

# Human-Leopard Conflict: An Emerging Issue of Common Leopard Conservation in Machiara National Park, Azad Jammu and Kashmir, Pakistan

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**Abstract:** Human-wildlife conflict is an emerging issue in current era which has intensified with the passage of time. Many wildlife species have become threatened due to this conflict, especially the large carnivores. Human - leopard conflict is common in various parts of their distribution range around the world. Present study was conducted to assess livestock depredation by common leopard in Machiara National Park (MNP) from January, to December, 2011. Structured and semi-structured questionnaires were used to collect data with the help of MNP field staff. Statistical analysis showed that there was a significant difference ( $p < 0.05$ ) in livestock depredation in different seasons of the year, highest depredation was recorded in summer season that gradually decreased toward autumn due to the availability of natural prey species. A significant difference ( $p < 0.05$ ) was observed between goats and other livestock species showing that goats were the preferred livestock prey species. Most of the depredation occurred during night as compared to day time and a significant difference ( $p = 0.048$ ) was noted between night and day time depredations. Villagers suffered a high economic loss (PKR = 2.693m) in terms of estimated market price of killed domestic animals. Factors contributing to this conflict include: increasing human population and dependence on natural resources, habitat destruction and population decline of leopard's natural prey species, poor protection practices of livestock and poverty of local people.

**Key words:** Common leopard, human-wildlife conflict, livestock depredation, Machiara National Park, Azad Jammu Kashmir

## INTRODUCTION

Livestock depredation is a common human-wildlife conflict at global level. It is a wide spread issue both in developing and developed countries, especially in rural areas. This conflict involves a variety of wild animals, but, it is extra intensified with large carnivores (Dickman, 2008). Large carnivores are chiefly vulnerable to human actions, as they require wide ranges which bring them in closer contact and therefore, conflict with humans (Hilty *et al.* 2006). This conflict involves competition for subsistence resources at different levels, which include threat to lives as well as economic losses for local people (Sillero-Zubiri and Laurenson, 2001). These conflicts are consistently greater in areas that are close to forest edges and in areas that provide cover for the carnivores to come within reach of livestock unnoticed (Woodroffe and Ginsberg, 1998). Occurrence of conflicts has increased in recent decades. This is the result of increased anthropogenic activities in natural

habitats (Graham *et al.*, 2005; Bulte and Rondeau, 2005). People in the far-flung rural areas generally are without modern services, thus solely dependent on the natural resources for their subsistence. Generally they resort to killing of the large carnivores through trapping, poisoning or shooting to avoid losses to livestock and property. The human-carnivore conflict is an alarming global issue for conservationist as many carnivore species are at the brink of extermination (Treves and Karanth, 2003). Due to increasing desires of daily subsistence, every eco-zone on the earth has now been influenced by human activities (Vitousek *et al.*, 1997). New space for settlements has changed the land use practices and uncontrolled utilization of natural wild resources is also imposing negative impact on biodiversity. Due to unlimited desires intact forests have become restricted to small and fragmented patches (Laurance and Bierregaard, 1997; McCloskey and Spalding, 1989). These rapid emerging desires for space and daily subsistence intensify the conflicts over natural resources at national level (USIP, 2001; Mishra, 1997; Saberwal *et al.*, 1994).

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Common Leopard is considered as top predator in its home range where it plays very important role in continuation of biodiversity (Terborgh, 1992). Therefore leopard populations are of central concern to conservationists for safeguarding of natural ecosystems (Gittleman *et al.*, 2001). The large home ranges of leopards often result into competition with humans, predominantly in areas where livestock rearing overlap with leopard home range (Karanth *et al.*, 1999; Polisar *et al.*, 2003).

In most of developing countries livestock rearing is an integral part of local economy. Especially the marginalized local people graze their herds in or adjacent to protected areas and forests. Leopard often attacks livestock that are grazed in forest areas as well as inside the human settlements posing risks to human lives also. This damage to local livelihoods often angers herders who may resort to taking revenge (Conforti and de Azevedo, 2003). The high economic value intensifies the level of anger toward predators, enhancing feelings for retribution among the affected herders (Oli *et al.*, 1994; Schaller *et al.*, 1994).

