%)	III
9.	Barking Deer	8 (3.2%)	I, II, III
10.	Rhesus Monkey	150 (61.2%)	I, II, III
11.	Hanuman Langur	40 (16.32%)	II, III
12.	Three Striped Palm Squirrel	6 (2.4%)	I, II, III
13.	Orangebilled Himalayan Squirrel	1 (0.4%)	II
14.	Golden Jackal	11(4.48%)	I, II, III
15.	Indian Hare	4 (1.6%)	II, III
Total		245 (100%)	

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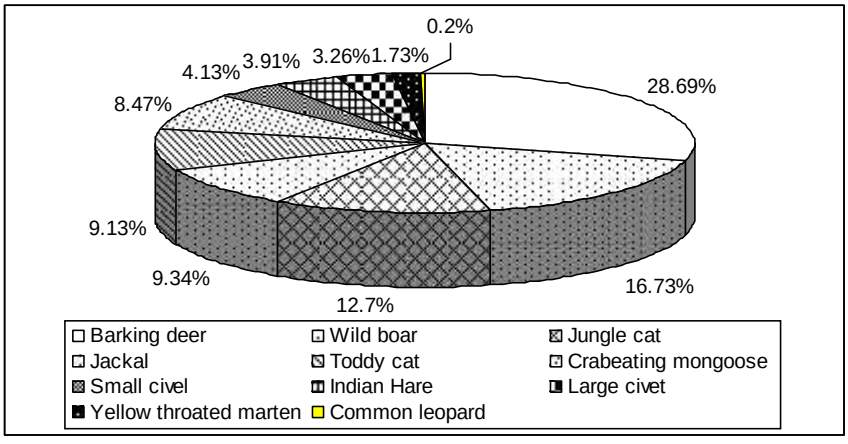

Figure 10: Percentage Distribution of Signs of Mammals.

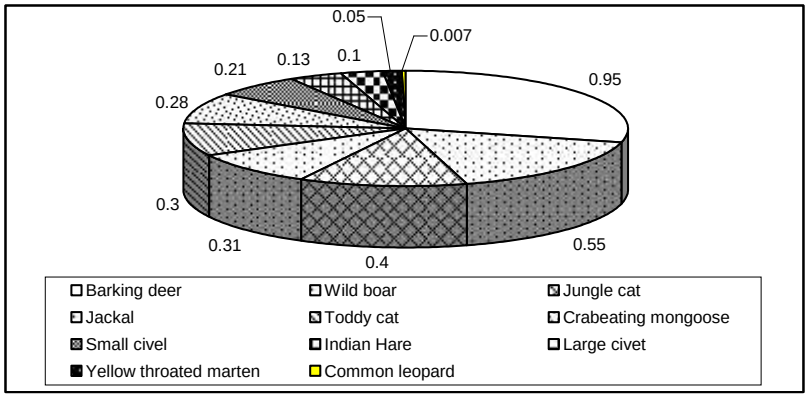

Figure 11 : Encounter rate of sign.

Among these 26 mammals, Nine species are listed in the National Red Data Book (NRDB) including eight species (*Panthera pardus*; *Felis chaus*, *Herpestus urva*, *Macaca mullata*, *Presbytes entellus*, *Manis crassicaudata*, *Cervus unicolar* and *Aonyx cinerea*) under susceptible and only *Cuon alpinus* under vulnerable category (Table 4).

Similarly according to CITES appendices list, three species (*Panthera pardus*, *Presbytis entellus*, *Felis bengalensis*) are listed in the Appendix I, five species (*Felis chaus*, *Macaca mullata*, *Manis crassicaudata*, *Cuon alpinus* and *Aonyx cinera*) are listed in Appendix II and seven species are listed in Appendix III namely (*Viverra zibetha*, *Viverricula indica*, *Paradoxurus hermaphrodites*, *Martes flavigula*, *Herpestes urva*, *Herpestes edwardsi* and *Canis aurens*) (Table 4).

