

# 1 INTRODUCTION

## 1.1 Background

Mammals are particularly important for nature conservation, as they are generally charismatic flagship species whose welfare garners the support and sympathies of the general public. As umbrella species and flagship species, with comparatively large home ranges, protecting enough habitats for their populations will also protect adequate habitat for many other species (Hunter 1995). Small mammals have been a favorite subject for physiological studies for many years, but most studies have dealt with classical questions of mechanism under laboratory conditions and only in the past twenty to thirty years has physiologists concentrated on small wild mammals such as mongoose, otters, etc, attempting to investigate comparative adaptive strategies for coping with environmental circumstances (Hunter, 1995). Small mammals play the main role for forest, grassland and sometimes alpine ecosystem and many ecologists began to approach ecosystem and/or population function from the point of view of energy flow by the early 1960s (Crebs 2002). Small mammals (mongoose, rodents and shrews) are mostly common and generalist species that play important role in many ecosystems worldwide, including European forests, Himalayan alpine forest, Savanna, Tundra forest and temperate forest, etc. Small mammals are core components of forest food webs (Crebs 2002). They can influence tree recruitment through selective foraging on seeds (Garcia et al. 2005, Zwolak et al. 2010) and seedlings (Ostfeld et al. 1997, Gomez et al. 2003).

On the other hand, many species of rodents promote forest regeneration by dispersing seeds and caching them in safe sites (den Ouden et al. 2005, Zwolak and Crone 2012). Small mammals also eat and disperse spores of mycorrhizal fungi, thus enhancing functioning of forest trees (Schickmann et al. 2012). Rodents and shrews are important consumers of invertebrates (Churchfield and Rychlik 2006) and may control insect populations (Jones et al. 1998). Small mammals are a crucial part of the diet of numerous species of predators and birds of prey (Jedrzejewska and Jedrzejewski 1998). The family of mongoose consists of 37 species (Agnarsson et al. 2010) and they range from mostly solitary species (e.g. the Egyptian mongoose, *Herpestes ichneumon*, and the slender mongoose, *Herpestes sanguineus*), through flexible family living groups (e.g. the yellow mongoose, *Cynictis penicillata*), to the obligatory social breeding banded mongoose and the obligatory cooperatively breeding

meerkat and dwarf mongooses (LeRoux et al. 2009). It has been argued that the main factor for the evolution of sociality in mongooses is communal anti-predator defense (Rood 1986), while in larger carnivores the primary benefit of sociality is the communal hunting of prey (MacDonald 1983). There have been detailed studies on the anti-predator behaviour, communication and social interactions in many sub species of mongoose like social mongooses, dwarf mongoose (Rood 1990), meerkat and yellow mongoose (LeRoux et al. 2009). The vocal repertoire of the banded mongoose was studied in captivity (Messori et al. 1987) and in a wild habituated population. Overall, descriptions of vocal repertoires and general behaviour are available for eight mongooses species (LeRoux et al. 2009), with various degrees of sociality. Mongooses therefore form an ideal group to study the relationship between the nature of sociality and the vocal repertoire (LeRoux et al. 2009).

Three species of mongoose are well known to occur in Nepal, also inhabiting to Pakistan, Bangladesh, Bhutan, China and India namely Small Indian Mongoose *Herpestes (javanicus) auropunctatus*, Indian Grey Mongoose *Herpestes edwardsii* and Crab-eating Mongoose *Herpestes urva* (Shrestha 2004). Ruddy Mongoose *Herpestes smithii* is known from Sri Lanka and peninsular India. ( Dookia 2013, Mudappa 2013). Ruddy Mongoose is said to be reclusive in contrast to Indian Grey and Small Indian Mongooses, usually using more secluded dry open scrub forests (Prater 1971). In Banke NP Ruddy Mongoose record was also in a dry region. Furthermore, the record comes from the periphery of the park's central zone: the sector least disturbed by people, with healthy forests of dense canopy and profuse ground vegetation with higher prey and predator density (Dhakal et al. 2014). Banke NP also holds the localized Four-horned Antelope *Tetracerus quadricornis*. Four Tiger individuals have been recorded so far (Dhakal et al. 2014). With the forest patches of Banke district finally turning into a national park and the prey and predator density slowly recovering, the promise the park has for small carnivores is a better one.

## **1.2. The species**

The small Indian mongoose has been touted as one of the worlds 100 worst invasive species (IUCN 2000). Native to Asia, it was introduced to many islands in the Pacific and Indian Oceans and the Caribbean Sea, mostly in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, primarily in order to control rats in sugar cane fields. However, the success of the mongoose in this

endeavor is questionable as rat numbers continue to be high (Barun et al. 2010). Small Asian or Indian mongoose i.e. *H. auro punctatus* also called Gold Speckled mongoose i.e. *Herpestes javanicus* and common or Grey mongoose i.e. *H. edwardsi* are terrestrial species but crab eating mongoose i.e. *H. urva* is aquatic in nature (Majpuria et al. 2006, Shrestha 2004). The small Indian mongoose and Grey mongoose are solitary carnivores (Macdonald 1984) and mainly diurnal (Rood 1986). Mongooses eat small vegetables arthropods and plant foods (Ewer 1973, Rood 1986). The larger crab eating mongoose eats largely fishes, crabs, frogs and other aquatic prey (Cobert and Hill 1992). They display highly developed sense of smell, hearing and vision in hunting and will often sit up on their hind legs in order to get a better view while out foraging (Shrestha 2004). Killing prey with a perfectly aimed bite at the back of the skull or with a neck bite has been observed in several mongoose species (Zannier 1965, Ewer 1973). A well aimed bite drives the long, slender and slightly curved canines in to the brain or vertebral column of rodents, birds and snakes (Nellis 1989). Mongoose is not liked by people because it attacks the birds tamed by them but it is believed and respected due to its habit of killing snakes and rats (Majpuria et al. 2006).

### **1.3. Systematic Position of mongoose**

Phylum: Chordata

Class: Mammalia

Order: Carnivora

Family: Herpestidae

Genus: *Herpestes*

### **1.4 Significance of the study**

Mongoose is least studied species. There are two opposite thoughts among the people about mongoose. Some believe that it has great power and other take this animal as only destructive animal. So study is fruitful. Much species (invertebrate to large mammalian) has no study and conservation practices. Only one endemic mammalian species named as Gorkhali muso, *Apodemos gorkha* is the home of the study site. Also, avian fauna of that study areas are little studied by some masters dissertation students and some researcher but it has to more study. In

the broad, information on mongoose of this region of the Nepal is lacking. Baseline survey and data are necessary for the proper conservation and management initiatives. Hence, this study is essential to explore the diversity and information on mongoose and also provide baseline data for the conservation of this list studied species.