Sometimes excessive killing of livestock by leopard becomes intolerant for local poor communities. This mass killing of livestock results in severe financial hardship to the herders. Leopards are potentially aggressive and sometimes kill humans themselves; this attitude generates strong opposition towards their presence around human settlements (Baldus, 2004; Sillero-Zubiri and Laurenson, 2001). These factors are often compounded by a natural fear of large predators (Berg, 2001; Quammen, 2003).

Leopards are mainly confined to the far-flung mountain and foothill areas of central and south Asia. They can be found from rainforest, grasslands, mountain temperate forest and close proximity of urban areas, where they get some cover to hide along availability of prey species (Sommer and Benecke, 2006; Hayward *et al.*, 2006). Due to their nature of less specialized in diet than other felids they are still surviving in those areas from where other big cats have been exterminated. Previously it has been recognized as common species due to their wide geographic range and attained low conservation priority. However, now eight sub-species of leopard are listed as threatened by the IUCN Red List, they are either 'endangered' or 'critically endangered'. Through loss of their natural habitat, reduction of natural prey and direct human harassment the leopard has been eradicated from vast areas of its former range (IUCN/SSC, 2005). The local people living around the forest areas are main hindrance in leopard conservation. In these areas the most common form of conflict is livestock attacks by leopards (Khorozyon, 2005). In much of its range area the leopard is in severe danger of extinction and

immediate conservation interventions are required for the survival of this species.

Snow leopard (*Panthera uncia*) and common leopard (*Panthera pardus*) are two large felids found in Pakistan. Common leopard distribution range extends from low altitudes in the Himalayan moist temperate forest to scrub forest up to Kirthar hills in Sindh, Kalat, Makran in Balochistan and Waziristan (Roberts, 1997). However in Galliat areas of Khyber Pakhtonkhwa (KPK) province and the districts of Neelum, Muzaffarabad and Bagh of Azad Jammu Kashmir, substantial numbers of leopard still survive perhaps because of the successful large scale forest regeneration projects that have been implemented over the past 40 years (Iftikhar, 2006). These areas are also densely inhabited by humans who own a large number of livestock for their livelihood. In these areas attacks on livestock by leopards is the emerging human-leopard conflict.

In Azad Jammu Kashmir the leopards are widely distributed from Dudyal in the south to Neelum Valley in the north. These are mainly hilly areas having the agro-pastoral economy. In these areas common leopard have been persecuted because of the increasing conflict with local communities. This conflict has become the major threat to the conservation of this species and the issue has attained the status of national priority due to which government is under intense pressure from rural communities who are demanding compensation for their livestock losses to leopards, as well as other carnivore species (Dar *et al.*, 2009). Thus keeping in view the importance of the issue in question, the present study was conducted on the human-leopard conflict in Machiara National Park (MNP).

## METHODOLOGY

**Study area:** Machiara National Park (longitude 73-37°E and latitude 34-31°N) is situated in the foot hills of Himalayas at about 35 km north of Muzaffarabad city along the right bank of the Neelum River. It covers an area of 13,532 hectares possessing different types of ecosystems ranging from moist to dry temperate coniferous forests with an altitudinal range of 1350-5000 m. *Pinus roxburgii*, *Pinus wallichiana*, *Cedrus deodara*, *Abies pindrow*, *Aesculus indica*, *Quercus delitata*, *Taxus wallichiana*, *Juglan regia* and *Betula utilis* are the most important and familiar trees in these forests (Ayaz, 2005). The study area consists of three union councils, including Bhari, Machiara and Sarlisacha (Fig. 1). The surrounding forests of these union councils having the habitat of common leopard were extensively surveyed to record the conflicts.