Three species (*Panthera Pardus*, *Felis chaus*, *Felis bengalensis*) are listed under LR/lc. two species (*Manis crassicaudata*, and *Presbytis entellus*) under LR/nt and one species (*Cuon alpinus*) under vulnerable category in the IUCN status list of mammals (Table 4). Figure 10: Encounter rate of sign

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Table 4 : Status of Mammalian Species in KCF, 2006

Common Name	IUCN	CITES	NRDB	Local
Common Leopard (*Panthera pardus*)	LR/lc	I	S	Rare
Jungle Cat (*Felis chaus*)	LR/lc	II	S	Common
Large Indian Civet (*Viverra zibetha*)	-	III		Least abundant
Small Indian Civet (*Viverricula indica*)	-	III		Least abundant
Toddy Cat (*Paradoxurus hermaphrodites*)	-	III		Intermediate
Yellow throated Marten (*Martes flavigula*)	-	III		Least abundant
Small Indian Mongoose (*Herpestus auropunctatus*)	-	-		NE
Crabeating Mongoose (*Herpestes urvu*)	-	III	S	Intermediate
Common Mongoose (*Herpestus edwardsi*)	-	III		NE
Wild Boar (*Sus scrofa*)	-	-		Common
Barking Deer (*Muntiacus muntjak*)	-	-		Common
Rhesus Monkey (*Macaca mulatta*)	-	II	S	Common
Hanuman Langur (*Presbytis entellus*)	LR/nt	I	S	Intermediate
Porcupine (*Hystrix indica*)	-	-		Least abundant
Pangolin (*Manis crassicaudata*)	LR/nt	II	S	Least abundant
Three Striped Palm Squirrel (*Funambulus palmarum*)	-	-		Intermediate
Orangebilled Himalayan Squirrel (*Dermomys lokriah*)	-	-		Rare
Golden Jackel. (*Cannis aureus*)	-	III		Common
Bat (*Pipistrellus babu*)	-	-		NE
Lesser Bamboo Rat (*Canomys badius*)	-	-		NE
Indian Hare (*Lepus nigricollis*)	-			Least abundant
Wild Dog (*Cuon alpinus*)	Vu	II	Vu	NE
Spotted Deer. (*Axis axis*)	-	-		NE
Samber Deer. (*Cervus unicolor*)	-	-	S	NE
Leopard Cat (*Felis bengalensis*)	LR/lc	I		NE
Small Clawed Otter (*Aonyx cinera*)		II	S	NE

Note : LR/le → Lower Risk/Least Concern Vu → Vulnerable

LR/nt → Lower Risk /near threat tened S → Susceptible

Pt. → Proctected NE → Not estimated

5. DISCUSSION

5.1 Habitat Status

Habitat Composition

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An appropriate habitat can provide an opportunity to wildlife to increase and maintain their number (Bhatta, 2002). Researcher or wildlife manager often evaluate habitat for specific objective such as estimating habitat quality for a particular wildlife species or also for determining values for several species or even for entire biological communities. In such case food production, availability of cover, amount of water and dwelling space are the important measurements (Stromberg, 1990). In present study, the habitat structure of the study area (KCF) was evaluated focusing mammalian species requirements.

Vegetation plays an important role to provide the food and natural cover to wild animals (Stromberg, 1990). So cover condition and availability of food in the study area were trying to obtain (know) through quantitative analysis of vegetation.

The number of total plant species recorded in KCF through present study is lower than reported by Pandit (1995) in CNP and Shrestha et al. (2004) in Chitwan district. This may be due to its smaller area steep topography and vegetation types.

The total tree density was higher than the value reported in similar habitat by Sejuwal (1994) and Chettri (1997) in Chitwan National Park, Aryal (1997) in Terai Pure Shorea Robusta Forest (TPSRF) and Terai Mixed Shorea Robusta Forest (TMSPF) of Bardia National Park, Shrestha (1997) in Chitrepani (Siwalik), Marasini (2003) in Churia (Rupandehi) and Karki (1999) in Koshi Tappu Wildlife Reserve (KTWR). The probable reason is due to management practices. The absolute protection of study area and tree species enhances the high regeneration of tree species, which increases the occurrence of maximum number of younger trees.