### **1.5 History of the Species**

An early introduction of *H. javanicus* to the West Indies (Trinidad) from India in 1870 apparently failed (Hoagland et al. 1989). In 1872, four males and five females arrived in Jamaica from Calcutta (Espeut 1882, Hoagland et al. 1989), where they were released on Espeut's Spring Garden Estate and, within a few months, establishment and reproduction were obvious. Other Jamaican planters obtained a few individuals from India but it is not believed that these reproduced (Hoagland et al. 1989). Mongooses were then trapped on the Spring Garden Estate and sold to other Jamaican planters, and Espeut and other planters then sent mongooses to Cuba, Puerto Rico, Grenada, Barbados, and Santa Cruz (Trinidad) (Espeut 1882). Numerous other introductions were made among islands in the West Indies, mostly from Jamaica (Hoagland et al. 1989), including that of four to eight individuals from Jamaica to St. Croix in 1882–1884. In 1883, 72 live mongooses from Jamaica were released by the Hilo Planters' Association at Hilo, on the island of Hawaii (Bryan 1938). These flourished, and they were perceived to be so good at killing rats that a large number of additional small Indian mongooses were imported from the West Indies to Hamakua (Hawaii) in 1885. The offspring of these early populations were subsequently taken to Maui, Molokai, and Oahu, where they established (Bryan 1938). Mongooses of uncertain species were introduced to Mauritius in the mid-nineteenth century but did not survive (Cheke 1987). In 1900, 16 males and three females of *H. javanicus* were released and rapidly established themselves (Carie 1916, Cheke 1987). The origin of this propagule is an unknown location in India and Nepal (Macmillan 1914, Haltenorth and Diller 1980). The small Indian mongoose population in the Fiji Islands was established by an independent introduction of a single founding pair from the Calcutta region in 1883 after an attempted introduction in 1870 failed (Rood 1996, Krebs 2002).

## 1.6 Distribution of Mongoose in World Context and in Nepal

Outside of its natural range, this species has many well established populations. Introduced mongoose has been implicated in the devastation of the native fauna, especially on islands and forest ecosystem, (Baldwin et al. 1952, Nellis and Everard 1983, Coblenz and Coblenz 1985). The IUCN lists the Small Asian Mongoose as one of the world's 100 worst invasive alien species (Lowe et al. 2000). This species was introduced to the West Indies, the Hawaiian Islands, Mauritius, the Fijian Islands, and Okinawa (Simberloff et al. 2000), as well as the Comores and Amami-Oshima Island, Japan (Abe et al. 1991). The reasoning behind these introductions was primarily control of rat and snake populations. The Small Asian Mongoose is also often taken aboard ships, indirectly introducing them to new areas. In Nepal, mongoose species are found in all protected areas of Nepal (Chalise 2014). The only one species of mongoose named as Ruddy, which occurs in Banke National Park, Nepal (Figure 1).

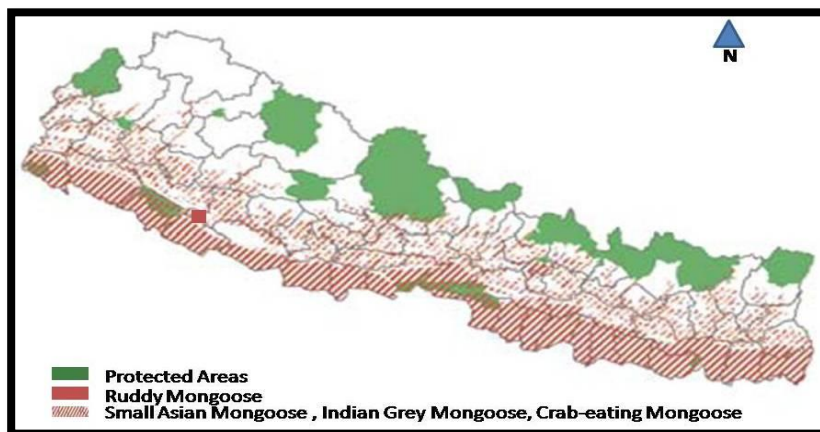


Figure 1: Distribution of mongoose in Nepal (Source: IUCN, Nepal)

**1.7. Objectives:** The objectives of the study were as follows.

### **1.7.1 General Objective:**

The general objective of this study was to find out the baseline information about mongoose in Bugawa VDC of Gorkha district, Nepal.

### **1.7.2 The specific objectives**

- ❖ To calculate the estimated population.
- ❖ To analyze the perception of local people about mongoose to evaluate the threats.

## 2 LITERATURE REVIEW

### 2.1 Mongoose in Nepal

Mongoose is a weasel shaped animal with long tapering tail and short legs (Hodgson 1836). Ear are small and the nose is grooved. Tail and body is uniformly grey or brownish. The top of the tail is black. It is reported by Hodgson (1836) as *Mangusta auropunctata*. *Herpestes edwardsi* commonly called Indian Grey mongoose and reported by Hodgson (1836). It prefers hedgerows and thicket among grooves of trees and cultivated fields. Shelters under rocks or bushes, in hollow or burrows, in the ground. It was recorded to an upper limit of 2100m. It widely distributed in Anna Purna Conservation Area, Makalu Barun National Park, Lantang National Park, Khaptad National Park, Bardia National Park, Chitwan National Park, Suklaphanta Wildlife Reserve and Koshitappu Wildlife Reserve. It was also reported from some districts of Nepal such as Sindhuli, Kailali, Dang, Ilam, etc. *Herpestes urva*, the crab eating mongoose was also reported by Hodgson 1836. This is also nocturnal and found mainly near water where there they prey upon fish, crabs, etc. (Hodgson 1836, Shrestha 2004, Chalise 2014). Besides of Hodgson 1846, there are very few studies relating to mongoose in Nepal, and we have some book based on the research of Hodgson (1836) who can justify its distribution and general information about mongoose in Nepal.

### 2.2 Study on mongoose in the world context

Rood (1986) worked in mongoose and find out the relationship between mongoose and their environment and he also concluded the habit of mongoose is depending on their environment. He also added the role of interspecific competition in producing geographic variation in morphology. Taper and Case (1992) review the recent theoretical literature on character displacement and conclude that several approaches have debilitating assumptions, particularly revolving around biased predictions associated with asymmetric competition, and also an inability to accommodate intraspecific phenotypic variation. As competition between species of different size is quite likely to be asymmetric and many species have substantial phenotypic variation, these are serious shortcomings. The small Indian mongoose, *Herpestes javanicus* (Herpestidae), has a native range from Pakistan and northern India to southern

China and the Malay Peninsula, as well as Hainan and Java; in the west it extends to Iran and Iraq (Corbet and Hill 1992).

