STATUS OF SNOW LEOPARD AND CONFLICT PERCEPTION IN KANGCHENJUNGA CONSERVATION AREA, EASTERN NEPAL.

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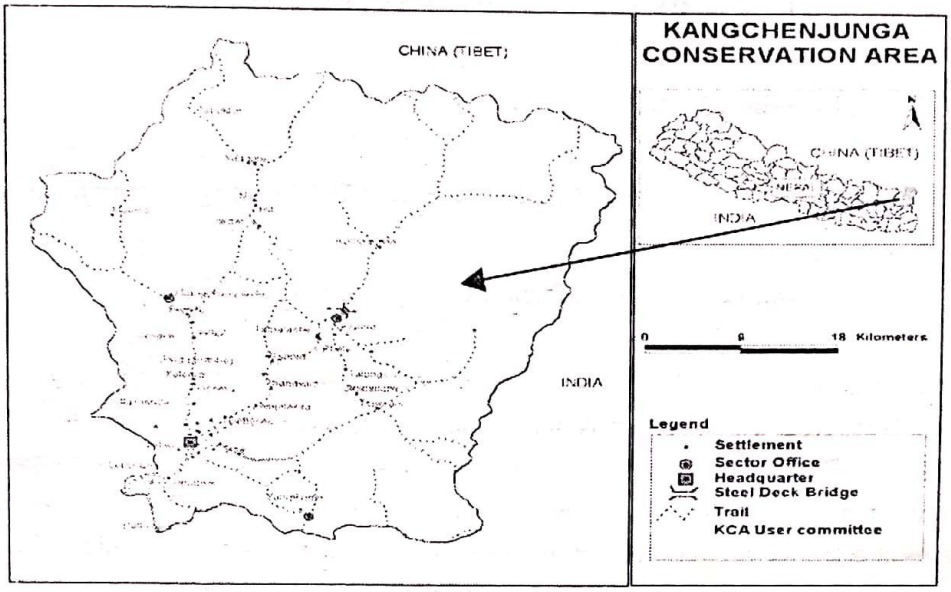
Kangchenjunga Conservation Area (KCA) is situated in the Taplejung district at the north-eastern region of Nepal. Livestock keeping is the main activity of people for making a living amidst a conflict with snow leopard (*Uncia uncia*). Each year snow leopard kills a number of livestock resulting significant economic losses for the poor people living in this remote area. Unless the people – snow leopard conflicts is well understood and appropriate conflict management activities are implemented, the long run co-existence between people and snow leopard – especially the existence of snow leopard in this part of the world–will be in question. This has now become an utmost important as the aspiration of the people for economic development has risen significantly and the area has been open to tourism. Study was done by counting snow leopard signs walking systematically in total 18 snow leopard sign transects covering 18.01 km in length in three sites, i.e. Lonak, Khambachen and Dudhpokhari of the Conservation Area. The average sign density was 12.63/km. The livestock depredation by snow leopard for one year (2005-06) was studied by interviewing the herders to understand the responsible and specific bio-physical and economic factors. The study revealed that sub-adult yaks were mostly hunted by snow leopard. Cattle's' winter (December-April) pastures are most vulnerable sites for predation. Presence of bushes, forest and boulders and rugged mountain crevices make good hides for snow leopard. The study also showed that a lax animal guarding system was significantly responsible for high livestock depredation by snow leopard. Blue sheep was observed by walking in selected trails and from vantage points. A total of 354 individual sheep of different age and sex of 14 different herds were recorded during the study period. The study showed that improvement in livestock guarding system should be adopted as the most important activity. However despite the importance of livestock in the KCA it is still not well understood why the herders neglect for proper livestock guarding. Proper guarding system required in winter pastures to reduce the depredation pressure.

Key Words: *Uncia uncia,* Kangchenjunga Conservation Area, livestock depredation, blue sheep.

