Status of Common Leopard *Panthera pardus* (Linnaeus, 1758) in Kunjo VDC of Mustang District, Nepal

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Abbreviations and Acronyms

| Annapurna Conservation Area |
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| Annapurna Conservation Area Project |
| Conservation Area |
| Convention on International Trade in Endangered Species of Wild |
| Fauna and Flora |
| Department of National Parks and Wildlife Conservation |
| Geographical Information Systems |
| Global Positioning Systems |
| Households |
| The World Conservation Union |
| King Mahendra Trust for Nature Conservation |
| National Red Data Book |
| Royal Bardia National Park |
| Royal Chitwan National Park |
| Tibetan Autonomous Region |
| Village Development Committee |
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Abstract

Common leopard *Panthera pardus* is one of the seven great cats found in the world and one of the most elusive too. The detail about the status of common leopard is not sufficiently known owing to very limited study on the species in the country. However, it is believed that the number of common leopard has significantly increased due to the success of the community forests in Nepal. This study was designed to find out the status of common leopard in Kunjo VDC of Mustang district. The field work of the study was carried out from 15th May 2006 to 29th May 2006.

Altogether, eight transects were drawn representing different habitats of the study area, where the indirect signs of the species were recorded. Signs such as scrapes, scats and pugmarks were recorded within five meters of both sides of the transects. Scrapes as high as nine in number were recorded in the transect conducted at Palanga, giving a good indication of the presence of the species. Two different sets of pugmarks with different physical dimensions were also recorded in Pudhar kharka which indicated the presence of at least two leopards in the area.

Total household survey was done to know the magnitude of livestock depredation caused by the leopard. The total annual monetary loss due to depredation came out to be NRs. 5,45,000, which is equivalent to US\$ 7370.84. The depredation per household came out to be NRs. 3585.35 which is equivalent to US\$ 48.49. The local people ranked common leopard as first predator in causing livestock depredation in the area hence creating the people-leopard conflict. It was also reported during the survey that in the past there used to be incidents of the leopards being killed directly by gun and by snaring or *darjan* before the area was included in ACAP.

The fact that local people still consider the leopard as pest makes the conservation activities even more difficult in the area. Therefore, the conservation initiatives must be backed up by the needs and aspirations of the local people. The conservation programmes to be implemented must also address the problem of livestock depredation. This will help in gaining the support of the local people for the conservation of the leopard in the area.

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Chapter 1 Introduction

1.1. Background

1.1.1 Common Leopard

Nepal is home for three species of leopard: Common Leopard *Panthera pardus*, Clouded Leopard *Neofelis nebulosa* and Snow Leopard *Uncia uncia*. Out of these three species Common Leopard is the most common one which is not only restricted to forest or heavy cover but also thrive well in open country (Prater 1998). The species is also known as forest leopard.

This spotted cat has short powerful limbs, heavy torso, thick neck, and long tail. Large black spots grouped into rosettes on the shoulders, upper arms, back, flanks and haunches, and smaller scattered spots on the lower limbs, head, throat and chest, and the belly has large black blotches. The body color of leopard is yellow with black spots. The coat color varies from pale yellow to deep gold or tawny, and is patterned with black rosettes. Like human fingerprints, each individual leopard's spots are unique (Brakefield 1993). The head, lower limbs and belly are spotted with solid black. Coat color and patterning are broadly associated with habitat type (Pocock 1932). Black leopards (the so-called "black panthers") occur most frequently in humid forest habitats (Kingdon 1977), but are merely a color variation, not a subspecies. The leopard's dark rosettes help it to blend into the foliage while stalking their prey.

Pocock (1932) found the following trends in colouration for the leopards in Africa:

1. Savannah leopards - rufous to ochraeceus in colour;

2. Desert leopards - pale cream to yellow-brown in colour, with those from cooler regions being greyer;

- 3. Rainforest leopards dark, deep gold in colour;
- 4. High mountain leopards even darker in colour than rainforest leopards.

The leopard is the fourth largest of the seven large cats, which include tigers, lions, leopards, cougars (puma), jaguars, cheetahs and snow leopards. It forms part of the family Felidae and order Carnivora. The leopard is an exceptionally strong and lithe cat, capable of climbing trees while carrying prey up to three times its own weight. The leopard can also descend trees headfirst. Because of its powerful limbs, the leopard can easily leap forward more than 6 meters and upward more than 3 meters. Along with the jaguar, the leopard is considered the strongest of the wild cats. The leopard and jaguar are judged to be roughly 10 times stronger than a human athlete of the same weight (Plessis and Smit 2005).

Following are the major subspecies of common leopard found in the world (www.agarmann.dial.pipex.com).

Africa

P.p.adersi – Zanzibar, *P.p.adusta* – Ethiopia, *P.p.leopardus* - West Africa , *P.p.melanotica* - Southern Africa, *P.p.nanopardus* – Somalia, *P.p.panthera* - Algeria, Egypt, *P.p.pardus* - East Central Africa , *P.p.reichenowi* – Cameroon, *P.p.ruwenzorli* - East Central Africa , *P.p.sindica* - South West Asia, *P.p.suahelica* - Eastern Africa

Middle East

P.p.ciscaucasia - West Caspian, *P.p.dathei* – Iran, *P.p.jarvisi* - Sinai Penninsula, *P.p.nimr* – Arabia, *P.p.saxicolor* - Iran, *P.p.tulliana* - West Caspian

South and South – East Asia

P.p.delacouri - Indo-China, *P.p.fusca* - Indian Sub-continent, *P.p.japonensis* - N. Central China, *P.p.kotiya* - Sri Lanka, *P.p.melas* – Java, *P.p.millardi* – Kashmir, *P.p.orientalis* - Amur – Korea, *P.p.pernigra* - Nepal, Kashmir.

1.1.2. Study Area

1.1.2.1. Kunjo VDC

The study area for the research work was Kunjo VDC of Mustang district (see Appendix 3). The whole of Mustang district falls under Annapurna Conservation Area Project (ACAP)

Kunjo VDC has temperate and sub – alpine forests, sometimes with an extensive bamboo under – storey and often on steep slopes. These forests comprise mixed broad leaves and conifers (mainly pines), conifers and rhododendrons (Inskipp and Inskipp 2003).

Kunjo VDC provides habitat for several mammal species such as Goral, Jharal, Himalayan Black Bear, Barking Deer, Common Leopard, Musk Deer, etc. The area is also inhabited by different bird species such as Cheer Pheasant, Koklass Pheasant, Impeyan Pheasant, Munal, Himalayan Griffon, Lammergeier and so on.

The settlements are mostly dominated by Thakalis and disadvantaged groups like blacksmith, cobbler etc. There are 152 households in the VDC. Their main occupations are related with animal husbandry and agriculture. In Kunjo VDC, out of total 72.47 km² land, 4.48 km² of the land is used as agriculture land, 19.47 km² is as forests, 0.77 km² land is as shrubland, 27.64 km² land is currently as grazing land, 18.19 km² as barren land, 0.42 km² is as landslide, 1.49 km² as water bodies (Land Resource Mapping Project 1986).

