

People's Perception on Human–Wildlife Conflict in a part of Kailash Sacred Landscape–India and strategies for mitigation

*In the selected horizontal transect of Pithoragarh District, crop damage by wildlife impacts the livelihood of local people. Authors interviewed randomly 317 villagers living in the lower part of KSL, India. Respondents perceived that HWC have resulted in significant shifts in crop pattern, food shortages, and poverty in the study area. 89% per cent of farmers reported that wild animals significantly contributed to the shortages of food for their family. Most of the interviewed villagers suffered major financial losses annually due to crop damage by Rhesus Macaque (*Macaca mulatta*), Wild Pigs (*Sus scrofa*), Indian Crested Porcupine (*Hystrix cristata*), Hanuman Langur (*Semnopithecus entellus*), and Barking Deer (*Muntiacus muntjak*). The farmers were aware of several locally used management options, which they suggested could be used to reduce the negative impacts of the conflicts. The authors found that the significant effect of HWC on social, economic, and environmental well-being of the community of KSL-India.*

Key words: Horizontal transect, Kailash Sacred Landscape, Wildlife Conflict, Western Himalaya.

Introduction

Interactions between humans and wildlife occur across a variety of social and landscape contexts (Brandt *et al.*, 1997; Distefano, 2005; Dickman, 2008; Ogra, 2008). People may view interactions with wildlife as fun, exciting, and providing an opportunity to learn more about wildlife (Hoare, 1992; Muruthi, 2005). The effect of HWC become devastating when the interaction results in property loss or threats to domestic animals or human safety (Else, 1991; Heidi *et al.*, 2013). Such conflicts can result in a desire for species control and considerable setbacks for local wildlife and habitat conservation (Hoare, 1992; Lamarque *et al.*, 2009). The species of wildlife that damage food crops include primates, rodents and ungulates especially wild pig (*Sus scrofa*). Primates are major agricultural pests in Pithoragarh District because of their agility and intelligence (Sprague and Iwasaki, 2006; Fuentes, 2006). Under the project, Kailash Sacred Landscape Conservation and Development Initiative (KSLCDI) which is a collaborative effort of the three neighboring countries India, China and Nepal to help preserve the unique biological diversity, the many ecosystem goods and services, and the value-based cultural heritage (ICIMOD, 2010; KSL India Feasibility Report 2010; Robert *et al.*, 2014). The major components of the program implemented during the five years (2012–2016) were 1) Innovative livelihoods, 2) Ecosystem management, 3) Access and benefit sharing, 4) Long-term conservation and monitoring, 5) Regional cooperation, enabling policies, and knowledge management. Human wildlife conflict is one of the sub components under component number four of KSLCDI project. *In the present study, we explored people's perceptions on human–wildlife conflict during Sep 2013 to May 2014 through household survey to assess farmers' perception on human wildlife conflicts.*

Study Area

KSL-India forms the study area having a larger part of Pithoragarh District (30.0815°N and 80.3659°E) and a small part of Bageshwar District of Uttarakhand having an area of 7212 km² altitudinal gradient from 350m to 7000m. Present study was focused in 12 selected villages in 'Horizontal Transect' (ICIMOD 2010; KSL India Feasibility Report, 2010) selected for various studies in KSL-India. Agriculture is the primary occupation in most

89% of the households reported human and wildlife conflict in KSL-India, Wild pig, Rhesus macaque were the most culprit for crop loss and Common leopards. Asiatic black bear was the main predators.

AJAZ HUSSAIN,
GOPAL SINGH RAWAT,
SAMBANDHAM SATHYA KUMAR AND
BHUPENDRA SINGH ADHIKARI
Wildlife Institute of India
P.O. Box # 18, Chandrabani,
Dehradun, Uttarakhand
E-mail: ajaz@wii.gov.in;
spengku1913@gmail.com