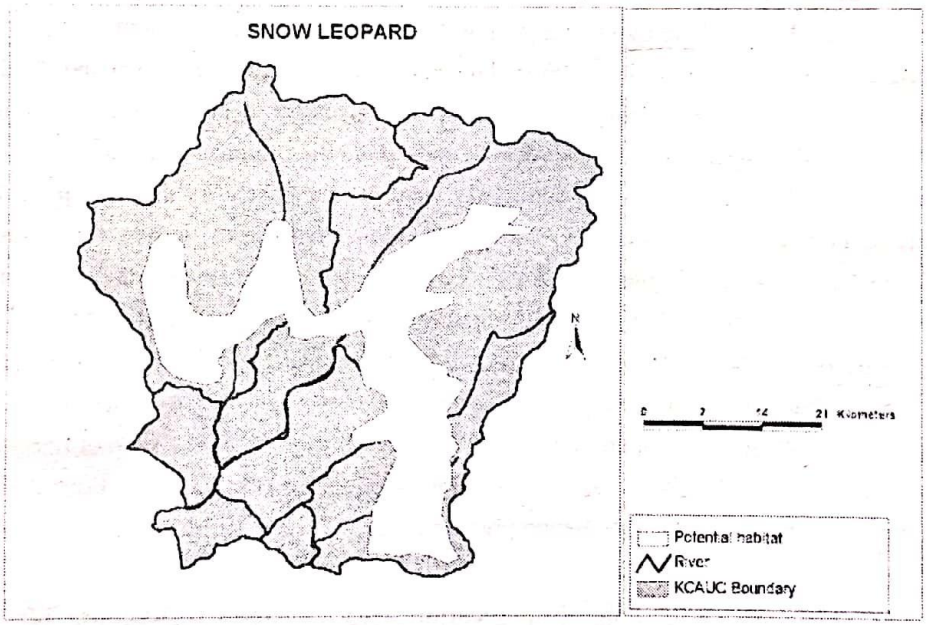
INTRODUCTION

KCA lies in northeast region of Nepal (27.15'-27.56' North to 87.32' to 88.65' East) bordering to Sikkim of India. It is an extraordinary landscape with unique floral and faunal diversity, breathe-taking scenery, and rich cultural heritage (Map 1 & 2). Biogeographically, it lies in eastern Himalayas (Olson and Dinerstein 1998). A rare, sparsely distributed and secretive animals such as the Snow leopard (*Uncia uncia*) presents significant difficulties in assessing its distribution in isolated and rugged terrain of its typical range. Efforts to determine the distribution and abundance of snow leopard therefore rely in large part on indirect sign such as tracks and markings (Jackson and Hunter 1996 and Fox *et al.* 1991).

Map 1: Kangchenjunga Conservation Area



Map 2: Potential habitat of snow leopard



The harmonious coexistence between snow leopard and subsistence herders in the western Himalaya and Central Asia has become a top concern for conservationists since long. But yet the down to earth inter-relation between the two livings has to be well understood very specifically for each of the villages and pastures. Unless the interfaces of the existence are understood and appropriate strategies are applied, harmoniously the coexistence cannot withstand. The greatest anger of the herders against snow leopard arises when the elusive and endangered cat depredates on livestock in heavy number. It has been understood that the depredation amount differ by season, livestock species, location, and very importantly by the herding practices which are site specific. These factors should therefore be studied for each site separately and coexistence strategy should be developed and applied specifically for each site.

The study was conducted in some parts of KCA to assess the current status and distribution of the snow leopard and to record its livestock predation trend.

METHODS

An indirect census method was used in the present study to estimate the population status, the habitat usage and the distribution of the snow leopard. The snow leopard leaves marks in the form of scrapes, scent spray (urine mark), scat (feces) and pugmarks (Ahlborn and Jackson 1988). These marks can be indexed to derive information on abundance using a standardized methodology 'the Snow Leopard Information Management System (SLIMS)' (Jackson 2005 and Jackson and Hunter 1996).

Using the SLIMS protocol, sign surveys were conducted in the probable habitats in three valleys such as Khambachen, Lonak, Jimbubari, Pangpema Base camp and Dudpokhari Area ranging from high to low human usage. Transect routes were plotted on available 1:500000 topographical maps, and were placed along land forms where leopard sign is likely to be found, such as on ridge lines and along the base of cliffs. To minimize transect variability, transects were short and laid in rarely crossed habitat (i.e. forest, shrub land and grass land) boundaries. All transects were walked by observers and all type and number of signs were recorded accordingly. At each site where snow leopard signs were encountered, various parameters including elevation, aspect, vegetation cover, dominant topographic feature, landform ruggedness, and land use pattern were recorded. Sign placement was considered as an indicator of leopard's preferred habitat. During the data analysis, sign density expressed in number of sign per kilometer of transect were calculated for each transect.

For Blue sheep study, fixed- point counts from ridgeline vantage points were conducted using the methods detailed by Jackson and Hunter (1996). Survey blocks were outlined on maps and observation sites identified. Each block was scanned thoroughly and observed sheep were counted and categorized to sex and age class when possible.

Local herders and residents were interviewed on snow leopard abundance and livestock depredation rate and pattern. Information from them were also obtained on land use practices such as grazing areas for their cattle and sheep and extended usage of alpine pastureland.

RESULTS

Status of Snow Leopard

The sign survey was conducted from September 2005 to May 2006. During the study period, we walked 18 transects covering 18.01 km length in two different time period. The sign abundance between transects in two different time frames were not significantly difference i.e. Sept to Nov 2005 and Feb to May 2006. Altogether, 202 signs of Snow leopard were encountered. Among the total observed signs, 60% signs were scrapes (121), 37% scats (74) (fecal deposits) and least was scent spray and pugmarks (Fig 1 and 2). Lonak area had higher Snow leopard sign density (41.11/km) which found to have increased in comparison with first survey (Sept to Nov 2005) i.e. 37.65/km.. Dead remains of adult male Snow leopard were found in Chijima area during the study period.