1.1.2.2. ACAP

The whole of Mustang district falls under Annapurna Conservation Area Project (ACAP), which was initiated by King Mahendra Trust for Nature Conservation (KMTNC) in 1986 at Ghandruk, Kaski. The project was started as an effort to integrate nature conservation and community development. The project, today, serves as a model for conservation projects all over the world.

The area of the Annapurna Conservation Area (ACA) is 7629 km² thus being the largest Conservation Area (CA) in Nepal. The area has 1226 plant species with 38 Orchids and 9 Rhododendrons. It also contains 101 mammals, 478 birds, 39 reptiles and 22 amphibians.

1.2. Rationale of the Study

The successful community forestry and conservation approaches in Nepal made it believe that the number of common leopard has been significantly increasing. However, with increasing population of the common leopard, the cases of poaching and hunting has been in dramatic increase (Acharya 1999). Habitat fragmentation (Modernization and unplanned development) has been one of the important causes in the destruction of the habitat of the common leopard thus creating a big threat. For this reason, there is a serious need of baseline data for the conservation and management of this species.

Although, few literatures on common leopard of Nepal have been published by foreign researchers (Eliasson 2003, Odden and Wegge 2005), the study of the leopard in the hilly regions of Nepal have not been done despite the fact that the leopard is the sole large mammalian carnivore in the hilly region of Nepal (Shah et. al. 2004). Because of being the sole large mammalian carnivore in these regions it occupies a special position in the food chain. Being the only large cat in the hilly regions of Nepal, its role in balancing the ecosystem of the region is very critical. This fact emphasizes the conservation of the leopard as the change in their population structure could lead to disturbance in the food chain. This could only be possible if a systematic study on the species is done. Hence, the study is very necessary.

It is not a protected mammal of Nepal under Department of National Parks and Wildlife Conservation Act, 1973 (DNPWC 1973), but it is included as a susceptible mammal in the National Red Data Book (NRDB 1995). Similarly, it has been listed as a lower risk and least concerned species in the IUCN red data book. However it is enlisted in the Appendix 1 of Convention on International Trade in Endangered Species of wild fauna and flora (CITES) as a highly threatened mammal. It is our concern to protect and manage this nationally and globally important species.

This is one of the most vulnerable species because of its killing behavior to large number of domesticated animals; however least concern in terms of its conservation is given in Nepal. Livestock depredation by this species and other predators is common in Nepal and Annapurna Conservation Area (ACA) is no exception in this regard. It is also the major reason for people-wildlife conflict in the area. A total economic loss of \$54861 was reported from Kaligandaki valley due to wildlife predation on livestock and crop in 1999 (Acharya 1999). During the study, common leopard was found to be the major predator in the lower part of Kaligandaki valley.

On May 18, 2002, the Royal Nepal Army in Mustang seized 22 skins of common leopard heading to Tibet via Lomanthang. Also, there were several other seizures of the leopard skins in the last five years in the mid-hills including Annapurna Conservation Area (Aryal 2003).

Common Leopards are hunted for their fur. The Leopard skin depending on its size costs from U.S. 67.22 to 135.24 a piece, while the international price for the same is said to be approximately U.S. 10,000 (Aryal 2003). This difference in price plays a very critical role in poaching of common leopard. They also suffer from the loss of natural habitat due to the spread of human population throughout its distribution in the globe (BBC 2006). To mitigate the people – wildlife conflict and to create conservation awareness among locals as well as outsiders, the study is obligatory.

Chapter 2 Objectives

2.1. General Objective

• To assess the status of the common leopard and extent of human leopard conflict in the study area.

2.2. Specific Objectives

- To assess the presence absence of common leopard in the Kunjo VDC of Kaligandaki valley.
- To analyse the livestock depredation by the leopard and quantify it in terms of economic loss.
- To find out local people's perception on the human leopard conflict in the area and
- To recommend conservation initiatives for the species.

Chapter 3 Scope and Limitations of the Study

3.1. Scope of the Study

If the study is restricted to a discrete area, such as a protected area or forest fragment, and the goal is only to identify presence or absence of the species, ad hoc surveys will suffice (Henschel and Ray 2003). This study tries to cover the status of the leopard in the study area by doing ad hoc presence – absence survey. The study however explicitly covers the involvement of the common leopard in the livestock depredation which was found to be very common in the area. The economic valuation of the livestock depredation due to the leopard will also be done. The study however will not cover the ecology and behavioral aspects of the leopard.

3.2. Limitations of the Study

However, there were some limitations which compelled this study to narrow down the objectives. Some limitations of this study were:

- The study was carried out in Kunjo VDC of Mustang district only as it was not possible to carry out the study in a larger area due to time and financial constraints.
- The study was carried out in a simple manner in a sense that there was no use of camera trapping and radio collaring due to financial and technological limitations.
- Due to difficult physio-geographic conditions the study was done by conducting eight transects and interviews with the local villagers only.

Chapter 4 Literature Review

The common leopards (*Panthera pardus*) are the most widely distributed wild cats, and occupy a broad variety of habitats, from rainforests to deserts and from the fringes of urban areas to remote mountain ranges (Nowell and Jackson 1996; Kitchener 1991). Their greater adaptability is due to their catholic diet which even includes arthropods, amphibians, rotting carcasses, their lesser dependence on free water (obtaining it from their prey), and their smaller size, which reduces the area needed to sustain a population compared to their larger cousins and makes it possible for them to live closer to human habitation (Daniel 1996).

| Body Parts | Overall | Males | Females |
|----------------------------|---------|---------|---------|
| Head and Body lengths (cm) | 91-243 | 106-243 | 91-136 |
| Height at shoulder (cm) | 45-78 | 60-78 | 45-64 |
| Tail lengths (cm) | 58-97 | 65-97 | 58-78 |
| Weight (Kg) | 34-76 | 45-76 | 34-62 |

4.1. Principal Dimensions of the Body

Table 1: Body dimensions of the leopard.

Considerable variations in measurements exist between subspecies. The smallest '*nanopardus*' of Somalia has an average head and body length of 115cm (male) and 107cm (female) (www.members.aol.com/cattrust/leopard.htm). General weight of the leopard is in the range of 40kg to 60kg but exceptionally large males weighing over 91 kg have also been reported from South Africa's Kruger National Park (Turnbull and Kemp 1967)

4.2. Distribution

Panthera pardus could at one time be found from British Isles to Japan and throughout most of Asia. Today they can still be found in Africa, except for the true deserts of Sahara and Kalahari, and some parts of Asia such as Sri Lanka, India, Nepal, Pakistan, Myanmar, Thailand, China, Vietnam, Afghanistan, Asia Minor etc.

The leopards are more common in Eastern and Central Africa. Conversely, they are rare in Western and Northern Africa and most of Asia (www.wildlife.tour.india.com). The spatial distribution of leopards is shown in the figure (see Fig. 1)



Fig 1: Spatial distribution of leopard's habitat

Source: Plessis and Smit 1995

3.3. Habitat

The leopards are versatile animals in a sense that they can adapt to almost every types of the environment. They can survive well in dense forests as well as in the grasslands. The only factor that it is concerned with is that the area must have sufficient food and cover. The main reason why leopards are adaptable is that they have a high degree of flexibility in their diet.