The total tree density in KCF was within the range of the value reported by Sigdel (2004) in SHNP and Duwadee (2000) in Arun River Basin. Such a similarity in density with forest of different climatic region may be due to higher regeneration of tree species in a particular environment and soil types after protection

The total tree density in KCF was lower than some other reported values, such as reported by Nepal (2001) in Annapurna Conservation Area and Gautam (2002) in Natural forest of Palpa district. It may be due to different climatic condition and different vegetation types

Basal area is an indication of natural fertility of the site. The total basal area of trees in KCF (42.21 m^2/ha) was higher than the values of Churia forest 0f Rupandehi (Marasini, 2003); Koshi Tappu Wildlife Reserve (Karki, 1999), Bosan Community Forest (Adhikari, 2004) and Annapurna Conservation Area (Nepal, 2001). It may be due to greater total density of trees in KCF because density is always proportional to the basal area. In case of Annapurna Conservation Area, it may be due to different vegetation types and environmental condition.

The total basal area in KCF was within the range of the value reported by Shrestha (1997) in Chitrepani (Siwalik) and near about reported by Sigdel (2004) in ShNP site I, Giri (1997) and Aryal (1997) in Bardia National Park (BNP) and Poudel (2000) in Community Managed and Government Managed Forest of Udayapur district. The total basal area of KCF was similar of those forests having lower tree density, such as, Chittrepani and Bardia National Park. This may be due to presence of greater number of younger trees with thin trunk in KCF.

The value of total basal area in KCF was less than the value reported by Sejuwal (1994) and Chettri (1997) in Chitwan National Park (CNP), Sigdel (2004) in ShNP site III and Gautam (2002) in National Forest Palpa. It may be due to the presence of the regenerated tree species in greater number in

different successional stage with lower basal area in comparison with the National forest where relatively older trees with greater basal area were present.

Importance value index (IVI) of species shows the very clear picture about the present status of the forest and an individual species. The total IVI of all the tree species of KCF was 299.1. In the community forest *Shorea robusta* had the highest value (136.65) of IVI indicating importance in energy balance and stable ecosystem.

The IVI of *Shorea robusta* reported by Chettry (1997) in CNP was greater than in KCF. The probable reason is due to pure Sal forest of CNP and also the presence of greater number of old plants having thick trunk. The IVI of *Shorea robusta* reported by poudel (2000) in Community Managed Forest in Udayapur district, Aryal (1997) in TPSRF of Bardia National Park (BNP) and Pant (1997) in two hill Sal forest were lower than that found in KCF. It may be due to higher frequency and density of *Shorea robusta* in KCF.

Shrubs

The number of shrubs species presence in KCF is quite good in comparison to the shrubs species present in Chitwan district reported by Shresha (2004) and present in Chitwan National Park reported by Pandit (1995). Also the palatable shrubs such as *Woodfordia fructicosa*, *Indigofera cylindrica*, *Milleta extensa* etc were present in good number and is may be due to favorable edaphic factor, topography and climate.

Herbs

A total of twenty herbs species were recorded with total density of 4, 79,600 Pl/ha. *Gramineae*sp1. (Unidentified) had the highest frequency (82%) and highest density (13pl/m^2). Along with Gramineae sp. 1 (unidentified), other more frequent and densely distributed species were *Eupatorium*

oedenophorum, *Brachiaria racemosa*, *Pogonatherum crinitum*, *Carex cruciata* and *Eragostris* sp. Most of the species were palatable to herbivores.

Species Diversity and Dominance

Species diversity is a function of the number of species present in a given area and of the evenness with which the individuals are distributed among the species (Sai and Mishra, 1986). In KCF Shannon's index of diversity for tree species (0.793) was lower than the shrubs (1.03) and herbs (0.916). Here also the dominance index for the tree species (0.31) was greater than herb species (0.164) and shrub species. (0.105). It may be due to forest type (sub tropical tree forest) and dominated by particular tree species e.g. *Shorea robusta.*

Among tree species *Shorea robusta* had greater value (0.285) of dominance index and is followed by *Terminalia tomentosa*, *Semecarpus annacardium*, *Syzygium operculata*, *Syzgyium cumini*, *Sapium insigne* etc. It may be due to higher regeneration of these tree species and selective protection of timber plants. *Phoenix humilis* had greater value (0.015) of dominances index among shrub species and *Gramianea* sp.1 had greater value (0.073) of dominance, index among shrubs. It may be due to favorable physiography and edaphic factor.

