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High altitude conflict between humans and wildlife in a cold desert area of Spiti, Himachal Pradesh

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Abstract

To conserve wildlife and lessen conflicts between people and animals, it is crucial to have a thorough understanding of these relationships. This study attempts to evaluate and identify the interactions between people and wildlife in the cold desert region of Spiti, Himachal Pradesh, as well as the harm that wildlife does to people and how people perceive wildlife in this region. Wildlife-related issues and human-made solutions to them were discovered during the field trip in the Cold desert area of Spiti. In the Cold desert area of Spiti, wildlife became essential to growth and a major source of local income. From 2017 to 2022, there was no wildlife poaching or killing, and there were no human casualties brought on by the wildlife in the area. Due to the sparse vegetation in the Spiti Cold Desert Area, there is significant competition for resources between wild herbivores and livestock. NCF is doing a great job by encouraging locals to protect wildlife and offering insurance to residents against livestock damage caused by wild animals. In the Cold Desert area of Spiti, the government compensates for agricultural loss and animal damage caused by wildlife. The study's findings indicate that although the wildlife in the Cold desert area of Spiti is secure from humans, it may be in danger because of rising tourism and climate change.

Keywords: Cold desert area of Spiti, Crop Damage, Livestock, Tourism, Wildlife

Introduction

Human-wildlife conflict (HWC) is defined as the 'interaction between humans and wildlife where negative consequences, whether perceived or real, exist for one or both parties when the action of one hurts the other (Conover, 2001; Madden, 2004). The population of the species that are responsible for negative impact is declining rapidly because of retaliatory killing, hunting, and indirect human actions such as habitat alteration (Nyhus, 2016). Conflicts between humans and wildlife in India are escalating due to increasing human population, loss of natural habitats, and in some regions, increasing wildlife population because of a successful conservation program (Rodgers, 1989). Wildlife impacts in terms of crop and livestock loss which leads to economic loss (Bhatia et al., 2016). Direct and indirect competition between people and wildlife results in HWC or Human-Wildlife Interaction (HWI), and this presents major challenges to the development of both ecological and economic sustainability. In the Trans-Himalaya of northern India, predator-prey interactions involve the relationship between carnivores, the status of the wild prey, and livestock production that supports human livelihood (Bagchi et al., 2019). The higher the livestock densities lower the distribution and abundance of wild ungulates (Mishra et al., 2003; Bagchi et al., 2004), which are important prey for the higher altitude predators (Lyngdoh et al., 2014) that ultimately restrict their distribution (Madhusudan, 2004). In this type of landscape, higher livestock population opens many challenges for the wildlife (Jackson et al., 2006), which is a global conservation challenge (Rovero et al., 2018), and there have been few attempts that evaluate it (Mishra et al., 2004). Generally, the predators fed on the wild ungulates but when they got the opportunity, they killed the livestock as well (Bagchi & Mishra, 2006). The Trans-Himalaya is visualized as a multi-use landscape in which human communities primarily engage in agricultural activities and livestock rearing for sustenance. The local communities are also highly dependent on the natural resources available in their surroundings to meet their livelihood requirements. In such a multi-use landscape, anthropogenic activities such as agriculture, livestock grazing, and resource extraction overlap with the presence of wildlife (Sharma et al., 2015), and these types of activities affect the wildlife directly (Cardillo et al., 2004). In recent years, several research was conducted by Mishra et al., 2003, Bagchi et al., 2004, Mishra et al., 2004, Namgail et al., 2009, Sharma et al., 2015, Bagchi et al., 2019 to know about the status of wildlife at the higher altitude. The wildlife occurrence in Trans-Himalaya is pervasive due to the human dependence and use of these areas, although wildlife populations typically occur at lower population densities outside the protected areas (Namgail et al., 2009). So, our study aims to know about

the challenges that locals face due to wildlife and the relationship between wildlife and humans in the adjacent villages of Kibber Wildlife Sanctuary and Pin Valley National Park of the cold desert area of Spiti, Himachal Pradesh.