The Snow leopard sign were mainly distributed between the altitudes 3800m to 5100m in the Ghunsa area of KCA. The topography most frequently associated with sign was ridgeline (60%) followed by valley bottom (20%) (Table 1) hill sides or other landforms made up the remainder of the sites (15% and 7% respectively). Scent sprays were predominantly found in the valley bottom (55%) while scrapes and feces were usually noted along ridgelines (82.4% and 52.4% respectively).

Figure 1: Occurrence of snow leopard signs in Transect

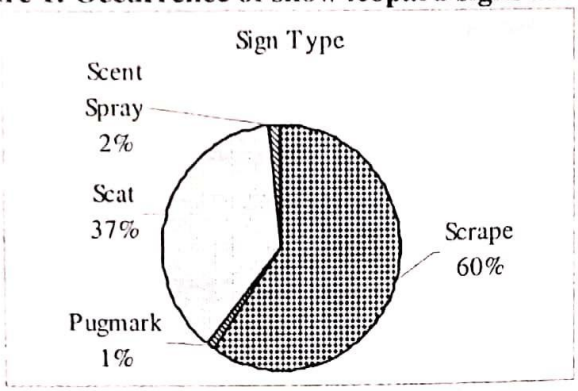
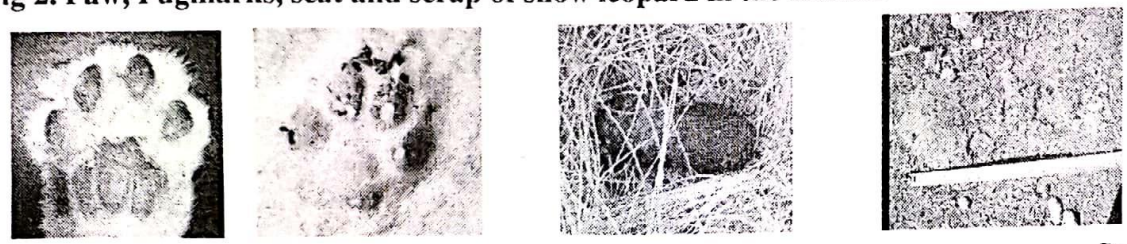


Fig 2. Paw, Pugmarks, scat and scrap of snow leopard in the habitat



Paw Pugmark Scat Scrap

Table 1. Dominant topographic feature of snow leopard sign sites by sign type along transect in KCA, 2005-2006.

Sign type	Dominant Topographic Feature			
	Valley Bottom	Ridgeline	Hillside	Other
Scats (n = 74)	21.5	52.4	12.6	4.5
Scraps (n = 121)	8.6	82.4	7.5	2.5
Scent sprays (n = 5)	55	20	25	00

Feces and scrapes were observed most often associated with ridgeline with the large boulders while scent or urine sprays were usually targeted at cliff base or over hanging boulders. Vegetation type at the sign site tended towards alpine scrub (shrub habitat) (70%) grassland (22%) or barren (8%).Five different pugmarks of Snow leopard were confirmed (Figure 2).

Human-Snow leopard interaction

Interviews with 26 households (herders/key resident in Ghunsa, Khambachen and Lonak with traditional / conservative animal husbandry practices) reveled that more than 51% had negative attitude towards Snow leopards due to its livestock depredating nature (Fig 3).

Livestock depredation

The livestock herding system of KCA has the seasonal grazing over various pastures in a year. Out of 26 households surveyed during August- September 2005, 20 reported that they have livestock depredation by Snow leopard in 2004 and up to October of 2005 (Fig 4). Other respondents reported that they had no loss of livestock from Snow Leopard during that period although they were lost livestock by diseases, winter snow and accident.

During the one year period (2005-2006), out of 38 livestock lost, 36 livestock were killed by Snow leopard in the Khambachen, Lonak and Olangchungola area. The Snow Leopard depredated the livestock during all the months in year however, 70% of the depredation occurred during some winter months (December to February).

Status of Blue sheep (*Pseudois nayaur*)

The Blue sheep (*Pseudois nayaur*) is the principal prey of endangered Snow leopard in Nepal Himalaya (Jackson 1996). A total of 354 individuals of different age and sex of sheep were recorded during the study period in 14 different herds which comprised 26% males, 64% females and 10% were yearlings (Fig. 5). Four types of herds were recognized; Adult male-Adult female 21%, Adult female only 14%, Adult male only 7% and mixed heard (Adult male, Adult female and Yearling) 58%. The average herd size was 25.5 per herd. The largest herd of sheep was 92 and least was 3. The habitat encroachment by the livestock is the major threat. Conservation of this species seems vital as it is prime prey species of snow leopard of KCA.