Populations formerly ascribed to *H. auropunctatus* are now subsumed in *H. javanicus* (Corbet and Hill 1992, Wilson and Reeder 1993). In addition, *H. javanicus* has been widely introduced for biological control, primarily for rats and snakes: Jamaica (Espeut 1882) and numerous other of the West Indies (Hoagland et al. 1989), the Hawaiian islands (Bryan 1938), Mauritius (Cheke 1987), Fiji (Gorman 1975), Okinawa (Ogura et al., *unpublished manuscript*), Amami-Oshima (Ishii 1998), Ngazidja in the Comoro islands (Louette 1987), and Adriatic islands (Tvrkovic and Krystufek 1990). There are erroneous reports that the Indian grey mongoose, *H. edwardsii*, was introduced to Mauritius (Lever 1985, Wilson and Reeder 1993), Fiji (Ryan 1988), Okinawa (Takashima 1954, Wilson and Reeder 1993), and the Adriatic (Van den Brink 1972), but no evidence supports these claims. In only two locations of *H. javanicus* introduction are there native or introduced herpestids, viverrids, or mustelids.

In large parts of its Asian native range, *H. javanicus* is sympatric with either or both of two slightly larger mongooses, *H. edwardsii* and the ruddy mongoose, *H. smithii*, as well as several substantially larger congeneric species and many other carnivores. In the eastern parts of its range, its two similar congeners are absent (Corbet and Hill 1992). The small Indian mongoose, the gray mongoose, and the ruddy mongoose are all solitary carnivores (the ruddy mongoose also lives in pairs), occupy a wide variety of habitats, and eat many kinds of prey, as well as some vegetable matter (Macdonald 1984, Corbet and Hill 1992, Creel and Macdonald 1983). The small Indian mongoose and the Indian grey mongoose are mainly diurnal, while the ruddy mongoose is mainly nocturnal (Rood 1986). The possible ecological significance of the different activity time of the ruddy mongoose has not been studied. The Small Asian Mongoose faces heavy exploitation in localized parts of its range, such as the Mekong Delta, but on the whole appears to be quite common and adaptable. This species is often captured and sold as pets (Shekhar 2003) and there is some commercial trade in China, India and Nepal. In northern Viet Nam it is hunted and sold in wild meat markets in both Viet Nam and China. None of these threats seem to be contributing to the decline of the species globally (Krebs 2002

### 3 Materials and Methods

#### 3.1 Study area

Baguwa is a middle sized village which lies in the weastern part of Gorkha district of Nepal. It has about 100 km<sup>2</sup> area. Its geographical co -ordinates are 28° 1' 48'' N and 84° 43' 12''E. About 50% part of the village is covered by vegetation, 25% parts by crop fields and 25% by residential areas. This village lies in the steep lands of mountain (Figure 2).

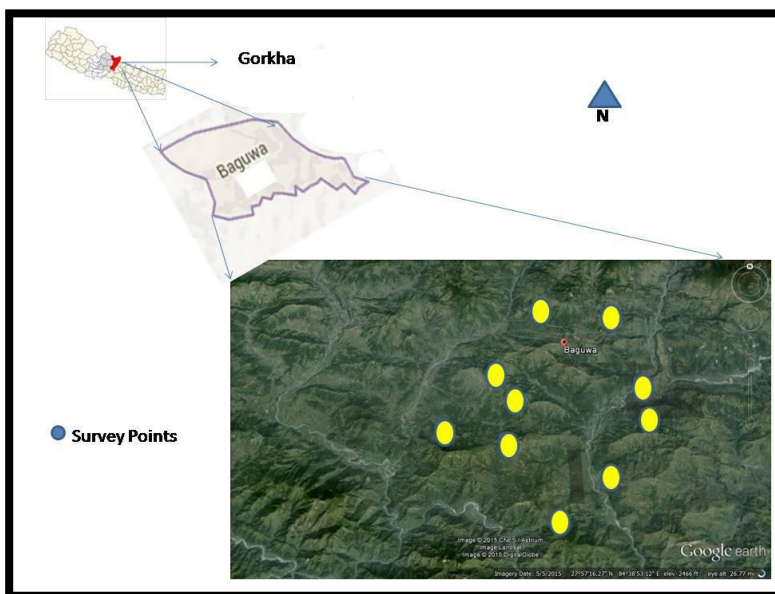


Figure 2: Study site location the Baguwa VDC of Gorkha, Nepal

#### 3.2 Climate

The study area lies in the mid hills of western Nepal. Climatologically the study area falls under the temperate zone. The cold and dry months are January, February, March, November And December. Mean minimum annual temperature recorded since 2010 to 2013 was 7<sup>0</sup>C in January (Figure 3).



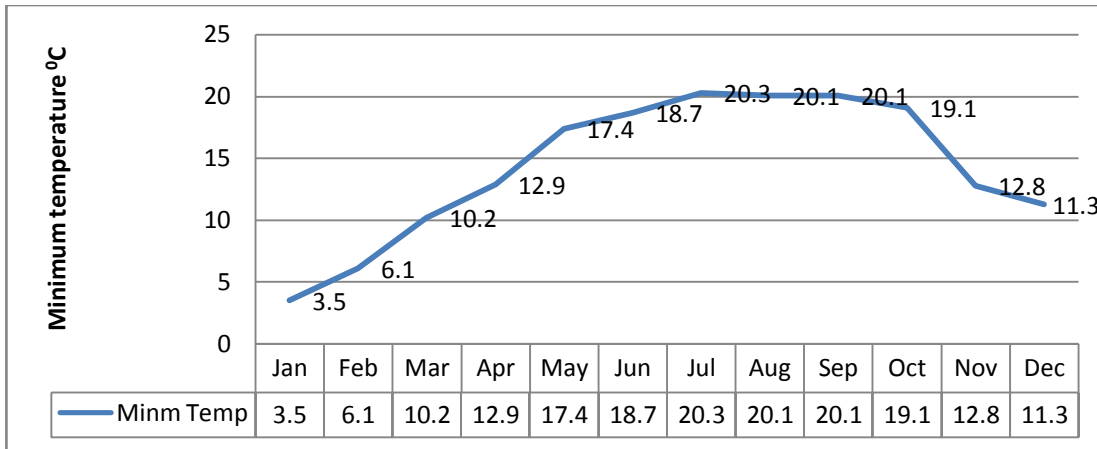


Figure 3: Mean minimum temperature recorded in 2010-2013 of Gorkha, Nepal.