Material and methods

Study area

Spiti Valley ($31^0$35' to $33^0$0'N and $77^0$37' to $78^0$35' E) (Elevation 2,950-4100m [9680-13,450ft]) in the Trans-Himalayan Lahul and Spiti District is surrounded by the Greater Himalaya in the South, Ladakh in the North and Tibet in the East (Figure 1). The arid and cold area has been described as a cold desert, with annual rainfall of less than 200mm and snowfall of about 155mm of water equivalent. The livestock assemblage includes sheep, goat, donkey, cow, cow–yak hybrid (Dzo), horse and yak. Livestock graze in the extensive pastures except during extreme winter when they are stallfed. Regarding wildlife, Spiti is the home to the Snow leopard, Siberian ibex, the Red fox, pika, the Himalayan wolf, and Bharal/Blue sheep. Apart from these Chukar partridge, Himalayan griffon, Lammergeier, and Himalayan snowcock are also found in the spiti. For the conservation and protection of wildlife, there are 2 protected areas i.e. Kibber Wildlife Sanctuary and Pin Valley National Park in Spiti. To know about the impact of Wildlife on human beings and vice-versa in the adjacent villages of protected areas of cold desert, the study was conducted in the 11 villages (Tabo, Dhankar, Mud, Ka, Kungri, Kaza, Hikim, Langza, Kibber, Chicham and Rangrik) adjacent to the Kibber Wildlife Sanctuary and Pin Valley National Park during the offset of winter 2022. The required information was gathered from the residents by the Snowball technique through the Questionnaire survey.

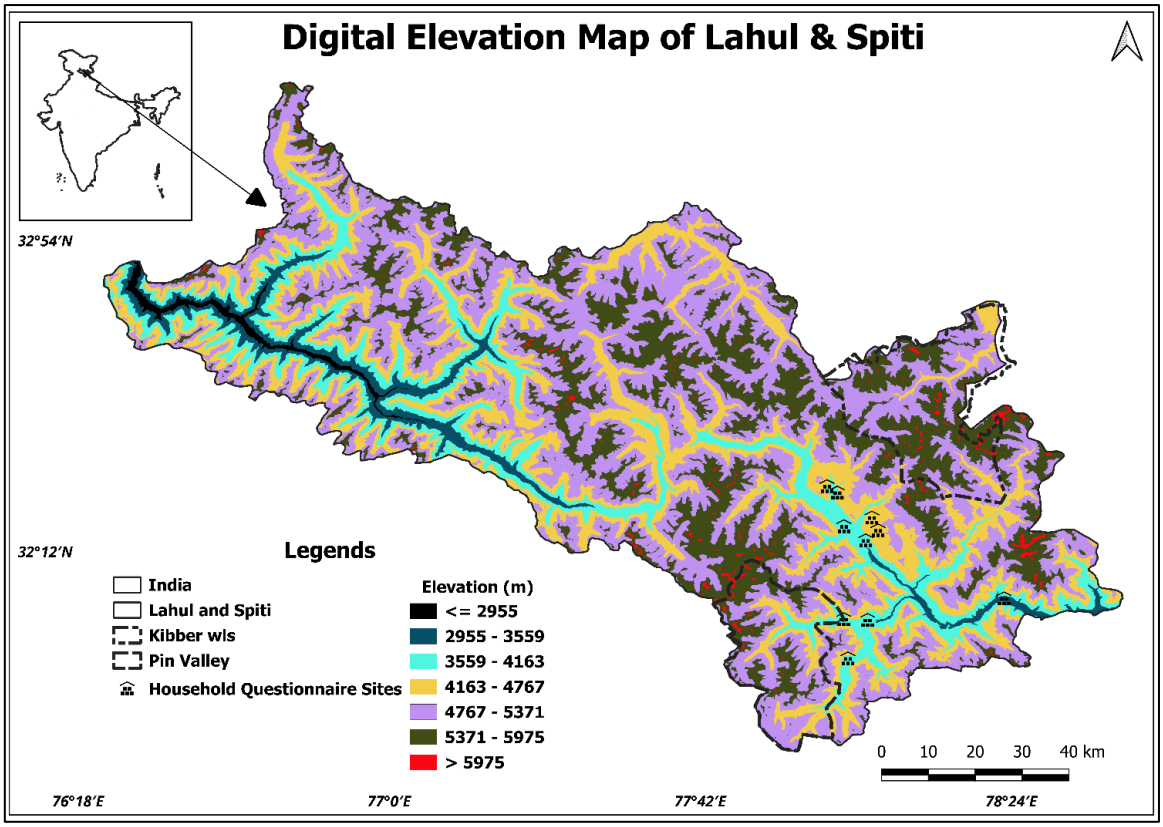

Figure 1. Digital elevation map of Lahul & Spiti, along with the Household questionnaire sites

Questionnaire survey

From every village, 10 households were sampled (n=11*10=110 respondents). At least one member from each family in these villages was interviewed. The questionnaire was designed in simple and understandable language. A semi-structured questionnaire survey was conducted to collect data on human-wildlife conflict. All questions were close-ended for simplicity in quantitative analysis. Some households were selected randomly (about 4-5) for a pilot survey, which helped to make improvements in the questionnaire before initiating the questionnaire survey. That pilot questionnaire was not considered in the result.