According to study conducted by Eliassen (2003) in Royal Bardia National Park, the leopards commonly do not inhabit the prey-rich area if the area has high tiger (or other large carnivore) density. Although sufficient prey was available, the leopards were probably displaced by tigers through social dominance in the prey rich part.

4.4. Behaviour

The leopards lead a solitary lifestyle. Males inhabit territories of 5 to 40 square km, which may overlap with the territories of several females. Annual home ranges of the two males in the study conducted by Odden and Wegge (2005) in RBNP, Nepal were 47 and 48 km² and had an overlap of only 7%, whereas the overlap between the female's home range (17 km²) and that of one of the males was 56%.

According to the study of Mijutani and Jewell (1998) conducted in Laikipia District, Kenya, females occupy exclusive home-ranges of mean extent 14.0 km² although there is some overlap with subadult females. The home-ranges of resident males, with a mean of 32.8 km², do not overlap each other but do overlap female territories. The movement data recorded by Grassman (1999) indicated that leopards occupied overall home range sizes of 8.8 to 18.0 km², the mean daily movement was found to be 1.95 km, and exhibited arrhythmic activity dominated by nocturnal and crepuscular tendencies.

The leopards are generally most active between sunset and sunrise, and kill more prey at this time (Hamilton 1976, Bailey 1993). The leopards have also been observed to ambush terrestrial prey by leaping down from tree branches, although this behaviour is apparently opportunistic and relatively uncommon (Kruuk & Turner 1967). Previous studies have found

that leopards show some behavioural differences in habitats where they are not competing with larger carnivores (Eisenberg & Lockhart 1972).

4.5. Food

Henschel et. al., (2005) studied the food habit of the leopard in Lope National Park of Gabon. They collected and analysed 196 common leopard scats. A minimum of 30 different prey species were identified, 27 of which were mammalian. The leopards preyed mainly on ungulates, which made up 59% of the biomass consumed. Diurnal primates (18%) and large rodents (17%) were also heavily preyed upon. The mean prey weight estimated from scats was 29.2 kg.

According to Bailey (1993) at least 92 prey species have been documented in the leopard's diet in sub-Saharan Africa. Seidensticker (1991) and Bailey (1993) reviewed the literature, and concluded that leopards generally focus their hunting activity on locally abundant medium-sized ungulate species in the 20-80 kg range, while opportunistically taking other prey. The known prey of the leopard ranges from dung beetles (Fey 1964) to adult male eland (Kingdon 1977).

The common leopard have a number of prey items, including gazelles, wildebeest, antelopes, duiker, impala, sheep, goats, monkeys, jackals, eland, rodents, hyraxes, hares, peacocks, snakes and insects,. The leopards can live independently of water for long periods of time, obtaining liquid from their prey (www.bbc.co.uk).

The flexibility of the diet is illustrated by Hamilton (1976) through the analysis of the leopard scats from Kenya's Tsavo West National Park, of which 35% contained rodents, 27% birds, 27% small antelopes, 12% large antelopes, 10% hyraxes and hares, and 18% arthropods. He found that the leopard's diet was extremely varied, including Thompson's baboons, gazelle, wildebeest, impala, aardvarks, jackals, pangolins, snakes, birds and rats. Even cheetahs are occasionally eaten. The Leopards in the Ivory Coast feed on over 30 different mammal species (www.members.aol.com). Karanth and Sunquist (1995) found that leopard focused on prey in the 30-175 kg class.

Johnsingh (1983) reported that 69% of leopard kills were less than 50 kg. A study conducted by Grassman (1999) in Kaeng Krachan National Park, Thailand, revealed that the leopard feces were dominated by hog badger *Arctonyx collaris* (44%), barking deer *Muntiacus muntjak* (19.5%), and wild pig *Sus scrofa* (7.3%). Eliasson (2003) found in his study in Royal Bardia National Park (RBNP), Nepal that leopards used to take mostly small and medium-sized species, with smaller species comprising 45.4% of their diet. Chital, monkeys, smaller domestic and small wild mammals constituted their main prey in all seasons, with wild boar and birds as other important prey in the dry season.

4.6. Reproduction

The leopards in Africa and India will mate at any time of the year, while those living in Manchuria and Siberia mate most often in January and February. One female may be pursued by several males, the successful male grabbing her by the back of her neck with his teeth, the female swatting him off when copulation is completed. Copulation is very frequent, from 70 to 100 times a day. Estrus lasts on average 7 days (4-14 days). The gestation period of the

leopard is an average of 96 days (90-112 days) with up to six cubs being born. Early mortality is high though and it is rare to see a female with more than two cubs. (www.members.aol.com/cattrust/leopard.htm).

4.7. Global Conservation Status

As with many endangered animals, increasing human populations, loss of habitat and hunting have dramatically reduced the number of the leopards. Leopards are considered pests by villagers as they will take livestock and are considered to be more dangerous as "man-eaters" than lions or tigers. They will even enter a hut and drag out a victim which a tiger would not do (www.members.aol.com/cattrust/leopard.htm). They are endangered through much of their range, with the Amur, Anatolian and Barbary leopards being almost extinct. The data on seizures of parts of Tiger and Common Leopard, TRAFFIC, shows that for one tiger killed, more than five leopards are poached. (Aryal 2003)

The leopard is placed on Appendix 1 of the CITES, which prohibits trade in any part of the animal in those countries that are members, but smuggling still occurs. The IUCN Red Data Book has the Arabian leopard (*P. p. nimr*), the Amur leopard (*P. p. orientalis*), North African leopard (*P. p. panthera*) and Anatolian leopard (*P. p. tulliana*) as Critically Endangered, the Caucasus leopard (*P. p. ciscaucasia*), Sri Lankan leopard (*P. p. kotiya*), North Chinese leopard (*P. p. japonensis*) and Javan leopard (*P. p. melas*) as Endangered and all other leopards as Least Concern. Leopards are good breeders in captivity and are a lot more resilient in the face of growing pressures than either lions or tigers appear to be, making conservation programs slightly easier (www.aol.com/cattrust/leopard.htm).

4.8. Relationship with Humans

Relationship between humans and wildlife is extremely necessary for maintaining ecological balance. But there occur many instances when either of the two affects each other negatively. This holds true even in case of common leopards.

Every year a substantial number of people are attacked by the leopards (Poudel 2003). Some of the reasons for the attack by the leopards are:

- **Obstruction of escape route:** Most of the time leopards hunt alone but when it enters into human habitations in search of food, it attacks people for an escape.
- **Non-availability of natural food:** When adequate prey is not available it moves towards the villages.
- **Competition with other animals:** Due to overlapping of territory with tiger in Terai, it moves towards the village away from the territory (Poudel 2003).

4.9. Signs of the Leopard

Felid tracks have an overall circular shape, with length and width about equal. A full-grown common leopard will have a track that measures 7.5 cm in width and 11cm in length, with the main pad at 4-7.5 cm (Henschel and Ray, 2003). The front tracks are somewhat circular while the hind track tends to be little bit rectangular.

The leopard scats are elongated with one end often tapering, generally in several pieces each measuring over 6 - 13 cm in length and 2.5- 4cm in diameter. While the leopard scats can certainly be smaller than 2.5 cm in diameter, they should never be identified as such unless they are found in close association with adult leopard tracks (Henschel and Ray, 2003).