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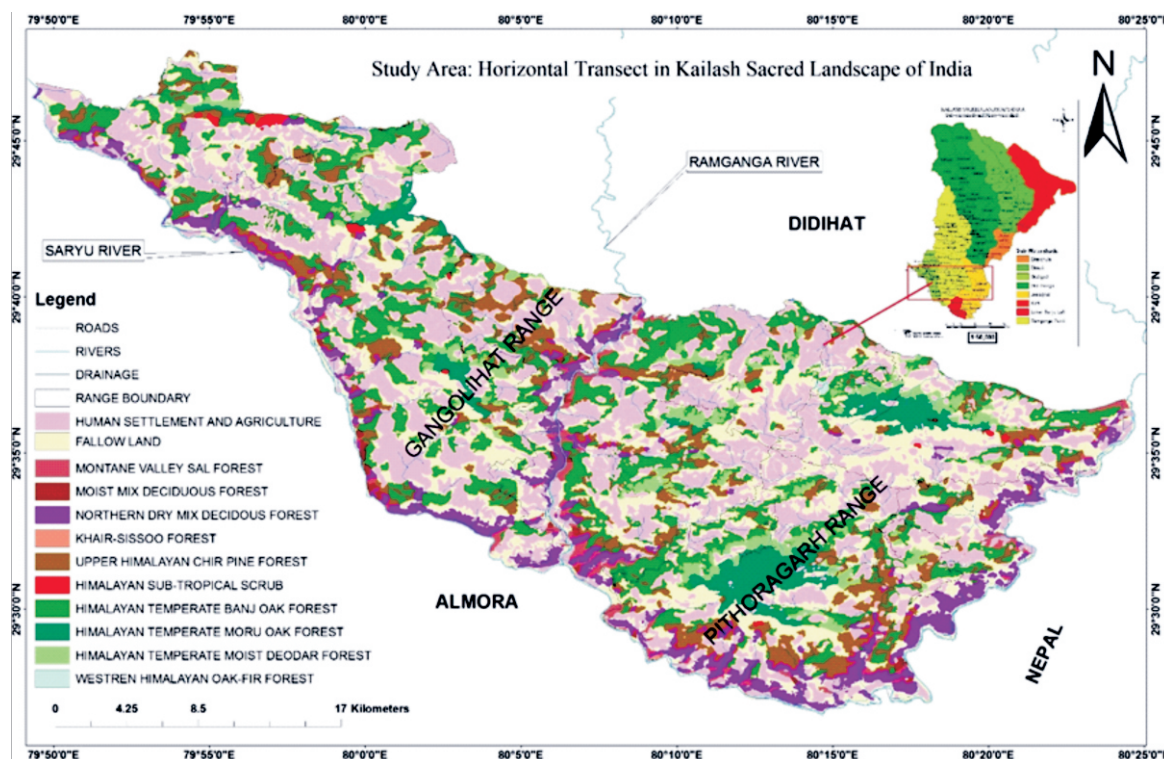


Fig. 1: Map showing the horizontal transect in Kailash sacred landscape of India.

of the area. The landscape predominates in diverse forests (broad leaved in lower altitudes to temperate forests in higher elevation areas while extensive alpine pastures in areas between 3000-3500m asl). The landscape has experienced rapidity of environmental changes and the global natures of socio-economic forces those have not only influenced the whole landscape but most of the ecosystems and associated elements have been notably transformed (ICIMOD 2010; KSL India Feasibility Report, 2010; Robert *et al.*, 2014).

Methodology

Information on the locals' perceptions and attitudes towards wildlife, and loss of livestock and crop damage by wildlife, and demographic and socio-economic status of households was collected using a semi structure questionnaire (Hill, 2004). The survey was conducted during September 2013 to May 2014. The questionnaire consisted of 20 open-ended questions. Only one person per household was surveyed, and households were randomly selected in 12 villages. A total of 317 people were interviewed out of which 204 were male and 113 were female. The questionnaire consisted of sections focusing on problematic animals and crop damage by wild animals.

Results and Discussion

Most farmers (89%) in our study area reported that they had experienced damage to their property as a result of the actions of wild animals. The results from the focus group discussions also suggested that most of the villagers in the study area experienced crop damage and livestock loss.

Table 1: Response regarding livestock loss and crop damage from wildlife in Horizontal Transect of KSL India (n=317).

Species name	Perception in %
Rhesus macaque	55.17
Wild pig	53.19
Common leopard	40.38
Indian crested porcupine	26.18
Common langur	21.77
Indian hare	12.30
Asiatic black bear	11.04
Red fox	8.83
Barking deer	6.62
Himalayan goral	3.79
Golden jackal	3.47
Bird's	2.84
Common Indian mongoose	0.63

Crop damages, livestock loss and human attack by wild animals

The percentage of crop damage and livestock loss due to wild animals reported by respondents was given in Table 1. 55.17% respondent reported that *Rhesus macaque* damage their crops followed by, Wild Pigs 53.19 %, Indian Crested Porcupine 26.18%, Hanuman langur 21.77% and Barking Deer 6.62%. Unlike damage to crops, many households in the study area loss their domestic animals to predators. 40.38% respondent reported that Common Leopard (*Panthers pardus*) as the major wildlife species preying on their domestic animals and attack on humans, followed by Asiatic Black Bear (11.04%). Additionally, farmers noted that small mammals like Indian hare (*Lepus nigricollis*), Himalayan palm civet (*Paguma larvata*) and bird's species like Plum headed parakeet (*Psittacula cyanocephala*), Slaty headed

Table 2: Response regarding percentage of crops damaged by wild life in the Horizontal Transect of KSL India. (n=317).

