IJCS INTERNATIONAL JOURNAL OF CONSERVATION SCIENCE

ISSN: 2067-533X Volume 9, Issue 1, January-March 2018: 179-184 www.ijcs.uaic.ro

PRELIMINARY OBSERVATIONS ON THE CRYPTIC FAUNA OF SIKKIM TRANS-HIMALAYA, INDIA

Tawqir BASHIR[1,2*], Tapajit BHATTACHARYA[1], Kamal POUDYAL[1,3], Sambandam SATHYAKUMAR[1]

[1] Department of Endangered Species Management, Wildlife Institute of India, Dehradun, 248001, Uttarakhand, India.
[2] Centre of Research for Development, University of Kashmir, Hazratbal, 190006, J&K, India.
[3] Namchi Government College, Kamrang, Namchi 737126, Sikkim, India.

Abstract

The Sikkim Trans-Himalaya remains one of the most threatened and least explored ecosystems in India in spite of its rich ecological and socio-cultural importance. We therefore aimed at conducting a baseline survey of its faunal diversity and the prevailing threats using sign surveys and camera trapping in the Lhonak catchment of North Sikkim during the spring of 2012. We confirmed the presence of Tibetan wolf (Canis lupus chanco) from the catchment through camera trap photos alongwith the records of seven other wild animal species. The carnivores in the area seemed to be under threat due to retaliatory killings by local herders in response to livestock depredation. Besides this, other potential threats to the biodiversity and the habitat included overstocking, feral dogs, infrastructure development and presence of defense forces in the area. We therefore propose extensive surveys and long-term monitoring exercises that could aid in resolving these issues and benefit towards efficient conservation and management of this unique Trans-Himalayan landscape of Sikkim.

Keywords*: Trans-Himalaya; Sikkim; Camera trapping; Tibetan wolf; Livestock depredation*

Introduction

The Trans-Himalaya represents one of the richest and most unusual ecosystems on earth [1]. The region is well recognized for its rich biodiversity including several threatened species, and supports the livelihood of millions of local human populations [2]. Spread over an area of approx. 2.6 million km² and constituting regions of Tibetan plateau and the Tibetan marginal mountains, it represents a vast rangeland system having considerable economic and socio-cultural importance [3]. However, this unique ecosystem is considered threatened due to over exploitation of resources and livestock grazing (overstocking) leading to rangeland degradation [4]. The region is also reported to be highly susceptible to global climate change [5]. Moreover, due to low productivity and high degree of resource seasonality, most of the animal species in this region occur in low densities [1, 6], and thus difficult to record and monitor. The rugged terrain, resultant inaccessibility, harsh weather conditions and logistic constraints append further limitations on conducting long-term ecological studies in such landscapes.

The Indian Trans-Himalaya classified under the Biogeographic Zone I is mostly represented by Ladakh in Jammu & Kashmir, Lahul & Spiti in Himachal Pradesh and northern Sikkim [7], with small portions found in Uttarakhand (Nanda Devi Biosphere Reserve and

* Corresponding author: tawqir84@gmail.com

Gangotri National Park). Although, extensive surveys have been conducted in the Changtang Wildlife Sanctuary, Ladakh and parts of the Tibetan plateau, most of the Sikkim Trans-Himalaya remains unexplored except a single short-term study in *Tso Lhamo* region [4, 8, 9]. The Trans-Himalayan landscape in Sikkim, together with being a part of the Eastern Himalaya biodiversity hotspot and located at the junction of three bio-geographic realms [6], forms a connecting bridge between the Trans-Himalayan landscape of Nepal, India, China, and Bhutan. Moreover, the area also supports the *Dokpa* and *Bhutia* pastoralist communities who constantly use the available resources to rear and herd their livestock. The area therefore represents an appropriate location for conducting detailed ecological study on interactions between pastoralists and wildlife. Therefore, as a preliminary step towards long-term ecological research, we aimed at collecting baseline information on the status of the cryptic fauna and livestock in the area, and documenting threats to their survival, and the ecosystem as a whole.

Material and Methods

Sampling was conducted during spring, 2012 in the *Lhonak* watershed of Sikkim Trans-Himalaya located in the northern part of Khangchendzonga Biosphere Reserve (BR, Fig. 1).