Group Interviews

The Group Interview (GI) is also called The Focus Discussion where a researcher conducts a form of in-depth interviews with participants (Kitzinger, 1995). The group interviews were conducted in every household Site with students and government employees. The range of people in group interviews varies from 2 to 10 depending upon the interest and the topics that were discussed. The information generated from group interviews was noted and analyzed according to the need of research questions. The trend of human-wildlife conflict in cold desert

areas along with its causes and possible solutions were also discussed in group interviews and relevant information was collected.

Secondary Data

The secondary data was collected from relevant sources like the Himachal Pradesh Forest Department and various published literature. The data were particularly related to human casualties, livestock depredation, and crop damage by wildlife around the PAs and were verified through Group Interviews with the Employees of the Forest Department at Spiti and another representative.

Data analysis

All quantitative data were analyzed using Microsoft Excel. Data were summarized using the Pivot Table and grouped according to demand. All the maps were made using the QGIS 3.36.0 version, and all the raster data of Digital Elevation were downloaded from earthdata.nasa.gov to better understand the study sites.

Figure 2. Bharal movement inside the agriculture field

Result

The socioeconomic characteristics of the respondents—such as gender, age, education level, and occupation—significantly impact how people view wildlife, how much they value their

conservation, and how they are of wildlife-related losses. Out of a total of 110 respondents, 71 (64.54%) were male (M) and 39 (35.45) were female (F). There was about 3.63% (3M+1F) were between 13-17years, 2.56 (3M+1F) were between 18-22 years, 25.64% (3M+10F) were between 28-32 years, 8.18% (6M+3F) were between 33-37 years, 40% (24M+20F) were between 38-42 years, 9.09% (9M+1F) were between 43-47 years, 11.81% (11M+ 2F) were between 48-52 years, 5.45% (6M) were between 53-57 years, 4.45% (5M) were between 58-62 years and 1.81% (1M+1F) were between 63-67 years age group. About 34.54% respondents (38) had 10+2 as their higher education, 33.63% respondents (37) had 10th, 0.90% respondents (1) had 5th, 2.72% respondents (3) had 7th class, 19.09% respondents (21) had 8th class, 0.90% respondents (1) had PG(Sociology), 3.63% respondents (4) had UG(Arts), 3.63% respondents (4) had UG(Science) as their higher education and 0.90% (1) was uneducated. About 17.27% of respondents (19) were Businessman, 26.36% of respondents (29) were Farmers, 31.81% respondents (35) were Government Employees, 17.27% respondents (19) were housewives, and 7.27% respondents (8) were students. Out of the total sampled households (n=110), 23.63% of households reported that they had problems due to wildlife (n=26) and 76.36% of households (n=84) reported that they didn't have any problems due to wildlife. Out of 110 respondents, 12.72% of respondents (n=14) reported that they had been facing crop damage problems due to wildlife and 87.27% (n=96) didn't face crop damage due to wildlife. The respondents were asked, "What do you think about the trend of crop damage due to wildlife?" to the participants (n=14) who face the crop damage problem. The result shows that 57.14% (n=8) felt that the trend of crop damage due to wildlife is decreasing from year to year whereas 42.85% (n=6) felt that the trend of crop damage due to wildlife is increasing from year to year. The respondents were asked, "What could be the possible cause of the increase in crop damage trend?" to those who felt that the crop damage is increasing from year to year. The result showed that 66.66% of respondents (n=4) out of 6 felt that the increase in wild herbivore population was responsible for the increase in trend whereas 33.33% of respondents (n=2) felt that the increase in crop damage trend was due to improper fencing. About 20.90% of respondents (n=23) had been facing livestock damage and 79.09% (n=87) didn't face any problem due to wildlife. Out of 110 households, only 0.90% of households (n=1) didn't keep livestock, and every household had kept one to twenty-six livestock to sustain their farming system. The total number of livestock in the sampled household (n=110) was 813.Out of 23 respondents who face livestock damage due to wildlife, about 69.56% respondents (n=16) face livestock damage due to Snow leopards, 4.34% respondents (n=1) face livestock damage due to Wolves and 26.08% respondents (n=6) face livestock damage due to both Snow leopard and