Crop Name	Damage in %
Maize (<i>Zea mays</i>)	77.60
Ginger (<i>Zingiber officinale</i>)	1.89
Turmeric (<i>Curcuma longa</i>)	1.58
Chickpea (<i>Cicer arietinum</i>)	30.60
Rice (<i>Oryza sativa</i>)	37.54
Pomegranate (<i>Punica granatum</i>)	21.50
Arbi (<i>Colocasia fallax</i>)	18.93
Wheat (<i>Triticum aestivum</i>)	69.72

Table 3: Farmers' (n = 317) response on types, extent of damages, and changes in population of the predators in the study area.

Type of wild animals	Extent of damage	Trends in population last decade
Rhesus Macaque	High	Highly increasing
Wild Pigs	High	Highly increasing
Common Leopard	High	Highly increasing
Asiatic Black Bear	Small	Remain same

Table 4: Methods farmers used to reduce crop damage in Horizontal Transect of KSL India (n=317).

Method	Reported Use		Target Animal
	N	%	
Fencing	117	36.91	Wild pig, Indian and crested porcupine,
Guarding	263	82.97	<i>Rhesus macaque</i> ,
Sari Fencing	180	56.78	Wild pig
Scarecrow	262	82.65	Birds
Dogs	87	27.44	<i>Rhesus macaque</i>

Table 5: Mitigation measures proposed by farmers (n = 317) to control or reduce crop raiding in study area.

Proposed options	Percentage
Plantation	12.61
Inform forest department for compensation	13.88
Prevent deforestation	15.45
Fencing	18.61
Guarding agricultural	20.18
Electric fencing	0.31
Housing away from forest	2.20

Table 6: Farmers perception of crop damage by wild animals in 12 villages in Horizontal Transect.

Respondent	Village names	Maize	Ginger	Turmeric	Pulses	Rice	Potato	Cocoyam	Wheat
28	Bans-Matoli	75.00	3.57	3.57	28.57	50	28.57	21.43	78.57
24	Boyal	71.43	0.00	0.00	25.00	35.71	3.57	7.14	50.00
26	Hanera	75.00	0.00	0.00	42.86	32.14	17.86	14.29	64.29
28	Jagtar-sinchora	89.29	0.00	0.00	28.57	10.71	25.00	32.14	57.14
28	Jajurali	53.57	3.57	3.57	25.00	21.43	25.00	10.71	60.71
23	Jhulaghat	67.86	3.57	3.57	10.71	25	25.00	17.86	53.57
26	Kuntola	89.29	3.57	3.57	57.14	57.14	14.29	17.86	89.29
27	Lali	75.00	0.00	0.00	21.43	50	25.00	25.00	67.86
30	Munakot	75.00	3.57	3.57	17.86	35.71	21.43	10.71	67.86
30	Pali	92.86	0.00	0.00	32.14	46.43	35.71	21.43	82.14
21	Patabubneshwar	46.43	0.00	0.00	21.43	21.43	10.71	14.29	42.86
26	Rawalgaon	67.86	3.57	0.00	35.71	39.29	10.71	21.43	75.00

parakeet (*Psittacula himalayana*) significantly damage crops in the study area. Maize (*Zea mays*) 77.60% followed by Wheat (*Triticum aestivum*) 69.72%, Rice (*Oryza sativa*) 37.45%, Chickpea (*Cicer arietinum*) 30.60% were mostly damaged by wild animals (Table 2 and 6). Among the responses concerning trends in populations of crop-raiding animals, 76% of respondents perceived that the numbers of major crop raiders, particularly monkeys, porcupines, and wild pigs, had increased in last decade (Table 3).

Methods farmers used to reduce crop damage

The damages to crops are most important factors affecting the livelihoods of the local community (Brandt *et al.*, 1997). In the study area 82.97% respondents guarded their agricultural crops in the fields. Scarecrows were the second most popular method used by 82.65% of farmers. Saree (Cloth Fencing) Fencing was used by 56.78% of farmers. Wealthier farmers used imported barbed wire; fencing was used by 36.91% of farmers primarily to guard the fields against wild pig, barking deer, and porcupine. However, many respondents agreed that it was ineffective against wild pig. According to farmers, scarecrows were easy to put up, and worked best with birds and to some extent monkeys. In addition, farmers raised serious concern about macaques, frequently stating that it was impossible to keep monkeys out of their crops. Trapping and hunting were the least popular methods for protecting crops (table 4).

