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RESEARCH ARTICLE

Livestock depredation by large carnivores in Western Himalayan region of Jammu and Kashmir: temporal adherence in predator's choice

Amar Paul Singh[1] · Kritish De[1,2] · Virendra Prasad Uniyal[1] · Sambandam Sathyakumar[1]

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Abstract

Background Human-wildlife conflict (HWC) is a serious management problem in India where humans and wildlife share space and resources. This problem is particularly acute in the Himalayan Mountain region. As the lives and livelihoods of local residents are inextricably linked to wildlife, it is important to know the extent of damage caused by HWC to local people.

Methods In this work, the pattern of HWC was assessed in the Chowkibal-Tangdhar sector of Kupwara district, Union Territory of Jammu and Kashmir, based on self-reported losses of livestock to large carnivores by local people (N = 217).

Results The carnivores that were perceived by local stakeholders to be responsible for livestock depredation were identified as the Asiatic black bear, Himalayan brown bear and Common leopard. It was found that the leopards reportedly killed livestock throughout the year at the relatively low altitude zones, but black bears and brown bears reportedly killed livestock in the monsoon months at the relatively higher altitude zones. It was also reported that the leopards prefer to kill small to medium-sized livestock, but the bears had no such preferences.

Conclusion This work recommends that the Forest and Wildlife Department or community-based livestock insurance schemes should practice quick and efficient compensation systems, improve night livestock shelters, and community-based supervised livestock grazing practices to reduce livestock losses due to wild carnivores.

Keywords Asiatic black bear · Common leopard · Himalayan brown bear · Human-wildlife conflict · Pir panjal range

Introduction

Human-wildlife conflict (HWC) is a serious threat to the conservation of threatened species, especially in remote regions of the world. The intensity of HWC has been rapidly increasing in recent years, and it is not limited to any particular geographical region, but to all areas where humans and wildlife share resources (Kalsi 2022). A diverse range of carnivores, including bears, wolves, foxes, and leopards, use human-dominated landscapes worldwide due to abundant food resources provided by domestic animals, organic garbage, and pets (Sathyakumar and Bashir 2010; Sathyakumar et al. 2016). Leopards and bears are occupying precipitous terrains of the Himalaya and coexist with humans or frequently use human habitations in the Himalaya, which is a serious concern (Chauhan and Sethy 2011; Sathyakumar et al. 2016). As a result, it frequently undermines the goals of wildlife conservation and sustainable use initiatives.

Globally, livestock depredation is the most frequently cited reason for the conflict with large carnivores (Sillero-Zubiri and Laurenson 2001; Janeiro-Otero et al. 2020). In the western-Himalaya, livestock depredation is attributed to three large carnivores namely the common leopard (*Panthera pardus*), Asiatic black bear (*Ursus thibetanus*) and Himalayan brown bear (*Ursus artcos isabellinus*)

✉ Kritish De
kritish.de@gmail.com

✉ Sambandam Sathyakumar
ssk@wii.gov.in

[1] Wildlife Institute of India, 248001 Chandrabani, Dehradun, Uttarakhand, India

[2] Department of Life Sciences, Sri Sathya Sai University for Human Excellence, 585313 Navanihal, Kamalapur, Okali Post, Kalaburagi, Karnataka, India

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(Sathyakumar and Bashir 2010). Livestock depredation has been a serious challenge to conserving these predators in non-protected areas (Treves and Karanth 2003). Loss of natural habitat or fragmentation of habitat, increasing human populations and the resulting expansion of human activities are the main factors responsible for the increasing livestock depredation (Woodroffe 2000; Conover 2001; Athreya and Belsare 2007; Inskip and Zimmermann 2009). Several other factors like, competition of livestock with the wild herbivores for grazing may reduce the abundance of wild prey populations; and also livestock which is not guarded by people or dogs, are easy prey to the predators and may contribute significantly to livestock depredation (Sillero-Zubiri and Laurenson 2001).

Human-wildlife conflict (HWC) has significant economic impacts on the farmers as well as herders (Oli et al. 1994; Mishra 1997; Gusset et al. 2009) because carnivores tend to prey on species valued by humans. Leopards and bears attacks on livestock are generally reported at the grazing sites which were inside or close to the forests, though leopards sometimes venture into the farms to kill livestock (Naha et al. 2020). Human–leopard conflict always attracts great consideration as it creates a serious threat to human welfare (Wang and Macdonald 2006).