According to species composition and importance of species KCF shows maximum similarities with Hill Sal forest and also comparatively with subtropical deciduous hill forest of Central Nepal. Shrestha *et al.* (2004) reported that Chitwan district contains 3 types of forest, (a) Tropical evergreen forest (b) Tropical deciduous forest and (c) Mixed forest. According to this KCF shows the characters of tropical evergreen forest and also bears some characteristics plants of mixed forest of Mahabharat Lekh, such as *Schima wallichi*, *Carea arborea* etc. Shrestha (1999) has also described this type of forest as Tropical mixed hardwood forest.

5.2 Mammalian Diversity and Status

I recorded a total of 26 mammalian species belonging to 7 orders and 14 families in the KCF. A total of 91 species within 26 families and 12 orders are found in Terai and Siwalik physiographic zone (BPP 1995). Out of the 12 orders found in Terai and Siwalik physographic zone, 5 orders, such as, Insectivora, Scandentia, Cetacea, Proboscidae and Peerrissodactyla were not found in KCF. The order Scandentia is not much known and recorded only from eastern district of Nepal. Cetacea is only the order of aquatic mammals found in Nepal. Probascidea and Perrissodactyal are the order bearing large mammals such as Asiatic Elephant (*Elephus maximus*) and one horned rhinocerous *(Rhinocerous unicornis*), which prefers only a plain topography. Among the mammalian orders reported in the KCF, the order Carnivora is more diverse and is followed by Rodentia and Artiodactyla species. Orders Chiroptera, Pholildota and Logomorpha were less diverse. The KCF represented good assemblage of mammalian diversity.

Although, having smaller size, it bears good number of wild animals with threatened species indicating high conservation value. The KCF contains six mammals species listed in IUCN threatened species category, fifteen CITES listed species, and two HMG protected species and nine species listed in National Red Data book (NRDB). One species orange billed Himalayan squirrel is newly recorded species in Terai and Siwalik Physiographic zone.

Locally in KCF, 2 species, such as Common Leopard and Orange billed Himalayan squirrel were very rare species, six species such as Large civet, Small civet, Yellow throated marten, Porcupine, Pangolin and Indian Hare were least abundant (found low in number). Five species such as, Common palm civet, Crab eating mongoose, Common Langur, Rhesus monkey were intermediate found in medium number. Other 4 species; Wild boar, Golden Jackal, Barking deer and Jungle cat were most abundant (found high in number) and eight species were not estimated.

6. CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The results of the study confirm that the habitat condition was intermediate in terms of vegetation structure (density, frequency, basal area and diversity) in Kankali Community Forest in comparison to other National protected forest and community forest throughout the country. Comparatively low total basal area in relation to total density reveals that the forest is at the state of regeneration and the habitat condition was dominated by Sal *(Shorea robusta)* forest mixed with number of other plant species. The diversity, density and frequency of shrubs and herbs were good, which can provide better choices of food for herbivores. Thus, it was concluded that the habitat condition in Kankali Community Forest was good and continuously improving in terms of food availability and cover condition.

Similarly, the Kankali Community Forest has supported good mammalian diversity with number of threatened species like common leopard *(Panthera Pardus*), Wild Dog (*Cuon alpinus*), Pangolin (*Manis crassicaudata*) and Common Langur (*Presbytis entellus*). The abundance of most of mammalian species was low in Kankali Community. Thus it was concluded that the Kankali Community Forest is continuously rebuilt as a good habitat and supporting good mammalian diversity after protection.

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6.2 Recommendations

The following are some recommendations, which will be useful for the conservation of mammals in the KCF area.

i. Management of present habitat condition focusing on the conservation of mammalian diversity should be done.

ii. Regular assessment of habitat in terms of cover condition and food availability should be done.

iii. Inventories and surveys should be conducted to record the occurrence of different biological species and their distribution pattern.

iv. Studies on population status and distribution of threatened mammals like Pangolin (*Manis crassicaudata*), Wild dog *(Cuon alpinus)* and Common Leopard *(Panthera pardus*) should be conducted to develop adequate database on protected and vulnerable species.

v. Regular monitories of threatened species should be done.

vi. The local people should be made aware about the conservation of wildlife and biodiversity for their well being.

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