The warm and wet months are May, June, July, August and September. In summer, the mean maximum temperature recorded was 35 c in May-June 2010 to 2013.(Figure 4)

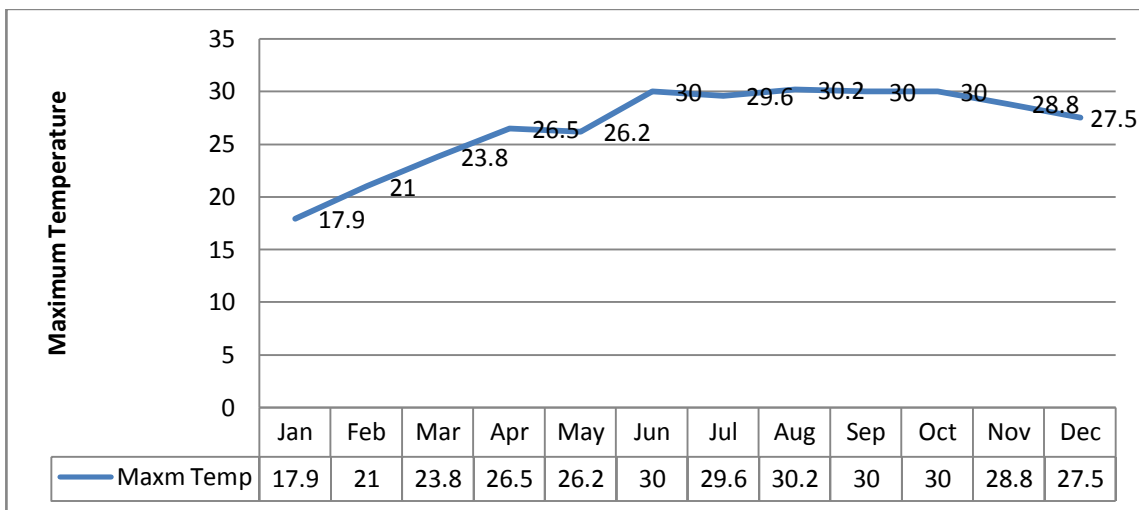


Figure 4: Mean maximum temperature recorded in 2010-2013 of Gorkha, Nepal

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 525 mm to 1040 mm, with more than half occurring as rain during the monsoon period (July- September). Data from Gorkha , the nearest weather station (which lies inside the study block also), annual precipitation is extremely variable ranging from less than 526.8 mm to about 1041.5 mm

(Figure 5). The observed population of mongoose was obtained maximum during rainy season because the natural habitat of mongoose were disturbed by rain and compelled to run towards human settlements.

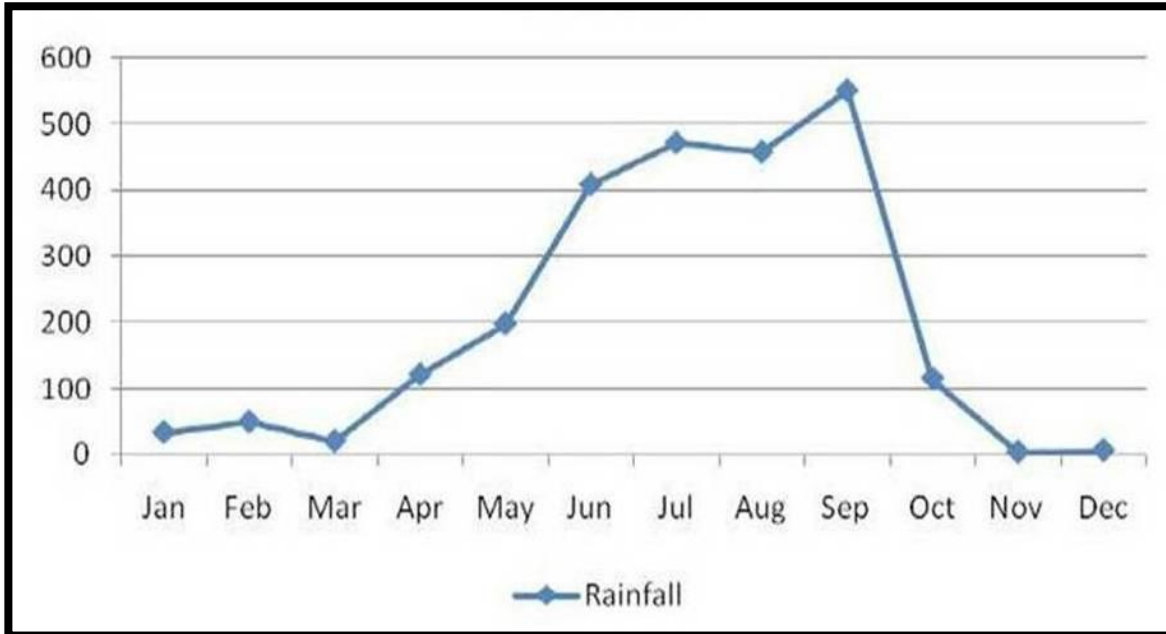


Figure 5: Average rainfall (mm) recorded from 2010- 2013, Gorkha, Nepal.

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 early in the morning. After the late of monsoon all the sky is covered by cloud and mist which reduce 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 6)

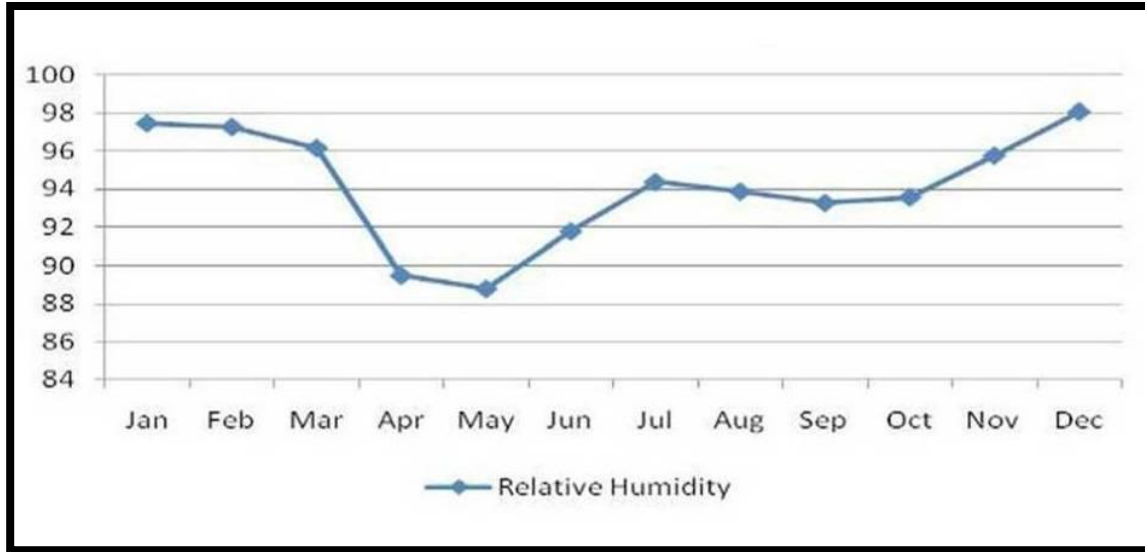


Figure 6: Average relative humidity recorded from 2010- 2013, Gorkha, Nepal.