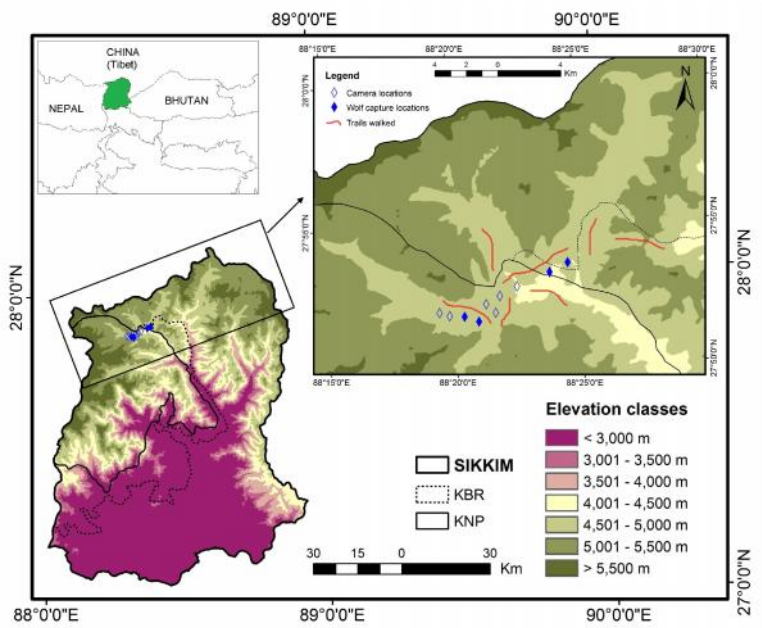

Fig. 1. Map showing the location of the study area, and distribution of trail, camera traps and wolf presence in the area

Lhonak catchment constitutes nearly 14% (i.e. 384 km²) of the Biosphere Reserve area out of which 99.72 km² was sampled. We carried out sign surveys along trails, ridges and *nullahs* (streams) during which evidences of animal presence (sightings, tracks, faeces, calls, kills, and feeding signs) were recorded. Encounter rates were calculated as the number of individuals/signs recorded per km walk. We also deployed a set of 10 remote-triggered infrared sensor camera units along animal trails at different locations to detect their presence in the area (Fig. 2a, Table 1). This method is efficient for inventories, especially of the cryptic fauna inhabiting landscapes with remote and rugged terrains [10, 11]. Photo-capture rates (PCR) were calculated as the number of independent photographs captured per 100 trap days of sampling

effort. Both encounter rates and photo-capture rates were used as indices of animal abundance. Information on distance walked during trail sampling, GPS location, elevation, slope, and aspect were recorded corresponding to each location of animal presence and camera deployment. In addition, information was collected on livestock depredation by carnivores through spot checks of kills and informal interviews with the Tibetan nomadic *Dokpa* and *Bhutia* yak herders.

Fig. 2. Images taken with the studied fauna: **a -** Camera trap deployment, **b** - snow leopard pugmark, **c** - sighting of snow partridge, **d-f -** camera trap photos of Tibetan wolf, Himalayan marmot and red fox, **g** - livestock grazing recorded in camera traps, and **h** - livestock depredation by Tibetan wolf

Table 1. Trail sampling and camera trapping efforts in *Lhonak* catchment of Sikkim Trans-Himalaya, April-May 2012

Trail sampling			**Camera trapping**			
Length (km)	**Elevation (m)**	**Walks**	**Trap Days**	**Elevation (m)**	**Slope (°)**	**Aspect**
3.8	4,625-5,080	4	23	4,600	15	SW
2.6	4,510-4,605	4	22	4,520	20	SE
5.9	4,465-4,650	4	23	4,580	10	NE
3.0	4,490-4,630	4	21	4,650	30	N
3.2	4,585-4,725	4	22	4,760	40	E
2.2	4,670-4,740	4	12	4,810	20	SW
3.6	4,610-4,830	4	21	4,740	25	NW
Total length walked = 97.2			20	4,750	20	N
			21	4,740	15	N
			20	4,790	25	NE
			Total camera trap days = 205			

Results and Discussion

Within our study duration, we were able to record the presence of eight wild animal species including five mammals and two galliformes (Table 2). The presence of Tibetan wolf, red fox *Vulpes vulpes* and Himalayan marmot *Marmota himalayana* was confirmed through tracks, scats/dung, kills, burrows, and camera trap photographs (Fig. 2d-f), however snow leopard *Panthera uncia* (scats & pugmarks, n = 5, Fig. 2b) and Tibetan snowcock *Tetraogallus tibetanus* (calls, n = 3) were only recorded through signs. Blue sheep *Pseudois nayaur* (n = 4), snow partridge *Lerwa lerwa* (n = 4, Fig. 2c) and Plateau pika *Ochotona curzoniae* (n = 9) were confirmed through direct sightings as well as signs.

