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# Living with Large Carnivores: Mitigating large carnivore-human conflicts in Kargil, Ladakh, India

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Photo from upper left: Red fox (with a kill of domestic fowl), Himalayan brown bear (mother and a cub) and meeting with local communities.

Cover page photo: Predator proof corral pen.

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# Introduction and Background

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Conflict with humans is a worldwide issue in large carnivore conservation (Nowell and Jackson, 1996; Bagchi and Mishra, 2004). Such conflict is seen with pumas (*Puma concolor*) and jaguars (*Panthera onca*) in Brazil (Conforti and Azevedo, 2003; Zimmermann, 2005), lynx (*Lynx lynx*) in France (Stahl *et al.* 2001), leopards (*Panthera pardus*) in Bhutan and India (Wanga and Macdonald, 2006; Rahalkar, 2008), wolves (*Canis lupus*) in Europe (Merrigi and Lovari 1996; Landa *et al.* 1999), tigers (*Panthera tigris*) in India and Indonesia (Bagchi *et al.* 2003; Nyhus and Tilson, 2004), and lions (*Panthera leo*) in Africa and India (Saberwal *et al.*, 1994; Patterson *et al.* 2004).

Carnivores often cause serious economic and social losses by preying on livestock, causing damage to property and general community insecurity, and in exceptional cases, human injury or death (Madhusudan and Mishra, 2003; Mishra *et al.*, 2003; Distefano, 2005; Ogra and Badola, 2008; Ogra 2008; Lee, 2011). The economic loss due to snow leopards (*Panthera uncia*) and wolves in Spiti region of the Indian Trans-Himalaya has been estimated at US\$ 128 per family annually, amounting to about half the per capita income of the state (Mishra 1997). Also a similar study by Maheshwari *et al.* (2010) revealed more than 2% livestock loss every year due to snow leopard, Tibetan wolf and Himalayan brown bear (*Ursus arctos isabellinus*) in Kargil, Ladakh. The impact is exacerbated if the loss is of human life. Loe and Roskoft (2004) estimated that 12,599 people have been killed in the 20<sup>th</sup> century by tigers in Bangladesh, China, India, Indonesia, Malaysia, Myanmar, Nepal, Russia, Singapore, Thailand, and Vietnam. Similarly, leopards in India, Nepal, South Africa, and Uganda have been found to be responsible for the death of 840 people. The antagonism arising from conflict with carnivores pushes people towards retributive killings, which have a substantial impact on the carnivore populations and thus undermine conservation efforts (Woodroffe *et al.* 2005, Dickman, 2008; Hazzah *et al.*, 2009). Therefore, reducing

antagonism caused mortality is an important strategy for conservation of carnivores (Lee, 2011).

The present project was originated from the findings of the previous study (Maheshwari *et al.* 2010) in the same study area (Kargil). As a pioneering initiative, that study confirmed the presence of snow leopard in Kargil areas of Ladakh. Eastern Kargil was identified as one of the most promising areas during previous surveys for camera trapping and construction of a predator proof corral pen. The potential habitats for large carnivores were identified but their survival is threatened because of decline in prey base and hunting. The large carnivore-human conflict is posing a threat to wildlife at some of the localities of Kargil and needs to be mitigated immediately to conserve the large carnivores and maintain the co-existence between humans and wildlife. In addition, findings of the previous study showed that livestock depredation by large carnivores instigates retaliatory killing of snow leopard and Tibetan wolf in Kargil. Scat analysis revealed that domestic livestock comprised 45.5% of the diet of snow leopard while for Tibetan wolf domestic livestock comprised 54.6% of the diet. The value of overall density estimated 0.09/km<sup>2</sup> for Asiatic ibex and for Ladakh urial 0.06/km<sup>2</sup> in areas surveyed during 2009 through vantage points. It shows the high proportion of livestock depredation, low availability of prey base and represents the extreme of large carnivore-human conflicts in Kargil.

Therefore, keeping this in view, predator proof corral pens were proposed in Kargil to protect domestic livestock from depredation by snow leopard and Tibetan wolf. In the conservation awareness workshop (organised during the previous surveys) this issue was discussed with the locals and they were encouraged to avoid hunting. They also requested that basic infrastructure to protect their livestock such as predator proof corral pens are provided to them.

Useful population estimation could not be done due to the rapid nature of the previous surveys. Therefore, in this study, camera trapping was also conducted to establish the relative abundance of snow leopard in Kargil.