### 3.3 Soil

Although no economically viable mineral concentrations are reported to occur in Gorkha, the study area may be considerably affected, indirectly, once the lead-zinc deposits of Manaslau Himal beings to operate. Mature, mainly fertile loamy soil occurs in the lower forested regions. In the upper Gorkha (mostly Manaslau Conservation Area), the most common textural component is sandy-loam with a large proportion of rocks (sources: Manaslau Conservation Area report). The mean proportion of sand decreases with elevation and loamy sands become predominant below 2,440 m. Where the practice of pasture burning occurs, the top soil layers often comprise alternating darks and pale horizons due to ash accumulation, and the pH is more homogenous between them. Soils are generally fairly acidic, pH 5-6 (Maire 1973).

### 3.4 Biodiversity

The study area is dominated by Sal forest (*Shorea robusta*). A very small portion of this zone is covered by Simal (*Bombax ceiba*) forest. Generally, Sal forest is present in all part of the study site as well as it also occurs most part of the Gorkha district. Some part the Hill Sal forest was found. This Sal is completely different from that of Sal forests of southern plain of

the country. This zone is heavily disturbed by human beings. This zone is also under the great anthropogenic pressure. However, small pockets are still untouched due to steep slopes. Mainly, three different kinds of forests can be observed in this zone. Hydrophilic forests (*Schima wallichii*) occur in the wettest area, e.g. the lower elevated areas. This appears to be the only vegetation type of this zone in which small areas have remained reasonably unspoilt in Nepal. A Mesohydrophyllic forest (*Schima wallichii*, *Castanopsis indica*) occurs in the damper areas of the lower. Xerophyllic forest and heath (specially, species predominated by *Pinus roxburghii*) was occurred on drier slopes, mainly in the upper parts of Gorkha, due to rocky terrain and reduced rainfall, *P. roxburghii* is often the only tree present. This vegetation type is frequently exposed to fires and the dense herb layer is poor in species. *Euphorbia royleana* occurs in the dry, rocky habitats along the river side of the Study area, in association with other strictly xerophyllic plants such as *Agave mexicana*. Agricultural pattern and cattle's grazing has largely affected the forest vegetation within the study site of this zone. Intensive collection of fuel wood and fodder has degraded the forest over the Gorkha. The forest has stunted sparse tree species present which are species associated with shrub such as *Berberis*, *Rubus* and *Lonicera*. Hydrophillic *Quercus lamellosa* forest occurs on south side of the Gorkha, although it is also present in the wetter part of the many river system of Gorkha. Mesophyllic *Quercus lanata* forest on south facing slopes together with *Rhododendron arboreum* and *Lyonia ovalifolia* occur. Mesoxerophyllic *Pinus excelsa* and *Rhododendron arboreum* forest lies in the upper zone of Gorkha. Temperate zone includes hill zone and montane zone. In montane zone, vegetation varies from the damp, shaded *Q. semecarpifolia* and *Tsuga dumosa* type, to the mesohydrophyllic stands which are almost pure *Q. semecarpifolia*. Other types of forest include those which have been burnt and now consist mainly of *Q. semecarpifolia*. Some of the other common plants are *Schima wallichii* (Chilaune), *Castanopsis indica* (Katush), *Alnus nepalesis* (Utish) etc. Utis *Alnus nepalesis* was also dominated forest in many part of the Gorkha. The study area possess some mammals like leopard cat (*Felis bengalensis*), common leopard (*Panthera pardus*), Mongoose (*Herpestes sps.*), Jackal (*Canis aureus*) and monkey (*Macaca mulatta*) etc.

### **3.5 Materials**

Some essential materials were: GPS, Camera, Binocular, Books, Maps, Pencil, pen and diary, etc

### **3.6 Methods**

**Data Collection: Data were collected by following methods.**

#### **Preliminary survey:**

The preliminary survey was carried out by principal research in starting of January 2014 and done brief field visit, formal and informal interview with local people and biological experts to estimates the potential sites of mongoose.

#### **3.6.1 Primary data collection**

**a. Direct Observation by Line Transect method:** Estimation of population of terrestrial mammals can be studied through transect sampling (Sutherland et al. 2004). The project sites and surrounding areas were visited systematically from one end of the study area, at the time of 6-10 AM in morning and 2-6 PM in evening and information was collected. In Line Transect method, survey was made of 100 m wide belt along transect for 1 km for each transect (Figure 2). The interval between the line transect was 500 m. The distance of transect was estimated by researcher and assistant instead of range finder. The distance was measured by following method.

-Extension of 1 step walk is 66 cm.

-Total distance travelled 1 km.

-Steps walked = 1515 steps.

The time taken for survey varied from depending upon the terrain and topography. Survey was conducted in the morning hours (6.30 am to 9.30 am) and in evening hours (3.30 pm to 6.30 pm).

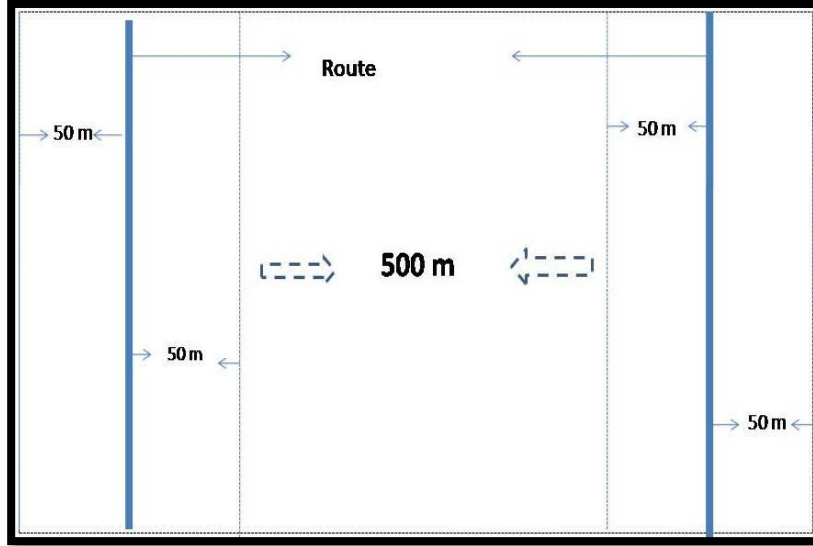


Figure 7: Line transect sampling design

**b. Questionnaire Survey:** The questionnaire survey was done with local people and school students. The main purpose of questionnaire was to find the perception of local people about mongoose and evaluation of threats in the study area. There were 100 individuals selected for questionnaire sampling in and around the study site of Baguwa VDC. Some interactions with local people, to know the historic and religious value of mongoose at village level was also added.