In this context, the present study was conducted in the Chowkibal-Tangdhar sector (CT sector) of Kupwara, Kashmir in India to understand reported patterns of livestock depredation by black bears, brown bears and leopards. There has been limited past research on HWC in this area with the exception of work by Sanwal and Lone (2012) who assessed the nature and extent of the Human-black bear conflicts in this area.

Materials and methods

The study was conducted in the Chowkibal-Tangdhar sector (CT sector) (34.345387°N to 34.448411°N; 73.750592°E to 73.995160°E; msl 1050–4200 m) of the Kupwara district, Union Territory of Jammu and Kashmir, India (Fig. 1). The size of the area is about 192 km^2. The region is characterized by the presence of dry temperate vegetation, agricultural lands and the Shamsbari glacier.

From 2018 to 2019, a semi-structured questionnaire survey was conducted in 214 households from 22 villages in CT sector, where animal husbandry was the main livelihood of the residents. Information on place and time of attacks, numbers and types of livestock killed and predator identity were included in the questionnaire to get a clear vision of the perception of livestock depredation by carnivores in the grazing lands. Furthermore, spot checks were carried out at sites where recent predation had occurred, and information on the circumstances surrounding the predation was ascertained. To confirm depredation and the predator involved, carcass remains were photographed and their condition, habitats of the incident sites, marks and signs of predation were documented.

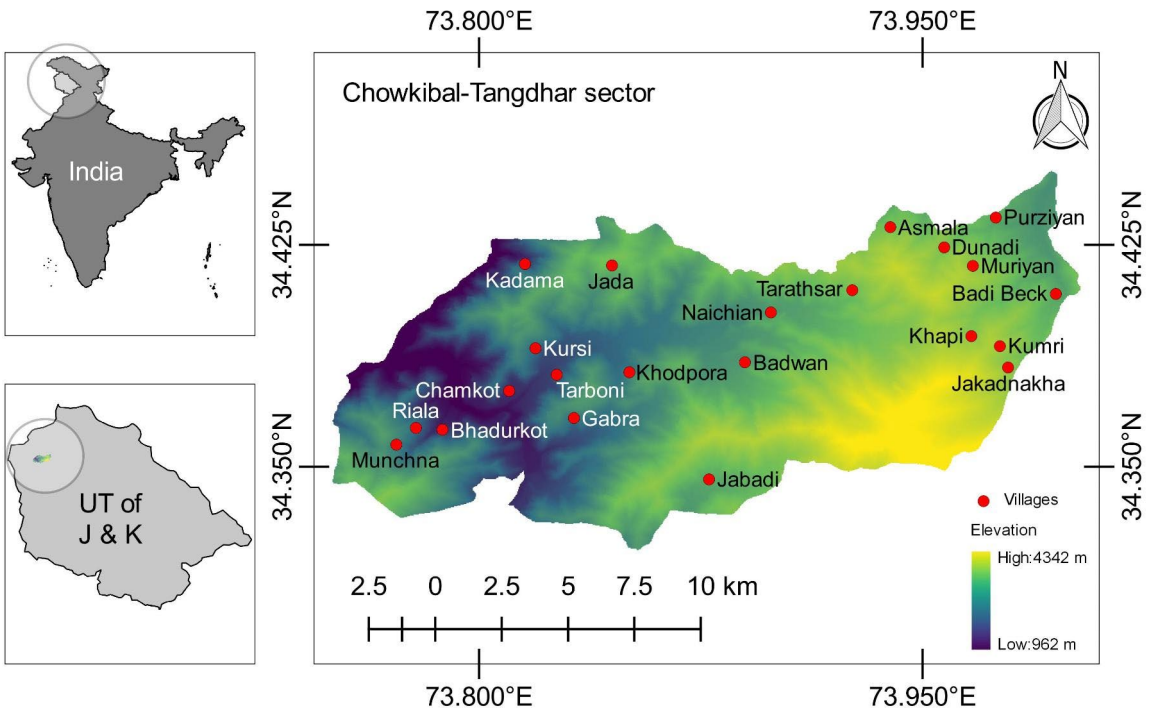

Fig. 1 Location of 18 villages in Chowkibal-Tangdhar (CT) sector, Union Territory of Jammu and Kashmir, India

The non-parametric χ^2 test for association (at $p < 0.05$) was used to determine whether there was a significant association between (i) the types of livestock killed and the predator types, (ii) the number of livestock killed in different months and the predator types.