This study was felt necessary to establish the following *objectives*:

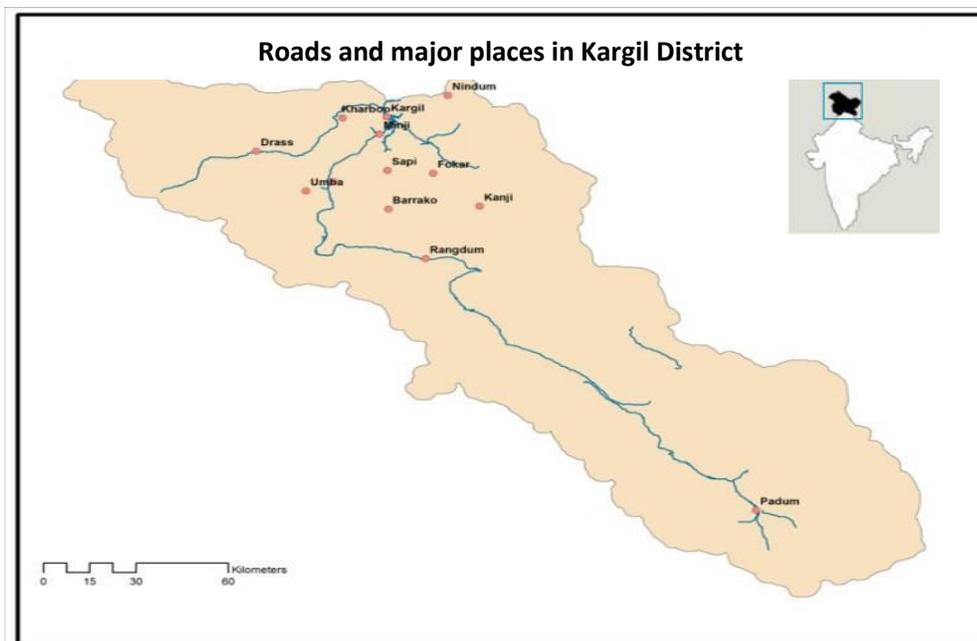
- 1. To study the relative abundance of snow leopard through camera trapping**
- 2. To undertake measures for mitigating snow leopard-human conflicts.**

# Study Area

Kargil district in the state of Jammu and Kashmir, India was once known as Purig. Purig included the areas around Kargil town, the Suru Valley, Shaghar Chiktan, Pashkum, Bodh Kharbu and Mulbek. Almost 14,000 km<sup>2</sup> in area, Kargil district has an agrarian population of approximately 120,000 people, who cultivate the land along the course of the drainage system, wherever artificial irrigation from mountain streams is possible. Kargil is also a town, which serves as the headquarters of Kargil District. It is located at 37.57° N to 76.1° east, 60 km from Drass, 220 km from Srinagar and 230 km from Leh.

The study area falls in the Kargil and Suru Valley of Trans-Himalayas. The only information available on wildlife from the Zaskar and Suru Valley is about the status of brown bear – human conflicts (Sathyakumar 2003), wildlife conservation status and planning of a Protected Area network in Ladakh (Chundawat and Qureshi 1999) and also the 1<sup>st</sup> phase of this study (Maheshwari *et al.* 2010). The forest types of Kargil are temperate and alpine forest. The four distinct seasons are spring (March–May), summer (June–August), autumn (September–November) and winter (December–February).

Figure 1. Study Area: Kargil district showing major places and roads.



# Methods

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## **1. To study the relative abundance of snow leopard through camera trapping**

Camera trapping is an advanced technique which allows photographing of elusive and rare animals either through detection of body heat i.e. passive photo trapping or by breaking of an infrared beam that is emitted from the camera trap device by the passing animal i.e. active photo trapping. Individual snow leopards can be identified easily as each animal has a unique spot pattern. Since direct sighting of a snow leopard is rare in wild conditions, identification of individuals was only possible using remote photography. In India, the photographic capture-recapture estimate for enumerating the abundance of a large cat species was first obtained for tiger by Karanth in 1995 and for snow leopard by Jackson *et al.* in 2005.

## **2. To undertake measures for mitigating snow leopard human conflicts**

From the previous study (2010), a village was identified and one predator proof corral pen was proposed to be constructed in coordination with the locals. Such predator proof corral pens have been set up in the other snow leopard ranges to avoid livestock depredation by snow leopard and Tibetan wolf. The basic material for construction such as stones, mud etc was purchased and the corral pen was constructed on the livestock owner's property or land. Identification of the site for corral pen was done on the basis of depredation rate and acceptability and support of the local communities. The construction was done on a cost sharing basis.

# Results

This study was initiated in 2011 to manage the snow leopard-human conflict and conduct camera trapping on snow leopard in Kargil. The work was hampered due to the severe cloud burst in Ladakh during August, 2010. It not only had an effect on our field work but had severe impact on entire life of Ladakh. Tremendous and timely efforts by several agencies helped Ladakh to recover from this trauma and these relief programmes are still continuing in Ladakh.

## PHOTOGRAPHIC CAPTURES OF SNOW LEOPARD

Camera trapping was conducted during 2011-2012. Initially, a systematic grid based design was planned to conduct camera trapping but considering the low number of camera traps (n=04), we opted for an opportunistic approach i.e. based on our previous and current data (Maheshwari *et al.* 2010), we laid the camera traps. We applied our previous and current data from reconnaissance intensive surveys for suitable camera stations, which resulted in a 100%



Camera trap capture of snow leopard in Kargil

success rate in capturing of snow leopards at each camera trap. We deployed double sided camera traps at both the camera stations to ascertain the identification of snow leopard with confidence from the photographic captures of both flanks. We obtained 02 captures of two different individuals from a trapping effort of 130 trap nights. We could not get any recapture of these captured individuals, thus, in limitation of computer programme CAPTURE (Otis *et al.*, 1978; White *et al.*, 1982; Rexstad and Burnham, 1991), as of now, we

cannot comment on the density of snow leopards in the sampled area. For that, we have to continue camera trapping in these areas and are trying to acquire more camera traps to maximize our efforts. Apart from snow leopard, the camera traps delivered photographs of red fox, blue sheep, feral dogs, domestic livestock and human beings.