**c. Vegetation Analysis with reference to habitat of mongoose**

Vegetation Pattern of the forest (habitat) was analyzed by laying down quadrature sampling randomly, and all together 15 quadrates of size 25m × 25m was used in the study site. The plant local name was identified by the experienced local person while for unidentified plant Photographs was taken simultaneously; herbarium was made to preserve the unidentified vegetation. Some unidentified plants were later identified by the help of college friends and internet search by using photographs.

Statistics used for this study to identify dominance and diversity of vegetation type are:

Density = No of plants of individual species/Total area.

$$\text{Relative Density(R.D.)} = \frac{\text{No. of individual species 'x'}}{\text{Total no. of species}} \times 100 \%$$

Frequency= No of plants of individual species.

Relative frequency=No of plants of individual species/Total no. of plants.

**3.6.2 Secondary data collection:** The secondary data was collected from various books, journals, internet and library. It was collected from VDC report of Baguwa, Gorkha and Manaslu Conservation area report.

**Data Analysis:**

- i. The observed population of mongoose was calculated by adding the number of individuals of different study area.
- ii. The total population of mongoose was calculated by using formula:

$$N = nA / a$$

Where, N= Total population;

n= no. of individual in the study area

A= Total areas and

a= Area of study field section (sample area)

(Bibby et al 2000)

iii. Questionnaire survey method was used to collect the information about food habit of mongoose. It was counted and interpreted in tabular form.

iv. Perception of local communities on mongoose conservation was measured by questionnaire survey method and after counting the revived answer it was interpreted by pi-chart and bar diagram.

v. Chi square test was used to measure the perception of different level people towards the conservation of mongoose

vi. The vegetation of the study area was analyzed by calculating density, relative density, frequency and relative frequency of each types of plant (trees), then the dominant type was obtained.

## 4 RESULTS

This study answered the research questions such as population of mongoose in the different area, human attitude towards mongoose conservation, some perception and tolerance, etc of local people in those areas. The details of the results are presented in the following sub headings.

### 4.1 Population Estimation

Altogether, there were 151 individual mongoose counted in three different habitat of Baguwa VDC of Gorkha by using direct observation . Most number of mongooses were seen during May – Aug 2014, and it was followed by Sep – to Dec 2014. In May – Aug 2014, 33 individual mongooses were counted in cultivated land, while there only 3 individual mongooses during Jan- Apr 2014. The estimated population of adult mongoose during Jan to Dec 2014 in Baguwa VDC of Gorkha has been shown in Table 1. During the population census the species and sex of mongoose was not identified due to the shy nature of mongoose and agnostic behavior towards the humans.

Table 1: Observed population of mongoose during Jan to Dec 2014 in Baguwa VDC of Gorkha

<b>Seasonal Population Habitat</b>	<b>observed population in Jan –Apr 2014</b>	<b>Observed population in May – Aug 2014</b>	<b>Observed population in Sep – Dec 2014</b>
Natural forests	16	14	19
Cultivated land	3	33	13
Human settlement	17	22	14
Total	36	69	46

The population scenario of mongoose was not seen in same order, during the monsoon season, the observations of mongoose was high in rainy season (May to August) in comparison to summer (January to April) and autumn season (September to December) (Figure 8).



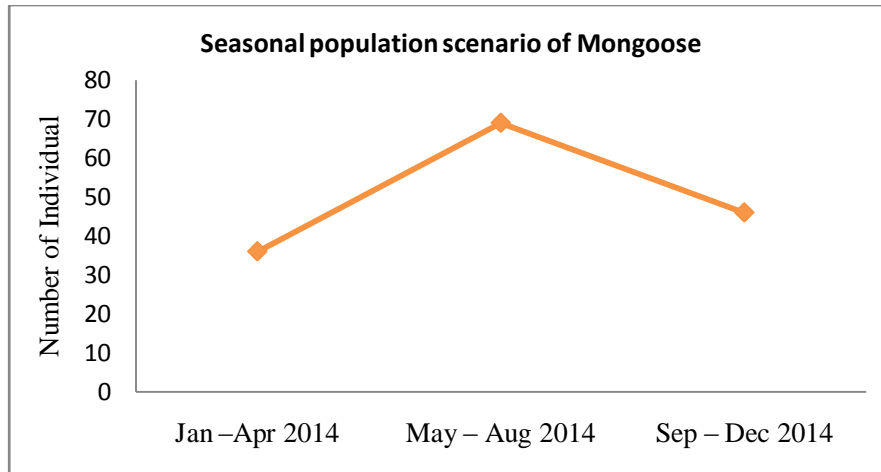


Figure 8: Seasonal population trend of mongoose in the study site

It is estimated that the total observed population of mongoose in Baguwa VDC, was Jan-Apr = 3600( Average observed population= 900) May-Aug = 6900( Average observed population= 1725), and Sep-Dec =4600( Average observed population= 1150).

It was calculated by the following method.