Twelve monthly surveys were conducted from January, to December, 2011 to assess the livestock depredation

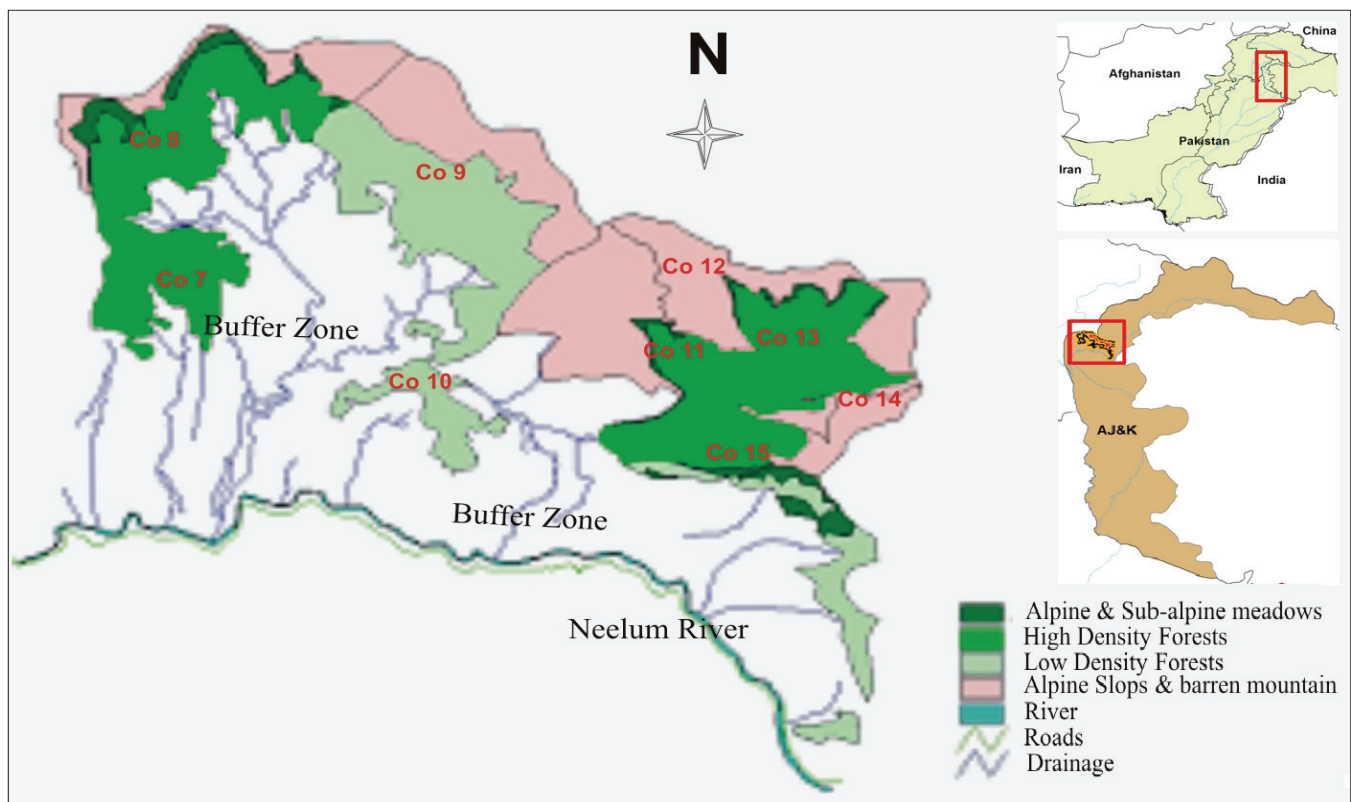


Fig. 1: Map of the study area; Machiara National Park © GIS Lab, WWF Pakistan

by the common leopard. Data were collected on prescribed questionnaire forms through unstructured interviews, participatory observation and focus group discussions, and by quantitative methods (structured interviews). The structured interviews, conducted from 232 randomly selected respondents in MNP, were the main data source. Data gathered from field through wildlife field staff were pooled in Statistix (ver. 8.1) and analyzed statistically using one-way ANOVA. Results were presented using least significant difference (LSD) of groups such as livestock type, time of depredation, season and month of depredation.