Figure 3: Attitude of local people towards Snow Leopard

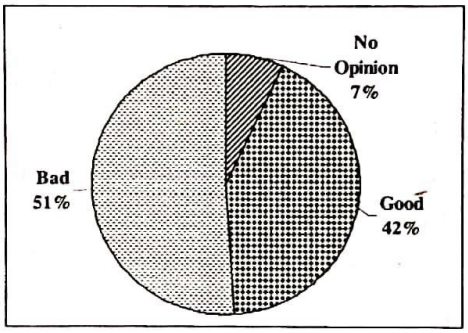


Fig 4 Snow Leopard hunted remains in the study area.

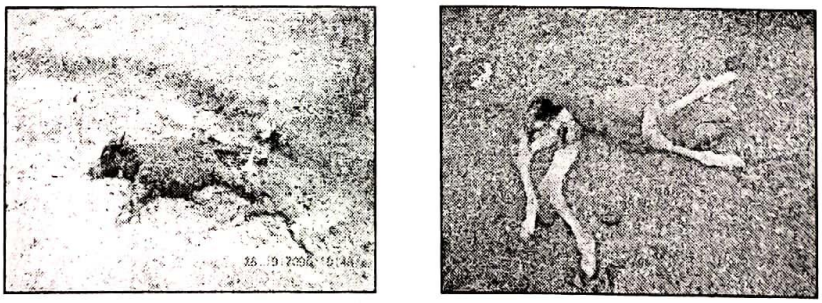
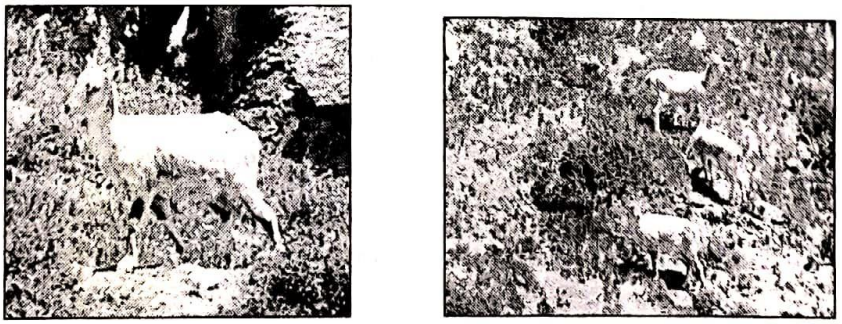


Fig. 5 Blue sheep yearling and a herd in the habitat



DISCUSSION

The presence of snow leopards in Kanchanjunga conservation area has already been reported by Carpenter *et al.* (1994), recorded the different snow leopard signs. At present study, we systematically laid the 18 snow leopard sign transect with 18.01 km length. Similar study was carried out by Ale (2004) and altogether, 24 transects were walked covering 13.4 km in length. Thirty three (10 relic and 23 non-relic) snow leopard sign sites and 56 signs were counted. Pugmark method was used by many biologists (Mc Dougal 1997, Tamang 1982, Sunquist 1981 and Choudhary 1971) to estimate the rough figure of Tiger population because it is reliable, easier, cheaper and more precise. The pugmark survey method was successfully practiced and employed to estimate the abundance of Snow Leopard in Langtang National Park, Nepal too (Chalise, *et al.* 2005, Kyes & Chalise 2005 and Khatiwada 2004). In the present study, this method was employed to estimate the abundance of Snow Leopard in Kangchenjunga Conservation Area. During the study period, five different sizes of Pugmarks were observed. McCarthy and Munkhtsog (1995) reported similar study applied in Mongolia and found 21 instances of Pugmarks. Highly cryptic coloration, reclusive and mostly solitary behavior, sparse distribution in relatively inaccessible mountains make Snow leopard surveys extremely difficult (Malik 1995).

The animal tending system in KCA was found to be poor. During day time the animals were mostly unattended. The herders left the animals almost free in the pasture throughout the day. They stayed in a distance at a comfortable terrace instead of moving after the animals continuously. So most of the animals were killed when they were unattended by a herder. Also the corrals were found to be poorly structured in all the pastures although night killing was very low in the area. The study showed that sub adults yaks are the most vulnerable species to snow leopard depredation in KCA. Gurung and Thapa (2004) reported that annually in Phoo village inside Annapurna Conservation Area there is a 4.07% livestock loss because of snow leopard depredation. Wildlife damage is a major source for conflict between local communities and protected areas managers in the Himalaya (Jackson and Hunter 1996; Oli *et al.* 1994).

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