The leopard's Tracks



Front Track Fig. 2 Leopard's Pugmarks

The leopard's Scat



Hind Track Source: Stuart & Stuart 1994



Fig. 3 Source: P. Henschel 2003

4.10. Status of Common Leopard in Nepal

Common Leopard is one of the most common large Cats found in Nepal. It is found in almost every part of Nepal except high Himalayan regions. Sufficient studies have not been carried out in Nepal regarding the status, distribution and number of the leopards.

If forest cover and prey supply are available, the vertical distribution range of common leopards extends as high as 4000m (KMTNC 1998). It is reported to visit up to 3500m in the Trans-Himalayan region like Upper Mustang (Shah et. al., 2004) but Jackson (1984) even reported it at 5200m.

According to Shah et. al. (2004), it is concluded that common leopards are found in 73 districts of Nepal. The only districts where any evidences of the presence of the species were not found were Dhanusha and Okhaldhunga. The study though was mostly based on secondary literature review.

A study was carried out by Poudel (2002) in Royal Chitwan National Park (RCNP) in Chitwan valley. The study found that the population of common leopard in RCNP was 18 - 35 individuals then. Outside the park also, the leopards exists though the density was found

relatively lower than inside the park. The study estimated 25 - 55 common leopards in the Chitwan valley.

4.11. Livestock Depredation by Common Leopard in Nepal

Livestock depredation is one of the main reasons for the human-leopard conflict in Nepal. Areas with good numbers of wild prey could face some degree of livestock depredation but where natural prey has been depleted, livestock depredation is likely to be inevitable (IUCN – CSG, 1992). Shrestha (1994) found that out of the total livestock loss in Royal Chitwan National Park, 63.33% were killed by Tiger and 36.36% were killed by the leopard.

A study by Gurung (1995) in Gokarna, Kathmandu found that common leopard was one of the main predators along with Jungle cat *Felis chaus* and Jackal *Canis aureus*. Tamang (2000) found in his study that in the Buffer zone area of Royal Bardia National Park, livestock depredation was quite high. It was found that the depredation by the leopard was second only to Tiger. The total loss of livestock to the leopard during six years prior to 2000 was 87 which was 19.68% of the total loss.

4.12. Human-Leopard Conflict in Nepal

Common leopards are also known to visit the human settlements quite frequently killing the domesticated animals and also terrorizing and sometimes injuring or killing the people. Different cases of human-leopard conflict are documented in Table 2.

| Year | H | uman attack | | Leopard casualities or captures | | ptures |
|-------|--------|-------------|-------|---------------------------------|--------------|--------|
| | Killed | Injured | Total | Killed | Live capture | Total |
| 1994 | 33 | 12 | 45 | 4 | - | 4 |
| 1995 | 19 | 6 | 25 | 8 | - | 8 |
| 1996 | 36 | 20 | 56 | 18 | 6 | 24 |
| 1997 | 27 | 45 | 72 | 18 | 1 | 19 |
| 1998 | 26 | 11 | 37 | 10 | 1 | 11 |
| 1999 | 12 | 19 | 31 | 17 | 1 | 18 |
| 2000 | 14 | 6 | 20 | 11 | 1 | 12 |
| 2001 | 15 | 9 | 24 | 8 | - | 8 |
| 2002 | 32 | 7 | 39 | 4 | - | 4 |
| 2003 | 31 | 26 | 57 | 4 | 4 | 8 |
| 2004 | 25 | 10 | 35 | 4 | - | 4 |
| Total | 270 | 171 | 441 | 106 | 14 | 120 |

 Table 2: Human and common leopard causalities in Nepal.

Source: Shah et. al., 2004

Chapter 5 Methodology

5.1. Data Sources

The sources of data used were primary and secondary data. Primary data sources were the field observations, formal and informal interviews with the local people using PRA tools and focus group discussions. The sources of secondary data were libraries, experts on the subject and internet.

5.2. Data Collection

5.2.1. Primary Data

Field visit and structural questionnaire were used to get primary information from the area.

5.2.1.1. Status of Common Leopard

Looking for the footprints in areas of soft grounds such as near water, muddy ridge was used to detect the presence of the species (Mooty and Karns 1984). The locations where the marks are found were noted with Global Positioning Systems (GPS). The sizes of the pugmarks (Heel pad length, greatest length, greatest width) were noted in each site where the marks were detected. This gives estimation about the number of individuals that exist in the study site only. Core areas were marked more than non – core areas, suggesting that marking plays an important role in spacing individuals (Jackson and Ahlborn 1989; Jackson and Hunter 1996)

5.2.1.2. Transect Design

For designing the transects, the resource map of the area was consulted. The different land – use types representing the habitat of common leopard were identified. To remove the biasness, the transects were designed in such a way so that the transects represent every land-use types and thus represent different habitats of common leopard. Eight transects in total were drawn on the basis of different habitats in the study area. According to WWF Nepal (2001), short transects were better therefore the transects were short with longest transect as 1 km and shortest being 278 m with an average length of 528.5 m. Five metres on both sides of the transects was also observed for the signs of the leopard. Local trails were also used as transects. Different indirect signs and marks were recorded i.e. carcasses, scats, scratches, scrapes, pugmarks etc. The locations where the marks are found were noted with GPS. Crude density of marks were obtained through transect survey (marks/km). The starting and end points of the transects were also noted with GPS.

5.2.1.3. People's Perception on Human -Leopard Conflict

Social survey form was prepared and used (See Appendix 1). Each households were surveyed to gather information about the common leopard including livestock depredation, its habitat, people's perception on the species and so on.

5.2.2. Secondary Data

5.2.2.1. Literature Review

Different literature, dissertations, reports, books, journal articles etc. were consulted from different libraries and the relevant materials were included.

5.2.2.1. Internet Surfing

Various websites were consulted and the important documents were downloaded from the internet.

5.2.2.3. Expert Consultation

Different experts on the subject were also contacted and various facts about the species were noted.

5.3. Sample Size

The total number of households (hhs) in the Kunjo VDC were 152. To maintain the accuracy and reliability of the study all the 152 hhs were surveyed with a structural questionnaire (see Appendix 1). Local teachers were hired and were instructed properly to fill up the survey form.

In total eight transects were designed. The transects were designed purposively in such a way that they represent different habitat types which can sustain the leopards thus giving an idea about the presence and absence of the leopard.

5.4. Data Analysis

Density was analyzed as number of signs per kilometers (numbers/unit length). Variation in the sizes of pugmarks was noted in different area which helped in estimating the minimum individual leopard existing in the area. Data was analyzed through combining the results of all interviews and questionnaires which was very critical to ensure the accuracy of the data. After editing both in the field and central level, the data was classified. Some of the responses were analyzed based on the likert scale. Most of the responses were analysed with the help of Microsoft Excel by presenting in either chart or table format. The transects were shown in the map with the help of Geographic Information Systems (GIS) software Arc View.

Chapter 6 Results and Discussions

The study was carried out in the Kunjo VDC of Mustang district. The Researcher spent a total of 15 days in the field for conducting transects and social survey. Out of 8 transects conducted 4 transects did not account for any signs of the leopard but the remaining four accounted for 19 signs. The scrapes were most abundantly recorded with 12 and followed by scats (4) and pugmarks (3).