Mitigation measures proposed by farmers for Crop protection strategies:

20% of the respondents suggest that guarding is the best management toll for protecting crops from wildlife. Other 18% suggest fencing, 15% suggesting prevent deforestation, 13% suggest to inform the forest department, 12% suggest plantation and likewise prevent hunting, electric fencing and house away from forest are suggest by less than 2% (Table 5).

Conclusion

In this study, we used the interview-based information to assess the status of HWC in a part of KSL – India. The study reveals that HWC is a potential barrier to effective, natural resource management and livelihood improvement efforts being undertaken in the area (Weladji and Tchamba 2003). Respondents of all 13 villages ranked crop damage by wildlife as very high. Problem species associated with conflict are *Rhesus macaque*, Wild pig, Crested porcupine and Barking deer. *Rhesus macaque* and Wild pig caused the most serious problem, more than 95% of the respondent (n=317) from 12 villages indicated that they lose the crop to wildlife. In the study area, most people reported crop damage in the

near-forested area agricultural field as compared to the far areas. More than 12 crops that farmers reported damaged by wildlife in the study area, problem animals consistently damaged vegetables, rice, maize, wheat, and pulses. Our findings from the personal interviews with farmers are consistent with the findings from the focus group discussions for all the variables. Thus, our results indicate that the problem is widespread and important for the community in the study area. We found that almost all of the farmers interviewed in the study area perceived that the degree to which wild animals are affecting their land has been increasing. The identified problematic species included crop raiders (monkeys, wild pigs, and crested porcupines,) and predators involved in killing livestock (common leopard, asiatic black bear, and red fox). Many households in the study area did not report any loss of their domestic livestock to wild predators. This underscores that the major source of conflict between humans and wild animals in the study area is crop raiding, rather than loss of livestock to predators. The farmers perceived that number of crop raiders, mainly monkeys, porcupines, and wild pigs were increasing over the years which is similar to the studies carried out in different parts of the world (Else, 1991; Sprague and Iwasaki, 2006). Communities in KSL-India abandoning agricultural fields near to forested areas as that were frequently damaged by wild animals. We recorded abandoned agriculture fields in some areas where it is highly accessible to wild animals. We identified the perceived direct and indirect economic, environmental, and social impacts on the communities living in KSL, India. Almost all farmers (99%) blamed wild animals for the significant shortage of food, low living standards, and poverty in the area. Brandt *et al.* (1997) also mentioned that the damages to crops are most important factors affecting the livelihoods of the local community. Hence, the findings of our study are important and can be useful in areas that have similar problems and where the problems are undetermined. We recommend the local government and development agencies pay more attention to further investigate the problems and mitigate the effects of these conflicts.

कैलाश पवित्र भूदृश्य-भारत के एक भाग में मानव-वन्यजीव संघर्ष के विषय में लोगों की धारणा तथा न्यूनीकरण के लिए रणनीतियाँ

एजाज हुसैन, गोपाल सिंह रावत, सम्बन्धम सथ्या कुमार तथा भूपेन्द्र सिंह अधिकारी
सारांश

पिथौरागढ़ जिले के चयनित अनुप्रस्थ परिच्छेद में वन्यजीव द्वारा फसल की क्षति स्थानीय लोगों की आजीविका को प्रभावित करती है। लेखकों ने कैलाश पवित्र भूदृश्य के नीचले भाग में निवास कर रहे 317 ग्रामीणों से बेतरतीब रूप से साक्षात्कार लिया। उत्तरदाताओं ने महसूस किया कि मानव-वन्यजीव संघर्ष के परिणामस्वरूप अध्ययन क्षेत्र में फसल पैटर्न में महत्वपूर्ण परिवर्तन, खाद्य की कमी और गरीबी ने जन्म लिया। 89 प्रतिशत कृषकों ने सूचित किया कि जंगली पशुओं ने उनके परिवार के लिए खाद्य की कमी में महत्वपूर्ण रूप से सहयोग किया। साक्षात्कार किए गए अधिकांश ग्रामीणों को रीसस मैकाक (मकाका मुलाटा), जंगली सुअर (सूस स्क्रोफा), भारतीय शिखाघाटी साही (हीस्टिक्स क्रिस्टाटा), हनुमान लंगूर (सीमोपिथीकस इट्टीलस) और काकड़ (मुन्टिएक्स मुंटजैक) द्वारा फसल क्षति के कारण सालाना भारी वित्तीय क्षतियाँ उठानी पड़ी। कृषक स्थानीय रूप से प्रयुक्त अनेकों विकल्पों के विषय में जागरूक थे, जिसका उन्होंने