Table 2. Encounter rates (ER) of signs and sightings, and photo-capture rates (PCR) of different species recorded in the study area, April-May 2012

Species	ER/km	PCR/100 trap days
Tibetan wolf	0.173±0.041	4.1±2.05
Snow leopard	0.057±0.04	-
Red fox	0.39±0.08	3.2±2.71
Himalayan marmot	1.05±0.20	7.9±3.93
Blue sheep	0.039±0.029	-
Plateau pika	0.082±0.029	-
Tibetan snowcock	0.09±0.05	-
Snow partridge	0.11±0.05	-
Feral dogs	-	13.73±9.26
Yak/*Dzo*	-	35.16±14.8
Humans	-	48.83±22.35

We walked a total distance of 97.2 km during our sampling surveys along different trails (n = 7, repeats = 4 each; Table 1). The sign encounter rate of Tibetan wolf was 0.173±0.041 signs/km; however, the highest sign encounter rate was recorded for Himalayan marmot (1.05±0.20 signs/km) and the lowest for Tibetan snowcock (0.09±0.05 signs/km). We camera trapped for a total of 205 effective trap days. Wolf was photo captured at four of the total 10 camera trap stations (Fig. 1), accounting for a capture rate of 4.1±2.05 photos/100 trap days (Table 2). Almost all the wolf photographs (n = 9) were recorded during night depicting nocturnal activity with majority of captures between 00:30-3:30 hrs. The entire marmot (n = 17) and red fox (n = 7) photo captures were however recorded between 09:30-13:00 and 19:00-23:00 hrs, thus depicting complete diurnal and nocturnal activities, respectively.

During our sampling we also encountered seven incidents of livestock depredation by wolves. The animals depredated were either the *Dzos* or calves of feral yak. Our conversation with local *Dokpa* and *Bhutia* herders (n = 23) revealed their negative perception towards the wolves. They reported wolves to be the main conflicting carnivores that predate on their livestock, and thereby badly affect their livelihood (Table 3). Persistent depredation by wolves was even confirmed during spot checks of kills. Few herders also advocated the presence of snow leopard in the area acting as another threat to their livestock. The presence of snow leopard has however been confirmed from the area during a recent camera trapping survey conducted by WWF-India [12]. The herders even admitted that in retaliation to their losses they kill the wolves and snow leopards while defending their livestock from repeated attacks by these carnivores. This suggests that the extent of livestock damage is much intense in the Trans-Himalayan part of the Khangchendzonga BR. This could mostly be attributed to huge livestock grazing in the area evident from their high photo-capture rates (35.16±14.8), as a result of which they become easy prey to wolves and snow leopards (Fig. 2g-h). This argument is further strengthened by less abundant wild ungulate prey population in the area (no photo captures) which should otherwise be highly detectable during the survey period due to their congregations in lower, snow-free areas in spring [13]. Heavy depredation by carnivores was even verified by

the semi-nomadic pastoralists based at *Munguthang*, *Thangu*, and *Lachen* villages reporting loss of their yaks and *Dzos* primarily to wolves.

Table 3. Details of livestock depredation incidents by snow leopard (SL), Tibetan wolf (TW) and feral dogs (FD) reported in the study area, January-May 2012

	Respondents	Incidents	SL	TW	FD	Livestock killed
***Dokpa* herders**	17	25	7	16	2	Cattle, *Dzo*, Feral yak
***Bhutia* herders**	6	9	4	5	0	Cattle, Sheep, *Dzo*, Yak
Spot checks[+]	-	7	0	7	0	*Dzo*, Yak

[+] During April-May 2012

Prior to this study, the presence of Tibetan wolf was reported only from the *Tso Lhamo* Plateau of north Sikkim [9]. The present study validates its presence from the *Lhonak* catchment of the Sikkim Trans-Himalaya through camera trap photos. Sign encounter rates and photo-capture rates indicated wolves to be more abundant than other carnivores in the area (Table 2). The reason could be its typical Trans-Himalayan character and group living behaviour, contrary to other carnivores recorded. Hence, being the dominant species in the area, wolves constantly remain disposed to the threats of retaliation by local herders in responses to their losses. On the other hand, since Himalayan marmot was reported as the most abundant wild mammal, it may be considered as a potential secondary wild prey during the times of absence or low abundance of wild ungulates in the area.

High photo-capture rates of livestock, humans and feral dogs indicate serious pressure on the inhabiting wild animal species together with the galliformes. This could further intensify the situation by increasing the risk of diseases being spread in the wild and by competition with wild carnivores over carcasses (as scavengers), and should therefore be addressed in detail. Moreover, besides feral dogs other potential threats to the biodiversity and the ecosystem as a whole observed during the surveys include infrastructure development and presence of defense forces in the area.