## RESULTS AND DISCUSSION

A total of 356 livestock heads were killed by common leopard during the study period (Table 2). Highest depredation was noted on goats (71.9 %) followed by sheep (14.6 %) and dog (8.1 %), while minimum depredation was recorded on cows. Analysis showed a significant difference in depredation between goats and other livestock species (Fig. 2). Present results supported the earlier study by Ayaz (2005) and Dar *et al.* (2009) who also reported higher depredation on goats followed by sheep in MNP. This could probably be due to the reason that goats have close resemblance with leopard's natural prey species, the wild caprinae which were abundant in the study area. Goats also make ideal leopard prey as they often prefer to browse understorey shrubs that are common in MNP. Same cover is

used by leopard in order to ambush the prey. Secondly, smaller animal could quickly be dragged to a safe place as compared to large livestock species such as cows and horses. Similar observations were also reported by Sangay and Vernes (2008).

Table 1. Livestock population around MNP

Kind	Number	%age Composition
1. Buffaloes	2,234	6
2. Cows	12,658	34
3. Bulls	3,351	9
4. Goats	11,541	31
5. Sheep	6,702	18
6. Equine (horses, mules & donkeys)	745	2
Total	37,233	100

Source: Ayaz. M (2005). Management plan of MNP, Wildlife Fisheries Azad Kashmir.

Highest depredation was recorded in summer months followed by spring, winter and autumn (Fig. 3). Means of LSD test showed significant difference between summer and autumn season depredation; however, non-significant difference was noted between rests of the seasons. This pattern of depredation was due to living style of local inhabitants. People moved spatially in

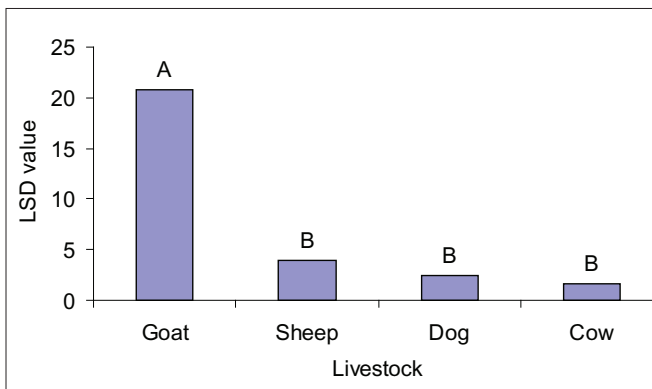


Fig 2. Comparison of LSD values for different types of livestock depredation in Machiara National Park during 2010-11.

summer season to higher altitude areas of the National Park where livestock remained in the open at night because of non-availability of shelter in *Bahaks* (summer dwellings of both herders and livestock at high elevation rangelands) and descended down to their permanent residences at the end of summer season. Human presence resulted in pushing the natural prey species of the leopard away from their habitat hence leopard prey on their livestock. Furthermore, livestock are plentiful and easy target to capture and kill as compared to wild prey. Leopard's natural prey species returned to their habitat after the herders and their livestock left at the end of summer to reach their lower altitude winter residences. In the absence of any livestock at higher elevations minimum depredation was recorded in the autumn. As weather became harsh during winter the leopards were compelled to move near human settlements that resulted in upshot of depredation again.

Livestock depredation varied in different months, however a gradual rise was observed from January to June and then it decreased from June to December (Fig. 4). LSD analysis showed that there was a significant difference ( $p < 0.05$ ) between June and rest of the months that proved the maximum depredation during this month (Fig. 5); this supported the earlier findings of Dar *et al.* (2009). Trend showed the minimum depredation in autumn, a gradual increase starting from February to May, remarkably higher in June and an abrupt decline in July and September. This behavior of depredation was synchronous with movement of livestock with the local inhabitants; as they start their spatial migration to the National Park from May and return in August. There was minimal or total absence of protection for goats at night in the park. Depredation of other livestock species i.e., cows and sheep also showed a similar trend. However, dogs were more vulnerable to depredation in winter because of no night protection during this season. High depredation trend of dogs was noted in winter season that gradually declined towards the summer season, though it shot up in June again. Most watch dogs were killed by leopards in June during night time.