6.1. Transect Survey

In total, 8 transects were conducted which gave ample evidences of common leopard's presence in the study area. In half (50%) of the transect observations, sufficient evidences of the presence of leopard in the area such as pugmarks, scrapes, scats were recorded. The details of all the transects are given in table 1, 2 and 3.

| Transects | Position on GPS | | | |
|-----------|-------------------|----------------------|--|--|
| Number | Starting point | End point | | |
| 1 | N 28°39'16.5" | N 28°39'01.6" | | |
| | E 083°36'22.5" | E 083°36'29.9" | | |
| | Elevation – 2736m | Elevation – 2822m | | |
| 2 | N 28°38'49.5" | N 28°38'54.1" | | |
| | E 083°36'47.2" | E 083°37'11.2' | | |
| | Elevation – 2883m | Elevation – 2787m | | |
| 3 | N 28°39'11.1" | N 28°39'16.2" | | |
| | E 083°38'28" | E 083°38'51.8" | | |
| | Elevation – 2628m | Elevation – 2728m | | |
| 4 | N 28°39'18.4" | N 28°39'12.8" | | |
| | E 083°39'03.8" | E 083°39'31.3" | | |
| | Elevation – 2808m | Elevation – 2906m | | |
| 5 | N 28°39'12" | N28°39'06.5" | | |
| | E 083°39'34.7" | E 083°39'45.7" | | |
| | Elevation – 2917m | Elevation – 2934m | | |
| 6 | N 28°37'39.5" | N 28°37'22.5" | | |
| | E 083°38'20.4" | E 083°38'47.9" | | |
| | Elevation – 2484m | Elevation – 2455m | | |
| 7 | N 28°37'34.8" | N 28°37'35.5" | | |
| | E 083°39'55.2" | E 083°40'05.3" | | |
| | Elevation – 2680m | Elevation – 2747m | | |
| 8 | N 28°37'14.9" | Device did not work. | | |
| | E 083°39'41.5" | | | |
| | Elevation – 2625m | | | |

Table 3: Position of the transects conducted in the study area.

| Transects | Site | Length | Land-use / Habitat |
|-----------|----------------------------------|--------|---------------------|
| number | | | Туре |
| 1 | Pongay, Titi | 1 km | Forest |
| 2 | Palangan, Titi | 400 m | Forest, Pastureland |
| 3 | Pangla, Kunjo | 500m | Riverside forest |
| 4 | Vralijong, Kunjo | 750 m | Dense forest |
| 5 | Pangbu, Kunjo | 350 m | Dense forest |
| 6 | Jhipra – Deurali to Pudar kharka | 600m | Agricultural land |
| 7 | Guranse Danda | 278 m | Broad leaved forest |
| 8 | Way to Annapurna base camp | 350 m | Broad leaved forest |

Table 4: General description of the transects

Table 5: Habitat description of the transects

| Transects number | Dominant tree species | Crown Coverage | Ground Coverage | Slope | Human impact |
|---------------------|-----------------------|-------------------|--------------------|-----------------|-----------------|
| 1 | Pinus wallichiana | 70% | 90% | 10 [°] | Medium |
| 2 | Pinus wallichiana | 70% | 90% | 10° | Medium |
| 3 | Pinus wallichiana | 85% | 40% | 15° | Medium |
| 4 | Pinus wallichiana | 70% | 40% | 5° | Medium |
| 5 | Pinus wallichiana | 90% | 70% | <5° | Medium |
| 6 | No Vegetation | - | - | 5° | High |
| 7 | Juglens regia | 90% | 80% | 20° | Medium |
| 8 | Esculus indica | 90% | 80% | 40° | Medium |

A total of 8 transects were conducted with a mean length of 528.5m.

The study provided many evidences such as pugmarks, scats and scrapes which clearly indicated the presence of common leopard in the area. In total, 3 pugmarks, 4 scats and 12 scrapes were recorded. The density of signs recorded was 2.375 signs per transect. The density of pugmarks, scats and scrapes came out to be 10.79, 3.59 and 3.59 per km respectively in transect 7 while in transect 5 the density of scats and scrapes were 5.72 and 5.72 respectively. In the transect 1, only scrapes were recorded with density of 9 scrapes per km however in the transect 4 only scat was found with density 1.33 per km. The density of scrape was the highest with 2.84 signs/km. The density of pugmarks and scats being 0.709 and 0.946 respectively (see table 8).

| Table 6: 6 | GPS positions | of the signs | encountered |
|------------|----------------------|--------------|-------------|
|------------|----------------------|--------------|-------------|

| Transect Number | Signs | GPS P | Elevation | |
|-----------------|-----------|-------------|---------------------------|-------------|
| | | North | East | (in Metres) |
| 1 | 7 Scrapes | 28°39'01.6" | 083°36'29.9" | 2810 |
| | 2 Scrapes | 28°38'58.4" | 083°36'32.3" | 2774 |
| 2 | No signs | - | - | - |
| 3 | No signs | - | - | - |
| 4 | 1 Scat | 28°39;18.4' | 083 ⁰ 39'03.8" | 2808 |
| 5 | 2 Scrapes | 28°39'12" | 083°39'34.7" | 2917 |
| | 1 Scat | 28°39'06.5" | 083°39'45.7" | 2934 |
| 6 | No signs | - | - | - |

| 7 | 2 Pugmarks | 28°37'34.3" | 083°39'57.4" | 2714 |
|---|------------|-------------|--------------|------|
| 8 | 1 Scat | 28°37'34.7" | 083°40'02.9" | 2730 |
| | 1 Scrape | 28°37'34.7" | 083°40'02.9" | 2730 |

Table 7: Sign number and density in each transect.

| Transects | Signs | | | Sign density(sign/km) | | |
|-----------|----------|-------|---------|-----------------------|-------|---------|
| number | Pugmarks | Scats | Scrapes | Pugmarks | Scats | Scrapes |
| 1 | _ | _ | 9 | _ | _ | 9 |
| 2 | _ | _ | _ | _ | _ | _ |
| 3 | _ | _ | _ | _ | _ | _ |
| 4 | _ | 1 | _ | _ | 1.33 | _ |
| 5 | _ | 2 | 2 | _ | 5.72 | 5.72 |
| 6 | _ | _ | _ | _ | _ | _ |
| 7 | 3 | 1 | 1 | 10.79 | 3.59 | 3.59 |
| 8 | _ | | _ | _ | _ | _ |

Table 8: Overall density of signs

| Sign density (signs/km) | | | | | |
|-------------------------|-------|------|--|--|--|
| Pugmarks Scats Scrapes | | | | | |
| 0.709 | 0.946 | 2.84 | | | |

The two different sets of pugmarks were recorded whose physical dimensions are given in table below (see Table 9).

| Table 9: | Physical | dimensio | ns of the | nuomarks | recorded |
|----------|------------|----------|-----------|----------|----------|
| | 1 Ilysical | unnensio | ns or the | pugmarks | IttoIutu |

| Pugmarks | Front/Hind | Greatest length | Greatest width | Heel pad length |
|----------|-------------|-----------------|----------------|-----------------|
| | | (cm) | (cm) | (cm) |
| 1 | Front track | 11.5 | 9.5 | 6.5 |
| 2 | Front track | 10 | 7.3 | 5.5 |

The close examination of the pugmarks led to the conclusion that both tracks were of the front leg thus it can be concluded that at least two leopards exist in the Pudar kharka – Guranse danda area.