सुझाव दिया कि इनका उपयोग संघर्षों के नकारात्मक प्रभावों को कम करने के लिए हो सकता है। लेखकों ने पाया कि कैलाश भूदृश्य के समुदाय के सामाजिक, आर्थिक एवं पर्यावरणीय कल्याण पर मानव-वन्यजीव संघर्ष का महत्वपूर्ण प्रभाव है।

References

- Brandt S.A., Spring A., Hiebsch C., McCabe J.T., Tabogie E., Diro M., Wolde-Michael G., Yntiso G., Shigeta M. and Tesfaye S. (1997). The tree against hunger: enset-based agricultural systems in Ethiopia. *American Association for the Advancement of Science, Washington, D.C., USA*.
- Dange M., Jassica R. and Mehari A. (2015). Farmers perceptions about the impact of human-wildlife conflict on rural livelihood and natural resource management efforts in ChehaWoreda of Guraghe Zone, Ethiopia. *Inter. J. Agriculture and Extension*, 3:003-090. ISSN 2329-9797
- Dickman A.J. (2008). *Key determinants of conflict between people and wildlife, particularly large carnivores, around Ruaha National Park, Tanzania*. Dissertation, University College London and Institute of Zoology, Zoological Society of London, United Kingdom.
- Distefano E. (2005). *Human-Wildlife Conflict worldwide: collection of case studies, analysis of management strategies and good practices*. FAO, Rome.
- Else J.G. (1991). Nonhuman primates as pests. Pages 115–165 in H. O. Box, editor. *Primate responses to environmental change*. Chapman and Hall, London, United Kingdom.
- Fuentes A. (2006). Human–nonhuman primate interconnections and their relevance to anthropology. *Ecological and Environmental Anthropology*, 2:1-11.
- Heidi E.K., Paul D.C., Joseph D.F., Rolf J.P. and Barbara A.K. (2013). Factors Affecting Perceptions of Human–Wildlife Interactions in Residential Areas of Northern New York and Implications for Conservation. *Human Dimensions of Wildlife*, 14:102-118.
- Hill C.M. (2004). Farmers' perspectives of conflict at the wildlife–agriculture boundary: some lessons learned from African subsistence farmers. *Human Dimensions of Wildlife*, 9:279-286.
- Hoare R.E. (1992). The present and future use of 76 Human–Wildlife Interactions 8(1) of fencing in the management of larger African mammals. *Environmental Conservation*, 19:160-164.
- ICIMOD (2010). Kailash sacred landscape conservation initiative: target area delineation report. ICIMOD, Kathmandu
- KSLCDI Feasibility Report (2010). *Kailash Sacred Landscape Conservation Initiative, Feasibility Assessment Report*. GBPHID Almora, ICIMOD, Katmandu. Unpublished Report
- Lamarque F., Anderson J., Fergusson R., Lagrange M., Osei-Owusu Y. and Bakker L. (2009). Human–wildlife conflict in Africa: causes, consequences and management strategies. *Food and Agriculture Organization Forestry*, Paper 157. United Nations, Rome, Italy.
- Muruthi P. (2005). Human–wildlife conflict: lessons learned from African Wildlife Foundation's African Heartlands. Working Paper. *African Wildlife Foundation, Nairobi, Kenya*.
- Ogra M. (2008). *Human-wildlife conflict and gender in protected areaborderlands: a case study of costs, perceptions, and vulnerabilities from Uttarakhand (Uttaranchal), India*. *Geoforum*, 39(3): 1408-1422.
- Robert J.Z., Antonio T., Marc J.M., Mingcheng W., Krishna P.O. and Jianchu Xu. (2014). Projected climate change impacts on spatial distribution of bioclimatic zones and ecoregions within the Kailash Sacred Landscape of China, India, Nepal. *Springer Science Business Media Dordrecht*.
- Sprague D.S. and Iwasaki N. (2006). Coexistence and exclusion between humans and monkeys in Japan are either really possible? *Ecological and Environmental Anthropology*, 2:30-43.
- Weladji R.B. and Tchamba M.N. (2003). Conflict between people and protected areas within the Bénoué Wildlife Conservation Area, North Cameroon; Wildlife Conservation Area, North Cameroon. *Oryx*, 37: 72-79.