Most of the depredation was noted at night as compared to day time (Fig. 6). There was a significant difference ( $p = 0.048$ ) between night and day time depredations showing high rate of depredation during night. It is mainly due to the nocturnal habit of the leopard. Another factor could be that during night time and particularly in summer and spring seasons, watch and ward conditions are very poor. Rabinowitz (1989) and Dar *et al.* (2009) also reported the similar behavior of the leopard in their studies. People mostly depend upon watch dogs during night. It provides an open opportunity to the leopard to attack livestock as dogs can often be ineffective in deterring leopard attacks during night (Kolowski and Holekamp, 2006).

There was high economic loss due to leopard depredation in different villages of the Machiara National Park. The loss was estimated based on market price of killed animals. Results showed that highest loss (PKR= 1.611m) was of goats killed by leopard during study period followed by cows (PKR= 0.733m), sheep (PKR= 0.225m) and dogs (PKR= 0.124m) (Fig. 7). The human-leopard conflict was found to be an acute problem in MNP, where people keep a large number of livestock for their daily subsistence and livelihood. The phenomenon is well documented in literature (Wang and Macdonald, 2006; Sangay and Vernes, 2008). Earlier studies showed that leopard was responsible for 94.1% of livestock loss in Machiara National Park (Dar *et al.*, 2009). The results suggested that the conflict was more severe in high pastures, inside and at the edges of forest. Dogs seem to be the most effective tool to protect livestock and help reduce the economic loss of villagers, they often intimate the herder from the expected leopard attack during day time in the pastures. Intensity of predation could be reduced by adopting good surveillance and protection measures.

Although the leopard is protected by national laws, it is still killed in retribution by those who lose their livestock to leopards. This is considered to be a major problem for leopard conservation. The leopard attacks on livestock is common and local villagers have become used to this conflict and have developed certain precautionary measures to minimize the risk, such as effective nocturnal livestock management and herding during daytime. Leopard attacks on humans are uncommon and were not noted during the study period in MNP. It is believed that people and leopards can coexist in MNP, but for this coexistence the human-leopard conflict must be resolved through insurance scheme of livestock.

The strategies that could be implemented in an attempt to lower livestock loss may include enhanced guarding, construction of predator-proof pens and grazing the livestock in areas that are away from core habitat of leopard. Encouragement of better breeds of guard dogs

could greatly reduce depredation or avoid predator form the livestock. Livestock insurance scheme should be introduced in this area to compensate the poor villagers in order to conserve leopard in Machiara National Park.

Table 2. Comparison of different types and numbers of livestock depredated during study period in Machiara National Park.

	Goats	Sheep	Dogs	Cow	Total
No. Killed	256	52	29	19	356
Percentage	71.9	14.6	8.2	5.3	100

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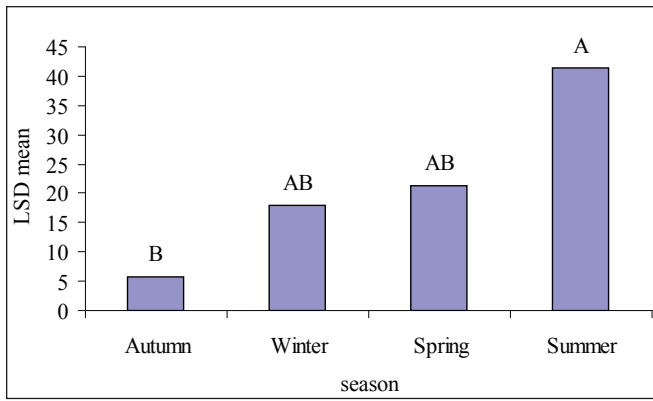


Fig. 3: Comparison of LSD values of livestock depredation by common leopard in different seasons of the year in Machiara National Park during 2011.