The sample area=1km<sup>2</sup> (10km x 0.1km)

The study area=100km<sup>2</sup>

Total population= Sample population X Study area /sample area

#### 4.2 Perception of local community on mongoose conservation

The respondents demonstrated positive thinking towards mongoose. It means they were positive towards mongoose conservation (Figure 9)

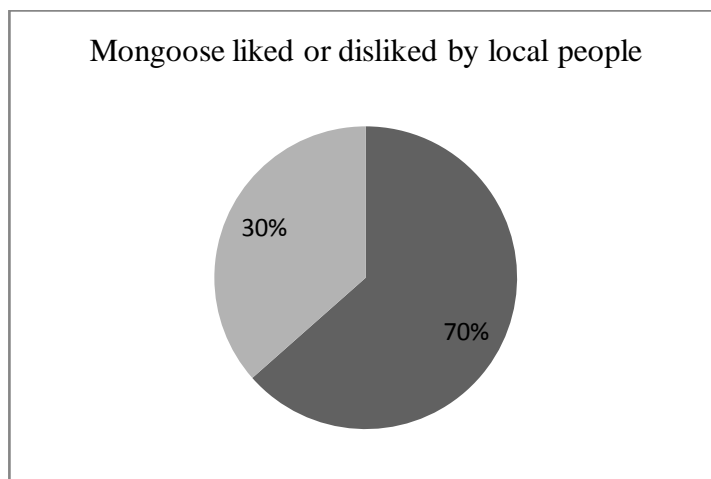


Figure 9: Mongoose liked or disliked by locals (n=100)

The question was asked why you like mongoose. The results showed that most of the people like mongoose because it kills harmful snakes and rats (60%). (Figure 10)

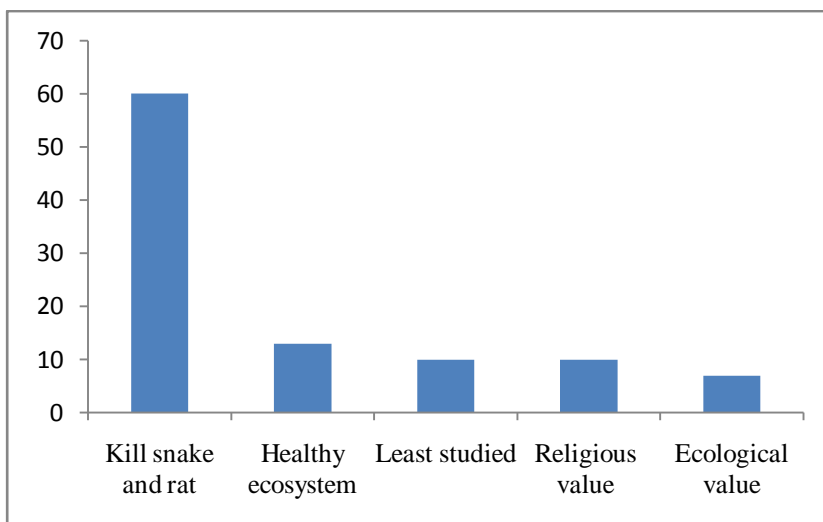


Figure 10: People knowledge towards mongoose (n=100)

Perception of local people on mongoose conservation and education were significantly associated (Pearson chi-square=36.36, df =3, p <0.001). More people with high education supported the conservation of mongoose including other wildlife. Similarly, perception and gender showed a significant association (Pearson Chi-square = 11.77, df = 1, p <0.001). Male respondents were more positive than female to conserve the mongoose (69.4% versus. 45.3%). It was found that local people had quite a good understanding on certain aspects of mongoose ecology. Above 65 % (n=100) of respondents answered that due to the absence of food in natural forest, they come out to village. It was found that, 15 % (n =100) of the respondents had no knowledge about mongoose ecology, they believed mongoose depends totally on the domestic chickens. Carnivore conservation concept among different ages of people (n=100) was explored by questionnaire sampling and young(less than 18 years) and old(more than 60 years) were seen have concept and knowledge for carnivore conservation (Figure 11).

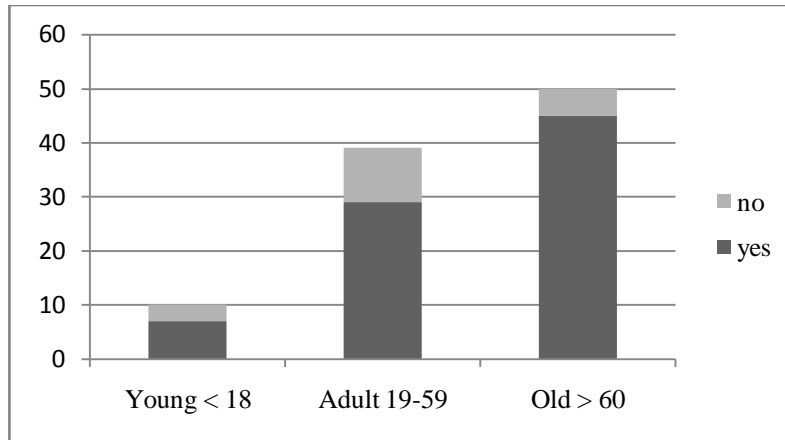


Figure 11: Carnivore conservation concept among different ages of people (n=100)

#### 4.3 Food habit of mongoose.

In the process of study following conditions of mongoose were observed:

- Attacking to the house rat.
- Killing the chickens.
- Scratching on the piles of wastes.
- Carrying lizard on mouth.

From the questionnaire following answers were obtained about the food of mongoose:

- Domestic chickens-32%
- Rodents-25%
- Snakes-16%
- Wild insects and lizards-27%

#### 4.4 Vegetation sampling

There were all together 26 species of plant identified by quadrat sampling (Table 2). The density, relative density, frequency and relative frequency of Chilaune (*Schima wallichii*) was high. There was not any either mongoose or any indirect marks of mongoose observed in the quadrat sampling. By the direct observation, It was found that, mongoose did not preferred dense forest, it preferred to habitat with grass and bushes or some trees.

Table: 2 Density and Frequency of Vegetation in the study site

Local Name	Scientific Name	Density	Relative Density	Frequency	Relative frequency
Chilaune	<i>Schima wallichii</i>	0.0117	30.79	75	13.11
Sal	<i>Shorea robusta</i>	0.0033	8.8	55	8.7
kattus	<i>Castanopsis tribuloides</i>	0.0031	8.24	60	10.77
Uttis	<i>Alnus nepalensis</i>	0.0015	4.19	25	4.35
Lapsi	<i>Choerospondias axillaris</i>	0.0004	1.05	12	2.17
Amala	<i>Embllica officinalies</i>	0.0004	1.05	12	2.17
Mayal	<i>Pyrus pashia</i>	0.0002	0.52	12	2.17
Bhalayo	<i>Semecarpus anacardium</i>	0.0002	0.52	12.5	2.17
Phalat	<i>Quercus spp.</i>	0.0020	5.24	12.5	2.17
Setikath	<i>Myrsine capitellata</i>	0.0020	5.24	50	8.7
Khari	<i>Celtis australia</i>	0.0020	5.24	25	4.35
Saur	<i>Betula alnoides</i>	0.0016	4.19	12.5	2.17
Lakuri	<i>Fraxinus floribunda</i>	0.0014	3.66	12.5	2.17
Firfire	<i>Acer oblongum</i>	0.0012	3.14	12.5	2.17
Nasi	<i>Stranvaesia nussia</i>	0.0010	2.62	12.5	2.17
Gobresalla	<i>Pinus wallichiana</i>	0.0008	2.09	25	4.35
Jhigani	<i>Eurya acuminata</i>	0.0008	2.09	12.5	2.17
Hadebayar	<i>Zizyphus incurve</i>	0.0008	2.09	37.5	6.52
Khanyu	<i>Ficus semicordata</i>	0.0006	1.57	25	4.35
Mauwa	<i>Engelhardia spicata</i>	0.0004	1.05	12.5	2.17
Kapro	<i>Ficus lacor</i>	0.0004	1.05	12.5	2.17
Bedulo	<i>Ficus sarmentosa</i>	0.0004	1.05	12.5	2.17
Gogan	<i>Saurauia napaulensis</i>	0.0004	1.05	12.5	2.17
Pipal	<i>Ficus religiosa</i>	0.0002	0.52	12.5	2.17
Laliguras	<i>Rhododendron arboretum</i>	0.0002	0.52	12.5	2.17
Maledo	<i>Macaranga indica</i>	0.0002	0.52	12.5	2.17