Results

In total, 128 livestock herders participated in the survey. A total of 389 livestock were reportedly killed by leopards, brown bears and black bears during the study period, which included 107 cattle, 139 goats, 6 horses and 137 sheep. Of the 389 livestock, 117 (30.08% of total) were reportedly killed by leopards (which includes 61 goats, 1 horse and 55 sheep), 152 (39.07% of total) were reportedly killed by brown bears (which includes 79 cattle, 37 goats, 1 horse and 35 sheep) and 120 (30.85% of total) were reportedly killed by black bears (which includes 28 cattle, 41 goats, 4 horses and 47 sheep) (Fig. 2).

There was a significant ($p < 0.05$) association ($\chi^2 = 95.63$, $df = 6$) found between types of livestock killed and predator species. By calculating standardized residuals of the χ^2 test, it was found that the cattle killing events had a strong negative association (standardized residual = -5.67) with leopards, but a strong positive association (standardized residual = 5.75) with brown bears.

The predators were reported to have killed livestock throughout the year, except the month of February. There was a significant ($p < 0.05$) association between the predator species and the month of depredation ($\chi^2 = 520.61$, $df = 20$). By calculating standardized residuals of the χ^2 test, it was found that the leopards had a strong positive association with April (standardized residual = 7.23) and November (standardized residual = 5.26), the brown bears had a strong positive association with September (standardized residual = 10.27) and the black bears had a strong positive association with August (standardized residual = 7.83). Out of 389 livestock killed, 291 were killed in South–West monsoon months (June to September). The highest depredation occurred in September (111 kills, all were reportedly killed by the brown bears), followed by August (70 kills, of which 58 were reportedly killed by black bears and 12 were reportedly killed by brown bears) and July (60 kills, of which 31 were reportedly killed by black bears, 16 were reportedly killed by brown bears and 13 were reportedly killed by leopards) (Fig. 3).

Of the total 117 livestock reportedly killed by leopards, the maximum number was in the month of April (34 kills), followed by November (17 kills) and March (15 kills). In February, August and September there were no depredation events attributed to leopards. Of the total 152 livestock reportedly killed by brown bears, all were reported in just two months, in September (111 kills) and July (16 kills). Of the total 120 livestock reportedly killed by black bears, all were reported in three months, June (31 kills), July (31 kills) and August (58 kills).

Discussion

The HWC occurs when the activities of wildlife impact negatively on humans or when humans negatively affect the requirements of wildlife (Mekonen 2020). Conflicts often occur when wild animals damage crops or threaten to kill or injure humans or domestic animals (Sillero-Zubiri and Laurenson 2001). These are critical problems created by the growing rural population in and around wildlife habitats (Sukumar 1989). This study relied in large part on self-reports from local people in regards to identifying the responsible species for depredation events. While this may result in some implicit biases, it still provides significant