### PREDATOR PROOF CORRAL PEN

A recent (July, 2012) incident of livestock depredation occurred in the village we identified for construction of one predator proof corral pen (detailed comparison on livestock depredation by large carnivores is summarized in table 1). The killing of a *dzo* (hybrid of yak) calf by a snow leopard demonstrated the need for a corral pen instead of a traditional livestock shed.



Predator proof corral pen

Upon demonstration of the benefits of a corral pen, the local communities agreed that retaliatory killing of snow leopard and Tibetan wolf can be avoided if predator proof corral pens can be provided.

The first and second corral pens for sheep and goats were 20 X 30 and 10 X 15 feet in dimensions and with a 6-foot and 3-foot high stone wall respectively. Both had an open roof covered by 4 X 4 inch wire mesh and supported with wooden poles at every 5 feet. Each of the structures had two covered windows and a single closely-fitting iron door that can be securely locked at night.

Table 1. Livestock depredation by large carnivores in Kargil, 2009 to 2011 (*Total livestock population in these sampled villages of Kargil, n=14483*)

Large carnivores	Total livestock loss		
	2009	2010	2011
Snow leopard	75	97	86
Tibetan wolf	179	223	226
Himalayan brown bear	9	39	26
Unidentified	159	106	93
<b>Total</b>	<b>422</b>	<b>465</b>	<b>431</b>

# Discussion

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The successful camera trap capture of snow leopards is one of the most important outcomes to have emerged from this work and these preliminary findings can be utilized to understand potential areas for snow leopard in Kargil. The reason behind the lack of recaptures could be an extremely low prey density which leads to huge home ranges i.e. predators have to travel long distances in search of prey and rarely continue to stay at one site for a long duration except when mating.

In a pioneering initiative, the corral pens that were constructed were appreciated by local communities. We had initially proposed only one predator proof corral pen but with the help of local communities the cost sharing was done in such a way that labor costs were reduced and locals voluntarily involved themselves in the work and as a result two corral pens were constructed successfully in place of one corral pen. Now, people from other villages have requested that corral pens be constructed for them in a similar fashion. But for this additional funding support is needed.

Our Phase I and Phase II work has provided important information on the wildlife of Kargil and on several issues such as large carnivore-human conflict, hunting, demographic information of sampled areas of Kargil. In general, we feel that the lack of basic infrastructure to maintain livestock and scientific knowledge on snow leopard hamper conservation efforts. In addition, we realized that locals had very poor knowledge about the issues pertaining to wildlife conservation and its importance. They were not even aware of the Indian Wildlife Protection Act (IWPA). Therefore, conservation awareness workshops were organized at both the administrative and local level. Such specific workshops were also organized for students and teachers in Kargil.

Kargil was a battlefield during the late 1990s and some of the areas were “sensitive” and beyond our reach. Also, it is a challenge to work in such inhospitable habitats with bad and unpredictable weather should also be kept in mind. The cloud burst in Ladakh in August

2010 hampered our work in Zaskar and harsh field conditions also threatened our survival a couple of times.

We tried our best to secure additional funding to buy more camera traps but could not succeed. Therefore, we had to make do with only four camera traps, which yielded successful results.

Red fox was recorded scavenging on the kills made by a snow leopard. For example, a horse and six sheep and a goat were killed by a snow leopard in two different attempts. A group of red foxes took advantage of the absence of snow leopard to scavenge the kills. Camera traps recorded the movement of snow leopard followed by red foxes on these kills. A minimum of 09 minutes interval was recorded between a visit by a red fox at the kill and snow leopard. It clearly demonstrated the opportunistic



Red fox on a horse kill from camera trap

feeding behavior of red fox.

We need to follow up on the camera trapping and require more camera traps for adequate sampling. Also, there is a persistent demand for more corral pens in Kargil. Altogether, our results from both phases clearly showed the importance of this work i.e. first, we collected base-line information on snow leopard and associated species with emphasis on large carnivore-human conflict and identified potential areas for wildlife as well as categorized the high, medium and low conflict zones in Kargil. Second, we conducted camera trapping to know the relative abundance of snow leopard along with measures to reduce the loss of livestock by snow leopard and Tibetan wolf through corral pens to avoid their retaliatory killing. Our results provided valuable insights for the improvement of overall conservation goals for snow leopard in Kargil.

For the way forward, we propose more robust camera trapping to estimate the density of snow leopard, capacity building of Department of Wildlife Protection, Kargil and supporting construction of predator proof corral pens in Kargil.



Wildlife conservation workshop for students and teachers in Kargil

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Snow leopard from camera trap



Red fox from camera trap



Snow leopard at a horse kills from camera trap



Asiatic ibex

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