3.2. Social Survey

Kunjo VDC is one of the 16 VDCs of Mustang district. It consists a total of 152 households. (See photo 1).



Plate 1: Interview of the villagers.

Most of the people in Kunjo have not seen the leopard during their lifetime. Out of 152 respondents, 40 of them have seen the leopard which comes out to be 26.32% and 112 of are yet to see the elusive cat (see fig. 4).



Fig 4: Percentage of the people who have seen or not seen the leopard in their entire lifetime

During the research period different personal communication provided valuable information about the whereabouts of leopards and the condition of livestock depredation in the area. Personal communication with Mr. Sat Prasad Gauchan locally well known as *Titi saila* provided an interesting account about the incidents of killing the leopards in the past. It was known during the communication that the persons who kill the leopards were venerated with *abir* (Pink or red powder that is used to put on the forehead as a sign of celebration) and garland and made to ride on a horse. He himself had killed one leopard in 2017 B.S. He also informed us about one recent killing of a sheep by a common leopard in Koklijo village on 17th May 2006.

It was also known from the study that Jestha and Ashad are the months when common leopard becomes most active and does most of the damages (see Table 10).

| Months | Percentage of people (Some responses |
|----------------|--------------------------------------|
| | are overlapped) |
| Baisakh | 25% |
| Jestha | 32.9% |
| Ashad | 26.97% |
| Shrawan | 13.16% |
| Bhadra | 3.29% |
| Ashwin | 3.95% |
| Kartik | 7.24% |
| Mangsir | 5.26% |
| Poush | 11.18% |
| Magh | 9.21% |
| Phalgun | 4.61% |
| Chaitra | 9.87% |
| Hiund (Winter) | 2.63% |
| No response | 21.05% |

Table 10: The perceived months/seasons when the leopards attack most to the local livestock

There were good number of people speaking about the damages done by the leopard. It was also found that Himalayan black bear also creates problems with its habit of depredating the crops. Though the nature of damages caused by the bear and the leopard are different. The leopard though is the prominent predator when it comes to livestock depredation. It does not damage regularly but the magnitude of its damage is significant. For eg., between 2062 B.S. and current year, Mr. Sat Prasad Gauchan lost about NRs. 1,44,500 (US \$ 1954.29) as leopard killed one horse, two mules, one dog, ten sheeps, one cow and five goats. Also, Mr. Ratne B.K., Mr. Mahendra Serchan, Mr. Tej Bdr. Bishwokarma, Mr. Bhim Prasad Gauchan, Mrs. Kamal Kumari Serchan, Mr. Indra Lall Tulachan lost a total of NRs 2,64,000 (US \$ 3570.46) due to livestock depredation by the leopard. According to the interview with the locals the total depredation came out to be NRs. 5,45,000 which is equivalent to US \$ 7370.84.

.Poaching and snaring are some of the activities that have been existed before and continue to prevail amidst all the strong preventive and legal measures. It was known from the questionnaire survey that poaching and snaring were commonly practiced in the area before the area was included in the Annapurna Conservation Area Project (ACAP). Some of the respondents openly accepted that it is fair to kill leopard as it incurs heavy loss to the people there by livestock depredation. It was found from the survey that the leopards were used to be killed before the area was declared Conservation Area. The responses of the people are given in fig. 5.



Fig 5: Responses of the people on whether the leopards were killed or not in the study area before it was included in ACAP?

According to the questionnaire survey the number of leopards has increased over the time after the intervention of ACAP. Respondents were provided with five options and the responses were analyzed based on Likert scale. Analysis showed that there is a healthy increase in the number of the leopards in the area and the incidents of damages done by the leopard are also on the rise.

Out of 152 respondents, 2.63% think that the leopard – human conflict is very high, 21.71% were of the view that it is moderately high, 2.63% did not know, 30.92% said that it is not very significant, 40.79% opined that there is no such conflict and 1.3% did not respond. Analysis showed that the human – leopard conflict is not very significant considering the healthy increase in the leopard's population. Some of the other findings of the survey are provided in Table 12

| Questions | Yes (%) | No (%) | Without response (%) |
|-----------------------------|---------|--------|----------------------|
| 1) Have you seen dead | 15.79 | 83.56 | 0.66 |
| leopard? | | | |
| 2) Do you know any incident | 3.29 | 95.39 | 1.32 |
| of killing leopard? | | | |
| 3) Have leopards killed | 0 | 99.34 | 0.66 |
| anyone here? | | | |
| 4) Have leopards injured | 0 | 70.39 | 29.61 |
| anyone here? | | | |
| 5) Have leopards killed or | 17.76 | 73.68 | 8.56 |
| injured your domestic | | | |
| animals? | | | |
| 6) Is any organization | 34.21 | 64.47 | 1.32 |
| interested in solving the | | | |
| problem of wildlife | | | |
| depredation in your area? | | | |
| | | | |

Table 11: Findings to other different questions

Different information about the human-leopard conflict was recorded. It was known that the leopards have killed livestock, dogs etc. from 17.76% hhs. Also 73.68% hhs had no incidents of their livestock being killed by the leopard and 8.56% did not respond.

It is very important to know whether body parts of the leopard have got any medicinal value or not. This could provide a crude estimation of poaching and illegal killing which is very crucial for the leopard to survive. Among 152 respondents, 13.82% responded that the fat of the leopard has got an excellent medicinal potentiality. According to them, it can be used to have a massage for *Bath* patient, for fractured bones etc. The responses of the people are shown in the figure 6.



Fig 6: The leopard's body parts being used as medicine

Most of the people in Kunjo VDC have not adopted any preventive measures against the livestock depredation by the leopard. Out of total 152 hhs, 118 hhs have not adopted any preventive measures and think that the problem cannot be solved easily. It was known that 12 households have kept cowherds, 9 hhs opined that the leopard should be snared and killed to prevent the depredation, 1hh burn the fire in the forest, 1 hh prepare thorny walls to prevent livestock depredation, 1 hh threatens the leopard by beating drums etc and 10 hhs do not know any preventive measures against livestock depredation by the leopards. This shows that 77.63% of the people have not adopted any preventive measures against the livestock depredation in the area (see Table 12).

| Preventive measures | Number of Households |
|---------------------|----------------------|
| Keeping cowherds | 7.89% |
| Making thorny walls | 0.65% |
| By threatening | 0.65% |
| Burning fire | 0.65% |
| By killing | 0.65% |
| By snaring | 5.26% |
| Nothing | 77.63% |
| Don't know | 6.58% |

 Table 12: Preventive measures adopted against the leopard depredation.

The leopard is a very strong predator which feed mostly on the ungulates. So, ungulates are always in an aura of danger wherever there are the leopards. Since the year 2062, the leopards have killed 21 Cows, 5 Oxen, 10 Sheep, 14 goats, 3 horses, 7 mules, 4 dogs and wounded 1 dog in Kunjo VDC. A total of 27 respondents told that their cattle have recently been killed by the leopards, 112 respondents were not having livestock depredation problem with the leopard and 13 did not answer (see Fig. 7).