Wolf. The respondents were asked, "What do you think about the trend of livestock depredation due to wildlife?" (n=110) particularly to those who have been facing wildlife problems. The result shows that 100% of respondents felt that there is a decrease in the trend in livestock depredation due to wildlife in the cold desert area of Spiti. The respondents were asked, "What could be the possible cause of a decrease in livestock depredation due to wildlife. The result showed that about 13.63% of respondents (n=15) felt that livestock depredation decreases due to Awareness, 54.54% of respondents (n=60) felt livestock depredation decreased due to Awareness and Fencing, 28.18% respondents (n=31) felt livestock depredation decrease due to Fencing and 3.63% respondents (n=4) felt that livestock depredation decrease due to Restriction in Forest, Fencing and Awareness in recent years. During research work, respondents were asked the question, "What is the cost of an animal that wildlife kills/injured?" to those who face livestock damage due to wildlife. The result showed that it cost around INR 50,000/ to 60,000/ ($600.26-72.31USD) for a mature yak, around INR 10,000/ to 12,000/ ($120.05-144.04USD) for a mature cow, around INR 25,000/ to 30,000/ ($300.09-360.15USD) for a mature horse, around INR 20,000/ to 25,000/ 8,000/ to 12,000/ ($240.07-300.09USD) for a donkey and around INR ($96.03-144.04USD) for a sheep. According to the respondents, the cost of an animal depends on its age, health, and gender. The respondents were asked "How much compensation money did they get against livestock loss due to wildlife?" to those participants who face livestock damage due to wildlife. According to the respondents they get INR 30,000/ ($360.10 USD) against Yak, INR 20,000/ ($240.07 USD) against Horse loss, INR 15,000/ ($180.05 USD) against Donkey loss, INR 15,000/ ($180.05 USD) against Jersey cow loss, INR 6,000/ ($72.02 USD) against cow (local breed) loss and INR 3,000/ ($36.01 USD) against sheep loss due to wildlife. Only 6.36% (n=7) faced house/shelter destruction due to wildlife whereas 93.63% (n=103) didn't face house/shelter destruction due to wildlife. There have been no human causalities due to wildlife in recent years.

Mitigation measures

During research, respondents were asked, "What mitigation measure should the Government provide?" during the household questionnaire (n=110). The result showed that about 51.81% of respondents (n=57) believe that government should provide drystone wall, solar fencing, education, awareness, insurance, and compensation, 6.36% of respondents (n=7) believe that government should provide drystone wall, solar fencing, insurance, and compensation, 40.90% respondents (n=45) believe that government should provide education and awareness,

insurance and compensation and remaining 0,90% respondents believe that government should provide only solar fence, education and awareness to the locals of the cold desert area of Spiti.

Perception of the local community on wildlife conservation

During research work, respondents were asked the question, "Do you like wildlife?" to every participant (n=110) during the household questionnaire. The result showed that 100% of respondents (n=110) answered that they like wildlife. We asked, "Why do you like wildlife?" to the respondents (n=110) during the household questionnaire. The result showed that 39.09% respondents (n=43) like wildlife because they are beautiful, endangered species, maintain ecosystem and are part of culture/religion, 0.90% respondents (n=1) like wildlife because they are beautiful species, endangered species and are part of culture/religion, 2.72% respondents (n=3) like wildlife because they are beautiful species, maintain ecosystem and are part of culture/religion, 10% respondents (n=11) like wildlife because they are beautiful species and are part of culture/religion, 1.81% respondents (n=2) like wildlife because they are endangered species, maintain ecosystem and are part of culture/religion, 0.90% respondents (n=1) like wildlife because they maintain the ecosystem, are endangered species and are part of culture/religion, 29.09% respondents (n=32) like wildlife because they maintain ecosystem and are part of culture/religion and 15.45% respondents (n=17) like wildlife because they are part of culture/religion. During the questionnaire, respondents were asked, "Something that you don't like about wildlife?" to the respondents (n=110) who participated in the household questionnaire. All the 110 respondents like wildlife a lot, but 16 respondents don't like the nature of killing/injuring livestock. During the questionnaire, respondents were asked the question, "Why do you want wildlife should be conserved in your area?" to the participants (n=110) who took part in the household questionnaire. The result showed that 20.90% respondents (n=23) want to conserve wildlife because of tourism aspect, 11.81% respondents (n=13) want to conserve wildlife because of tourism aspect and their ecosystem importance, 51.81% respondents (n=57) want to conserve the wildlife because of their tourism aspect, their ecosystem importance and religious importance and 15.45% respondents (n=17) wants to conserve the wildlife because of their tourism aspect and their religious importance. Some of the local people dislike wildlife in a small manner as sometimes they are responsible for the loss of their property and loss of their only source of income. The government gave the compensation money, but there is a big price difference between the compensation money and the actual price.