## 5 DISCUSSIONS

### 5.1 Population Estimation

The population of many small mammals are unknown in the country context. We have population data and timely census of only large carnivore and herbivore such as tiger, rhinoceros, etc.

Altogether, there were 151 observations of mongooses made. Maximum number (69) of mongoose were seen in May – Aug 2014 (rainy season). There were not any scientific proof to explore on why mongoose seen in rainy season? According to general interaction with locals, they said that rainfall destroy to natural habitat of mongoose, as a result many mongoose encountered with human beings at that seasons. There were only 36 individual of mongoose counted in Jan- Apr 2014, it could be very cold season, less visibility, and cloudy environment. According to Subba et al (2014), generally mongoose population was recorded at summer season and day time, even many researchers such as Cobert and Hill (1992), Hodgson (1836), Chalise (2014), Tvrtkovic and Krystufek (1990), Lowe et al. (2000) were reported the mongoose prey generally evening and night time. Therefore, the population census of carnivore is difficult due to nocturnal and shay behaviour (Hodgson 1836, Chalise 2014, Shekhar 2003). In my study, the night time was avoided to conduct the census of mongoose due to lack of research equipments and manpower, therefore some mongoose which travelled only in night time could be avoid for census. Although, this result emphasize to accuracy that rainy season did not support to mongoose population due to the higher differences among the seasonal populations of mongoose in those areas.

### 5.2 Food habit of mongoose.

Keystone effect of top and small predators on prey populations and ecosystem are well established. The direct effects of predators on their prey, however, are dependent on factors that may among seasons ( Allen et al.2014). Among local people it was obtained that most of the people believe on super power of mongoose to fight with snake. It also believed that it can re-survive the killed snake after consuming the middle part of the body by using special herb, Ajamary buty. In the study it was concluded that mongoose mostly feeds on wild

insects, birds, lizards etc. and only comes to human settlements when the wild food becomes not enough.

### **5.3 Attitude of local people in Mongoose conservation**

The extent of support and participation of people in the conservation of carnivores largely depends on how they place value on these predators (Gusset et al. 2009). In my study, even though mongoose preyed upon poultry (Chicken), although the majority of people liked mongooses. This essentially means they wanted to conserve it. They believed that the mongoose is a charismatic species also and promotes agricultural directly or indirectly in the local environment and, in turn, expands the economic activities. In this study, people valued to mongoose from ecological point of view as well. In the absence of mongoose, many snake species populations and rodents' populations will explode and crop raiding in the vicinity will increase sharply. The religious value has also a role towards contributing to positive attitudes in mongoose conservation. Many people and many religious followers worship to the mongoose as representative of god. Mongoose is also taken as good care provider for house especially for small child. Therefore, to kill a mongoose is considered as to disobey the god and it is a matter of morality and ethics. This local society dislikes persons who kill mongoose.

The most important reason behind developing positive attitudes in the local people in mongoose conservation might be the allocation of revenues earned and shared by the University student researchers, local media and some academic/ conversationalist persons. The local people should be trained in conservation management programs of mongoose with other important wildlife like some species of birds, bats, monkey etc by conducting conservation education and awareness, community development and conservation activities (e.g. community forest management and non-timber forest product cultivation). Other factors associated with their positive attitude may be in the consideration of local peoples' needs such as provisions for collection of thatch grass from the community forests and involvement of local people in management of natural resources like community forests, religious forests and sometimes private forests. In the topics of human- wildlife conflict, the local people perception towards high in many research conducted in different parts of Nepal. Similar to my result, in a study by Gurung (2008) in the Chitwan National Park of Nepal, positive attitudes

among local people towards mammals' conservation is found prevalent. In contrast to this study, there are many cases of negative attitudes towards predators. In the study of Oli et al. (1994), Bagchi and Mishra (2006) and Lucherini and Merino (2008), negative attitude towards large carnivores are discovered. Oli et al. (1994) further mentions that the cause of negative attitudes toward snow leopards is only due to the depredation of livestock.

## 6 CONCLUSION and RECOMMENDATIONS

The mongoose is under threats and anthropogenic activities are increasing day by day. Even some conservation practices by human population are going on directly or indirectly towards the wildlife conservation in Nepal. The small population of mongoose in the Baguwa VDC of Gorkha district shows t the positive thinking among the people towards mongoose conservation. The population of mongoose is varying with the seasons as well climatic conditions. The results of this study and the literature review suggest that mongoose were least studied species and are vulnerable although helpful to humans.

Based on the study, the some major recommendations are as follows:

- Mongoose were not harmful to the farmers, it was little beneficial therefore conservation awareness programs should be conducted in those areas where mongoose occur.
- The ruddy mongoose may be the object of study because it is only reported on Banke NP till now.
- The students and independent researchers have to conduct researches in different aspects of this species.



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## 8 APPENDIX

### PHOTOGRAPHS



Fig: Mongooses in their natural habitat



## Questionnaire

Name:

Date

Age:

Place

Sex:

Education

1. Do you like mongoose?

a. yes

b. No

2. Why do you like mongoose ? (if yes)

.....

3. Is the mongoose required for nature?

a. yes

b. No

4. What does the mongoose eat?

a. domestic chicken

b. rodent

c. wild insects and lizards

d. snakes

5. Why does the mongoose come out of jungle?

a. scarcity of food b. lack of natural habitat c. available of easy food in human area

6. Why does the mongoose decreasing in number?

a. habitat loss b. Lack of food c. human attack

7. Does mongoose have great power?

a. yes

b. no