Conclusion

Through this short study, we were able to obtain very useful information on the fauna of north Sikkim primarily the charismatic species such as Tibetan wolf and other cryptic species of Sikkim Trans-Himalaya. The study could also decipher some of the crucial conservation concerns prevalent in the area. Although, the local *Dokpa* herders and *Indo-Tibet Border Police* personnel reported the presence of other typical Trans-Himalayan species such as Tibetan argali *Ovis ammon hodgsoni*, Tibetan gazelle *Procapra picticaudata*, Kiang *Equus kiang polyodon*, Eurasian lynx *Lynx lynx*, Pallas's cat *Otocolobus manul*, Tibetan sand fox *Vulpes ferrilata*, and the rare wild dog *Cuon alpinus* in the area, we were unable to record their presence due to time and logistic constraints of our study. Our study clearly indicates the enormous potential and need for research and conservation initiatives in the area though a much comprehensive study and a long-term monitoring exercise. We therefore, propose extensive surveys in the area to understand the patterns and drivers of depredation by these carnivores that could aid in designing effective conservation and mitigation measures for the entire Trans-Himalayan landscape of Sikkim.

Acknowledgements

We thank the Wildlife Institute of India, Dehradun for providing us the grants (Grant-in-Aid) and support to undertake this work, and the Department of Forests, Environment and Wildlife Management, Government of Sikkim for providing necessary permission to work in

North Sikkim. We also gratefully acknowledge the generous support from the Indian Army and Indo-Tibet Border Police that made our sampling feasible in such harsh weather conditions.

Funding body

Financial support for conducting the field surveys, equipments and infrastructural facilities were provided by Wildlife Institute of India from its Grant-in-Aid (WII/GRT/208).

References

[1] C.P. Kala, V.B. Mathur, *Patterns of plant species distribution in the Trans-Himalayan region of Ladakh, India,* **Journal of Vegetation Science, 13,** 2002, pp. 751-754.
[2] A. Aryal, D. Brunton, D. Raubenheimer, *Impact of climate change on human-wildlife-ecosystem interactions in the Trans-Himalaya region of Nepal,* **Theoretical and Applied Climatology, 115**(3), 2014, pp. 517-529.
[3] C. Mishra, S.E. Van Wieren, I.M.A. Heitkonig, H.H.T. Prins, *A theoretical analysis of competitive exclusion in a Trans-Himalayan large-herbivore assemblage,* **Animal Conservation, 5**(3), 2002, pp. 251-258.
[4] C. Mishra, H.H.T. Prins, S.E. Van Wieren, *Overstocking in the Trans-Himalayan rangelands of India,* **Environmental Conservation, 28**(3), 2001, pp. 279-283.
[5] J. Xu, R.E. Grumbine, A. Shrestha, M. Eriksson, X. Yang, Y. Wang, A. Wilkes, *The Melting Himalayas: Cascading Effects of Climate Change on Water, Biodiversity, and Livelihoods,* **Conservation Biology, 23**(3), 2009, pp. 520-530.
[6] M.S. Mani, *The Himalaya, its ecology and biogeography: A review,* **High Altitudes of the Himalaya,** (Editors: Y.P.S. Pangtey and R.S. Rawal), Gyanodaya Prakashan, Nainital, 1994.
[7] W.A. Rodgers, H.S. Panwar, V.B. Mathur, **Wildlife Protected Area Network in India: A Review,** Wildlife Institute of India, Dehradun, 2000.
[8] G.S. Rawat, K. Sankar, A.K. Upadhyay, *Habitat Ecology and Conservation Status of Wild Ungulates in Northern Parts of Changthang Wildlife Sanctuary, Ladakh,* **Final Report,** Wildlife Institute of India, Dehradun, 2011.
[9] P. Chanchani, *Habitat use and food selection by wild and domestic ungulates in the Sikkim Trans-Himalaya,* **M.Sc Thesis,** Wildlife Institute of India, Dehradun, 2007.
[10] C. Carbone, S. Christie, K. Conforti, T. Coulson, N. Franklin, R.J. Ginsberg, M. Griffiths, J. Holden, K. Kawanishi, R. Laidlaw, A. Lynam, D.W. Macdonald, D. Martyr, C. McDougal, L. Nath, T. O'Brien, D. Seindensticker, J.L. Smith, M. Sunquist, R. Tilson, W.N. Wan Shahruddin, *The use of photographic rates to estimate densities of tigers and other cryptic mammals,* **Animal Conservation, 4,** 2001, pp. 75-79.
[11] S. Sathyakumar, T. Bashir, T. Bhattacharya, K. Poudyal, *Assessing mammal distribution and abundance in intricate eastern Himalayan habitats of Khangchendzonga, Sikkim, India,* **Mammalia, 75,** 2011, pp. 257-268.
[12] *** * ***, **Snow Leopard Spotted in North Sikkim for First Time**, WWF - India, 2016, https://scroll.in/latest/802603/snow-leopard-spotted-in-north-sikkim-for-first-time
[13] C. Mishra, S.E. Van Wieren, P. Ketner, I.M.A. Heitkonig, H.H.T, Prins, *Competition between livestock and bharal Pseudois nayaur in the Indian Trans-Himalaya,* **Journal of Applied Ecology, 41,** 2004, pp. 344-354.

Received: June 30, 2017
Accepted: February 21, 2018