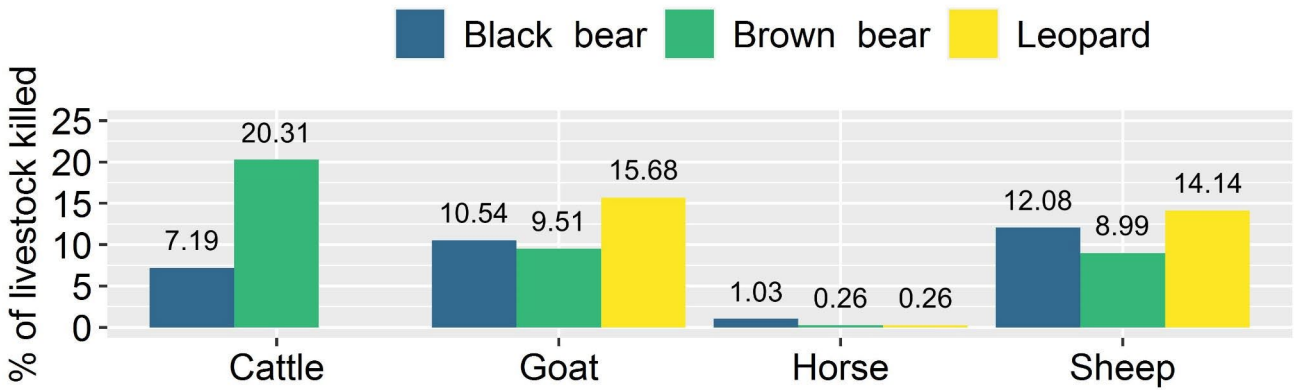

Fig. 2 Percentage of livestock killed by black bear, brown bear and leopard

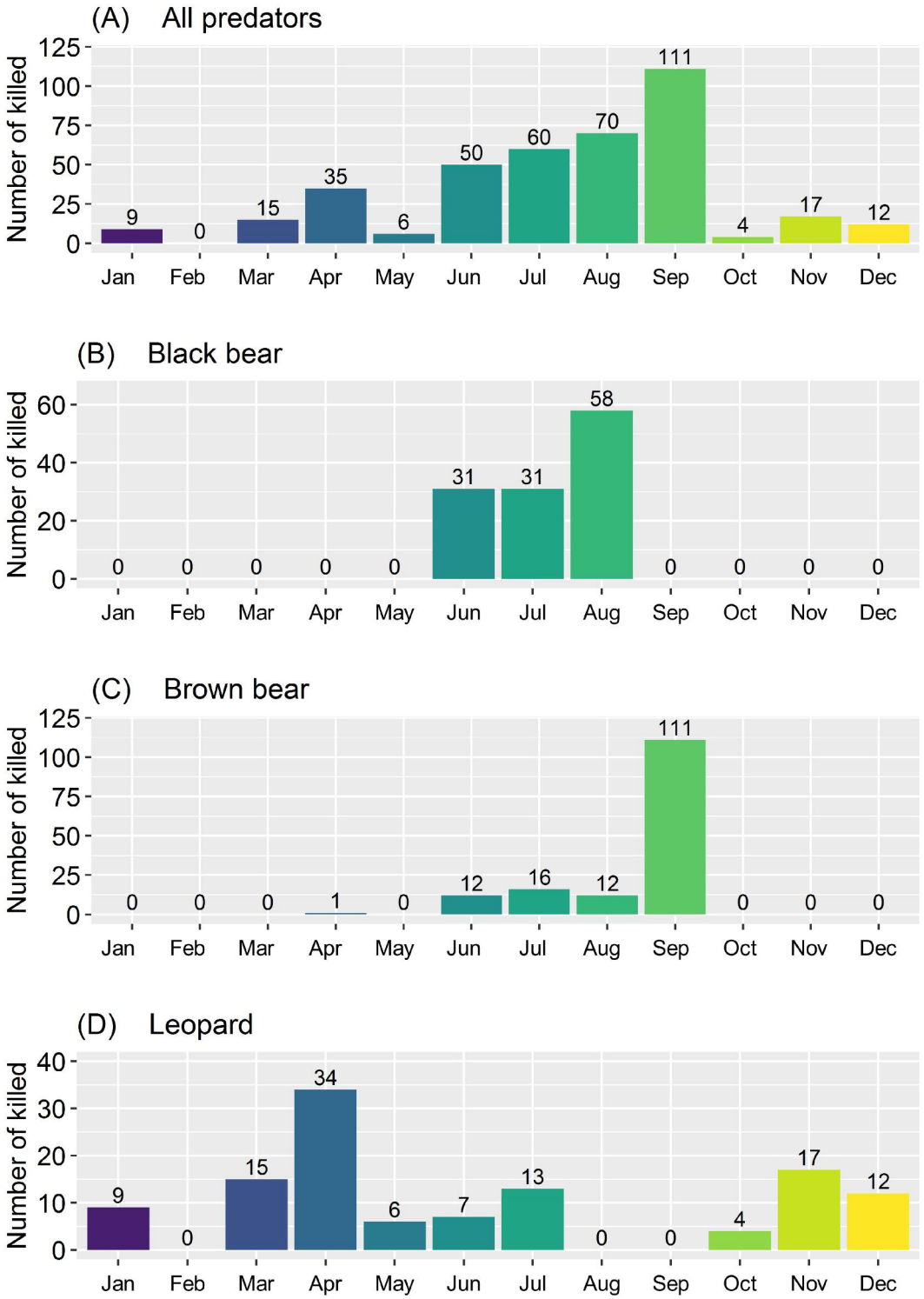

Fig. 3 Total number of livestock killed in each month by (A) all predators (B) black bear (C) brown bear and (D) leopard

evidence of conflict between humans and wildlife in the CT sector of Kupwara where mainly herdsman villages are located.