Discussion

This study undoubtedly illuminated the viewpoint of those who reside close to protected areas. Therefore, we may conclude that there is the presence of HWL in the cold desert region of Spiti, and livestock destruction and crop loss are the two main effects of wildlife. House/shelter destruction has a small effect, and stored grain is unaffected by wildlife. No wildlife has been lost because of localized slaughter and poaching restrictions in the area.

Human-wildlife confliction

The local community has been facing development and source of income due to wildlife, but crop damage and livestock depredation are the common problems faced by the locals. The livestock population in Spiti is much more than compared to the wild ungulates (Mishra, 1997). It is found that the locals with more than 5-9 livestock population went into the forest area to graze their animals and there is a chance of livestock depredation. Mostly smaller animals were killed/injured by the wildlife. Due to this, people start moving toward the use of machines for their farm use and the rate of livestock raring decreases year by year, according to the local respondents. The crop damage is one of the major problems faced by the locals every year. Agriculture is the main source of income for many people, and damage to that by wildlife causes a great loss to the locals as well as changes their attitude toward wildlife. In the cold desert areas of Spiti, there is competition for vegetation in herbivores, whether they are livestock or wildlife. As mentioned earlier, the change in climate and excessive erosion cause a decrease in the vegetation land, and due to the absence of food in the wild, wild animals start entering the field and causing crop damage. Sometimes the damage to the crop leads to a decrease in the price of the crop in the market. Some of the locals have shifted to an alternative source of income, and some have started cultivating horticultural crops rather than crops at lower altitudes in their fields. Some of the locals left their agricultural land fallow due to the low price of crops, and they started tourism businesses on the same land. Most of the crop losses by wildlife were found to be carried out by Bharal, where the proper fencing of the field was not done. Wild ungulates move in search of food from one place to the next due to the less vegetation in Spiti's cold desert area and enter the field causing agriculture damage (Figure 2). There is a strong linkage between livestock, agriculture, and the cold desert area of Spiti. Every household kept at least one livestock, a Yak or a Cattle. The depredation rate of smaller and younger animals was comparatively higher than others. It may be due to the grazing in open areas and unable to spot the predator easily due to its camouflage. Most of the household depends upon the agricultural by-products for their livestock feed. As insufficient vegetation

in the wild and the competition for the same resources from wild ungulates is higher, most people feed their livestock from agricultural by-products and the products from the market. But those who have a higher number of livestock) graze their animals in the forest area (Figure 3).

Figure 3. Livestock grazing far from the village area

Attitude and tolerance of local people

The local people of the cold desert area of Spiti showed a positive attitude in favor of conservation and participation towards wildlife. According to them, wildlife is the major aspect of the growth and development of their region. The sources of income for many people are increasing day by day, and locals are not going anywhere for the income sources. Most people want to conserve wildlife because of tourism and cultural aspects. In our study, we found that the majority of people liked wildlife and showed a willingness to conserve wildlife in the cold desert areas of Spiti; even wildlife causes crop damage, livestock depredation, and sometimes house/shelter destruction. Against the loss, the government is providing compensation according to their rules and regulations. However, apart from this, the Nature Conservation Foundation (NCF) is working the wildlife conservation in cold deserts and helping change people's mentality and positive attitude towards wildlife conservation. This organization provides livestock insurance and community-based programs that help in the participation of locals in wildlife conservation.

Conclusion

Cold desert areas of Spiti have been under severe pressure because of the increased tourism in recent years. As a result, visible impacts of climatic change are observed in the Spiti region. Its effect has been seen on human life and wildlife of higher altitudes. Tourism is the alternate source of income, but now it has become the primary source of income for the locals. Because of that, the environment and wildlife of the cold desert areas are affected both directly and indirectly. It has been concluded from the study that the wildlife of the cold desert areas is safe from humans as most locals know their importance, and humans have a positive attitude toward wildlife conservation, but wildlife may face danger due to the change in the environment in the future. It is suggested that the government should participate more with the locals and NGOs, and locals must use fencing around their fields and homes. Locals must have knowledge about the Wildlife Protection Act of 1972, and awareness regarding the environment and wildlife must be added to the education. The pollution level should be checked on a regular basis by the government, and tourists are requested to behave responsibly.

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