Fig. 7: Number of people whose cattle are injured/killed by the leopards.

Without any surprise, the respondents whose cattle have been killed or wounded by the leopard are of the view that the leopards must be eliminated from the area. This could be a major constraint for the conservation initiatives.

The leopard is the most adaptable of all the great cats. It can thrive well in mountainous, grasslands as well as tropical environments. It also inhabits in the forests as well as periphery of human settlements. It commonly feed on ungulates. It is a matter of interest to know where the leopard attacks its preys most. During the research, it was found that Cows were attacked mostly in the forest followed by goats, Mules, Horses, Oxen, Sheep, Yaks and Dogs. Buffaloes were not found to be attacked by the leopards (see Table 13).

| Animals | Forest | Pastureland | Village | Others |
|---------|--------|-------------|---------|--------|
| Cow | 39 | 5 | 1 | |
| Ox | 4 | | | |
| Sheep | 3 | | | |
| Goat | 22 | 3 | | |
| Yak | 1 | 1 | | |
| Horse | 5 | | | |
| Mule | 14 | | | |
| Dog | 1 | | 1 | |
| Others | | | | |
| Total | 79 | 9 | 2 | _ |

 Table 13: Places where the leopards attack most to the livestock in the area

The study also collected people's perception on the benefits of the leopard's conservation in the area. It is not surprising that 30.26% people think that the conservation of the leopard does

not yield good results rather it complicates the problem of livestock depredation. A total of 31.57% people opined that it will support the tourism and also balance the environment, 7.24% people expressed that it will help in bio-diversity conservation, 27.63% people do not know the benefits and 3.29% did not respond (see Table 14).

| Benefits | Percentage of People |
|----------------------------------|----------------------|
| Support to Tourism | 31.57% |
| Environmental Balance | 0.65% |
| Biodiversity conservation | 7.24% |
| No Benefits | 30.26% |
| Don't Know | 27.63% |
| No Response | 3.29% |

Table 14: Benefits of conserving the leopards

The data shows that the impact of human – wildlife conflict has a negative feeling among the locals. Among the respondents 30.26% people think that the conservation of leopard doesn't provide any fruitful results and 27.63% people are not well aware of the benefits of leopard conservation. Altogether 57.89% people don't care about leopard conservation which can be a critical factor in writing the fate of common leopard in the area. Habitat destruction is also one of the very important factors that is having a negative impact on the survival of the species. Road construction and deforestation are some of the factors which are contributing negatively to the habitat destruction of common leopard.

Leopard is one of the components of the ecosystem and very important and elegant species of the cat family. Some species of this family are in verge of extinction and really need special considerations. Though the leopard is not a protected animal under DNPWC Act 1973 and also it has been listed as a lower risk and least concerned species in the IUCN Red Data Book but the wildlife trade has started to take its toll on the existing leopard population. In other words, the fate of the Common Leopard in Nepal is now being written by the poacher's bullet, making this graceful spotted cat a marked animal today. The alarming rate at which the population of the Common Leopard is being decimated, suggests that they may become extinct even earlier than the tiger. They are endangered due to excessive poaching for skin and habitat destruction. The leopard skin is used to make long-coat, short-jacket, hat, stole and bones are used for making Traditional Chinese medicine. Besides leopard-bones, claws, teeth and whiskers are also in illegal trade. A favored route of smuggling from Nepal and India is overland to Tibet where the bones are usually bartered for Shatoosh. As many as 70 leopard skins and 18,000 leopard nails were confiscated on January 12, 2000 by the Indian authorities following a raid at Khaga, in the Indian state of Uttar Pradesh (Shrestha 2000). Also, in October 2003 the seizure in the Tibet Autonomous Region (TAR) of a single consignment of 31 tiger skins, 581 leopard skins and 778 otter skins, revealed the shocking extent and scale of an illegal trade that has been escalating in the last five years.

The TAR seizure is the largest in a series of incidents that have occurred in India, Nepal and China in recent years. Between 1999 and the August 2004 confirmed reports put the numbers of seized skins at; 81 tiger skins and 1062 leopard skins. These are only the substantiated seizures and do not take into account unverified reports of skin seizures. Nonetheless, it reveals the frightening tip of the iceberg with the volume of skins actually in trade likely to be significantly higher (CoP13 Inf. 47, 2004). The skins of the leopards seized at Ghansa checkpost of Mustang are shown in the Plate 10.

These incidents as the history has shown could well make us aware that Mustang district is one region very notorious for illegal wildlife trade. Since, this trade is quite lucrative; people are easily swayed by it. It is very difficult to say that poaching doesn't exist in Mustang district which means that there are some very serious hindrances on the way of the conservation of the leopard.

Chapter 6 Conclusion and Recommendations

6.1. Conclusion

The results of the transect and hence observation of other signs showed existence of the leopards in the area. The leopard's fresh scrapes in Palanga showed its presence in the area. The sign observation in the Vralijong and Pangpu also yielded fruitful results. In Guranse danda, two different set of pugmarks were recorded. This indicates the presence of at least two common leopards in the area.

Interactions with the locals have confirmed that the leopard is one of the prominent predators which is mostly responsible for the killing of the domesticated animals upon which the villagers are economically dependent. Out of 152 respondents surveyed, 66.45% answered that the trend of damages by the leopard have increased after establishment of ACAP office in Mustang.. Though 39.46% people perceive that there are many benefits of conserving the leopards in the form of support to tourism, ecological balance, biodiversity conservation etc. still 30.26% people think that there are no benefits of leopard conservation and 17.76% told that killing leopards is the only way to reduce the problem of livestock depredation. This may pose difficulty in launching the leopard related conservation initiatives smoothly in the area. This tendency could ultimately pose as a survival threat for the population of the existing common leopards in Kunjo VDC.

6.2. Recommendations

6.2.1. Detail Study of Common Leopard is Obligatory

There has never been a scientific research conducted in Mustang about common leopard. Thus a detailed, scientific study of common leopard is very necessary in Kaligandaki valley. This could provide an estimation of the number of common leopards in Kunjo VDC. The livestock depredation caused by the species must also be addressed during the study.

6.2.2. The Local People should be Encouraged to Follow Proper Methods of Guarding their Livestock against the Predation of the Leopards

Local people must be encouraged to follow appropriate methods other than killing the predator to save their livestock. Proper day guarding of the livestock by cowherd in the grazing lands, proper fencing of cow sheds and not using the leopards prime habitat for the grazing purposes are a few methods which can be used in the area.

6.2.3. Awareness for the Conservation of the Leopard

Conservation education must be included in the curriculum of school which provides students the knowledge about the importance of the leopard. Conservation education must also be provided to the villagers about the role the species plays in balancing the ecosystem by acting as the supreme predators of hilly region in the food chain.

6.2.4. Common Leopard and other Wildlife's Conservation related Publications including Brochure, Posters and Leaflets should be Prepared and Distributed

Brochures, posters, leaflets and other publications must be prepared and distributed showing the importance of common leopard and the benefits one can get from it. This could help in making people aware of its importance thus helping in its conservation.