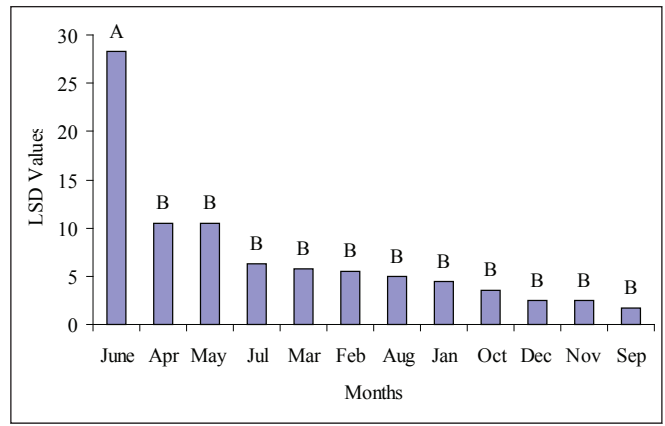


Fig. 5: Means of Least Significant Difference of livestock depredation by common leopard in different months of the study in Machiara National Park during 2011.

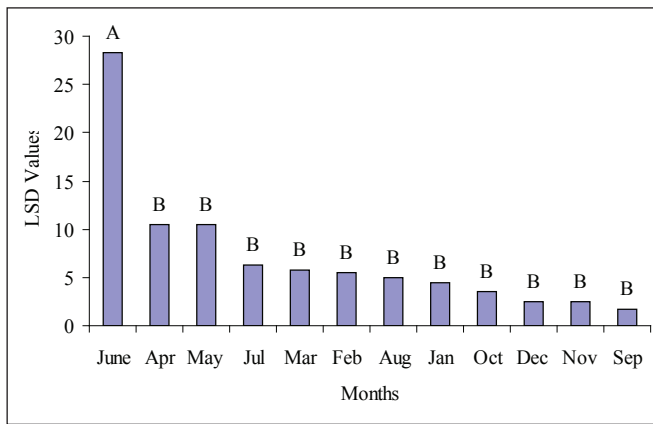


Fig. 5: Means of Least Significant Difference of livestock depredation by common leopard in different months of the study in Machiara National Park during 2011.

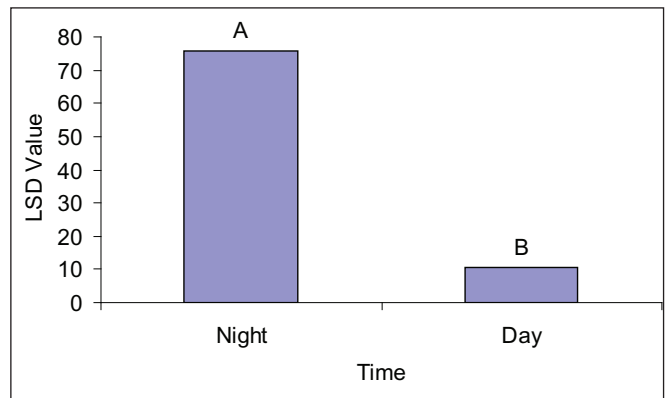


Fig. 6: Comparison of LSD means of livestock depredation in different times in the Machiara National Park during 2011.

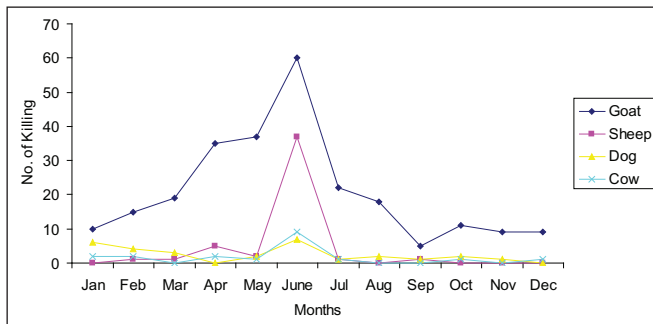


Fig. 4: Livestock depredation trend by common leopard in different months of study in Machiara National Park during 2011.