6.2.5. Regular Monitoring of the Conflict Levels should be Carried Out by the Concerned Authorities

The conflict arising between human and leopard must be monitored regularly, if possible within short interval of time. This could help in making the concerned authorities well aware of the extent of human – leopard conflict levels and assist in making some special arrangements to reduce the conflict.

6.2.6. Habitat Encroachment and Destruction should be Discouraged

During the study, it was evident that habitat destruction is quite rampant in the study area. Habitat encroachment is one of the main reasons for the leopard to turn its attention towards human settlements that results in livestock depredation. Therefore deforestation and encroachment of the leopard habitat must be discouraged properly.

6.2.7. Maintenance of a Leopard Database

A database must be prepared and maintained by conducting a detailed study about the leopard in the area by the concerned authority which contains everything about the leopard's situation/condition in the area. For e.g. Its potential and actual habitat, its natural prey base, prey – predator relationship and so on.

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Appendix 1 Human-Leopard Conflict Social Survey Form Kunjo VDC, Mustang

| Name: | |
|--------------|--|
| Ward No: | |
| Family Size: | |

Age/Sex: Village/Tol: Occupation:

1) Do you have livestock or other domesticated animals? If yes, fill the table below.

| Domesti | Co | 0 | Shee | Goa | Mul | Ya | Hors | Buffal | Do | Chicke | Other |
|-----------|----|---|------|-----|-----|----|------|--------|----|--------|-------|
| с | w | х | р | t | e | k | e | 0 | g | n | S |
| Animals | | | | | | | | | | | |
| Stall-fed | | | | | | | | | | | |
| | | | | | | | | | | | |
| Non | | | | | | | | | | | |
| stall-fed | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| | | | | | | | | | | | |

2) What are the natural resources found in your area? List five of them. Mammals:

Medicinal plants: Ecotourism services:

3) Have you seen Common leopard?

Yes No If yes, Where (Place) When (Month) How many (number)

4) There is an increase in the number of Common Leopards in the area after ACAP?

Strongly AgreeAgreeUndecidedDisagreeStrongly disagree

5) There is an increase in the incidences of livestock depredation in the area after ACAP? Strongly agree Agree Undecided Disagree

Strongly disagree

7) What are the wildlifes that mostly affects you negatively? Please list five in priority basis.

1) 2) 3) 4) 5) 8) What are your livestock and other pet animals that were killed / wounded by common leopard last year? Please write in numbers and local price.

| Animals | Total | Killed | Wounded | Loss | Rs./No. |
|------------|-------|--------|---------|------|---------|
| Sheep | | | | | |
| Goat | | | | | |
| Yak | | | | | |
| Horse | | | | | |
| Mule | | | | | |
| Dog | | | | | |
| Chicken | | | | | |
| Cow and Ox | | | | | |
| Others | | | | | |

9) What are the areas where domestic animals are killed by leopard?

| Animals | Forest | Kharka | Village | Other |
|-------------|--------|---------------|---------|-------|
| (Livestock) | | (Pastureland) | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

- 10) In which months/season the leopard causes maximum damage? Winter (months) Summer (months)
- What are the precautionary measures that you adopt to minimize the Leopard damage? Watchmen recruitment...... Fencing...... Threatening (How?)......
 Nothing......Smoking....... Killing......
 Other (Please specify):

13) What are the benefits of leopard conservation?

.....

14) Have you seen dead leopard?

Yes..... No.....

15) What you do to the dead body of domestic animals killed by the leopard?

.....

16) Is there any incident of leopard being killed in the area? Yes.....No..... done.....

18) Whether any part of the leopard's body is used as medicine? If yes, then which part and for what purpose?

.....

19) The extent of human – wildlife conflict is high in the area.
Strongly agree
Agree
Undecided
Disagree
Strongly disagree

20) What are the options to reduce the leopard damages? Give only two options.

.....

21) Do you think any organization concerning on people-wildlife conflict in your village?

| Yes |
|------------------------------|
| No |
| If yes please list the names |

Please fill any missing information if you think is useful concerning the human-leopard conflict.

.....

Appendix 2

| Ward | Cow | Ox | Sheep | Goat | Yak | Mule | Horse | Buffalo | Dog | Chicken |
|------|-----|----|-------|------|-----|------|-------|---------|-----|---------|
| No. | | | | | | | | | | |
| 1 | 46 | 16 | 500 | 300 | 0 | 21 | 3 | 0 | 9 | 50 |
| 2 | 24 | 14 | 0 | 47 | 0 | 0 | 0 | 0 | 6 | 61 |
| 3 | 19 | 12 | 0 | 41 | 0 | 7 | 0 | 0 | 3 | 167 |
| 4 | 63 | 34 | 0 | 69 | 32 | 12 | 1 | 0 | 2 | 145 |
| 5 | 22 | 23 | 0 | 192 | 1 | 0 | 1 | 0 | 3 | 144 |
| 6 | 8 | 7 | 0 | 59 | 0 | 7 | 0 | 0 | 9 | 18 |
| 7 | 46 | 20 | 0 | 0 | 0 | 7 | 2 | 0 | 3 | 68 |
| 8 | 12 | 10 | 0 | 38 | 0 | 0 | 0 | 0 | 16 | 21 |
| 9 | 128 | 51 | 80 | 81 | 0 | 9 | 4 | 10 | 13 | 171 |

Table 1: Number of Livestock in Kunjo VDC

Note: 12 households did not respond to the question.

Table 2: Monetary Loss Due to Livestock Depredation in Different Wards

| Wards | Depradation in NRs. | Depredation in US \$ |
|-------|---------------------|----------------------|
| 1 | 2,54,000 | 3435.22 |
| 2 | 16,700 | 225.86 |
| 3 | 41,000 | 564.5 |
| 4 | 41,500 | 561.26 |
| 5 | 23,000 | 311.06 |
| 6 | 3,000 | 40.57 |
| 7 | | |
| 8 | 5,000 | 67.62 |
| 9 | 1,21,200 | 1639.17 |

Table 3: Livestock and crop depredation by different wildlife

| Wildlife responsible for the depredation | No. of responses (Out of 152 respondents) |
|--|---|
| Leopard | 30.26% |
| Wild Cat | 0.65% |
| Jackal | 75% |
| Bear | 100% |
| Monkey | 71.05% |
| Ghoral | 2.63% |
| Deer | 5.26% |
| Barking Deer | 1.97% |
| Porcupine | 96.71% |
| Mongoose | 1.97% |

Appendix 3



Fig. 1: Study Area

Source: Raju Acharya and Medini Bhandari as from DNPWC, 2000

Appendix 4



Fig. 5: Map showing the transects conducted in the study area. Source: Raju Acharya

Appendix 5 Plates



Plate 2: Conducting the transect survey



Plate 3: Researcher recording the common leopard related event



Plate 4: At least 5-6 days old scat of a common leopard



Plate 5: Measurement of the leopard sign



Plate 6: The common leopard related Informal discussion with the villagers



Plate 7: Habitat destruction due to road construction within prime habitat of the common leopard.



Plate 8: Deforestation within the leopard habitat. Such habitat degradation ultimately affects the movement of the leopard.



Plate 9: Skins of common leopard confiscated by the authority at Ghansa. ACAP, Jomsom