The present study found that depredation events were attributed to leopards throughout the year which is consistence with the work of Naha et al. (2020). On the other hand, it was found that livestock were reportedly killed by bears in South–West monsoon season, which is similar to observations made in Great Himalayan National Park Conservation Area (Chauhan 2003) and Dachigam National Park in Kashmir (Charoo et al. 2011). Looking at the spatial pattern of livestock depredation by predators (Fig. 4), it was seen that livestock were most often reported as killed by leopards in low altitude areas but by black and brown bears in high altitude areas. There were special reasons behind these observations. Leopards do not live in the high-altitude areas but bears do (Sangay and Vernes 2008; Naha et al. 2020). Bears generally do not enter the village and kill any livestock that leopards often do. Villages located at high altitudes and on the border of dense forests are locally known as "beck" which are used as rainy season shelters for herders. At the onset of the monsoon season, the herdsmen move their livestock to these areas for grazing purposes. At the end of the rainy season and the onset of winter, herders return to lower altitudes with their livestock. When livestock go for grazing in these high-altitude "beck" areas during the monsoon season, they are confronted by bears and are killed by bears. For this reason, leopards attacks occur in low-altitude areas throughout the year, but only during the monsoon season in high-altitude areas do bears attacks occur. In other words, the temporal patterns of conflict largely occurred due to the lack of spatial overlap of predators during other times. The study also found that leopards were not reported to have killed any large-sized livestock (except one horse) but livestock of all sizes were reported to have been killed by bears. At certain times of the year, spatial aggregation of wild and domestic herbivores occurs caused by the seasonal movement of livestock to resource-rich areas used by wild herbivores, such as high-altitude meadows which often lead to overgrazing and increased competition for limited resources (Pozo et al. 2021). It is well established that abundant livestock grazing leads to the reduction of native herbivores which results in the increase of livestock predation (Sillero-Zubiri and Laurenson 2001; Mishra et al. 2003).

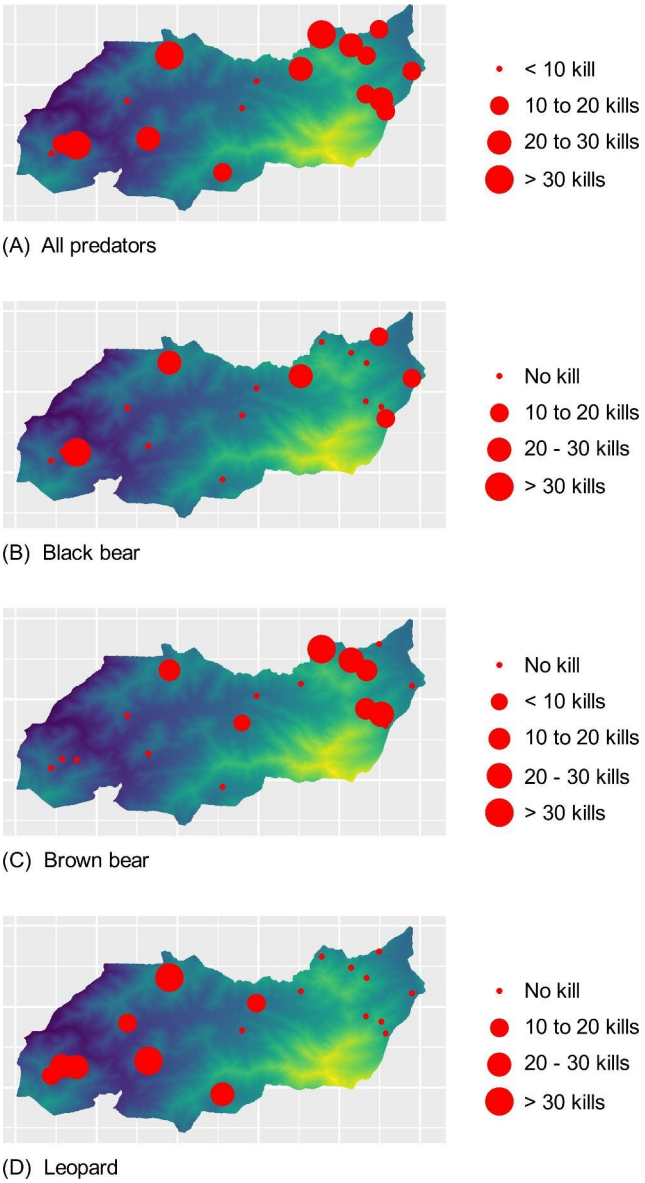

Fig. 4 Comparative picture of livestock killed by predators in Chowkibal-Tangdhar (CT) sector

Large carnivores that are involved in conflicts with humans are more prone to extinction (Woodroffe et al. 2006). Considering the populations of large carnivores which are already depleted, it is important to prepare and apply mitigation strategies for sustainable coexistence (Mishra et al. 2003), which rely upon a clear understanding of HWC (Inskip and Zimmermann 2009). Conservation strategies are being applied in the protected areas of the Himalayan range meanwhile, HWC in the non-protected areas can not be ignored because livestock depredation has been a serious challenge to conserving these predators in non-protected areas (Treves and Karanth 2003).

Although the current study is based on data from a relatively small area, it provides some important information on the patterns of perceived livestock depredation by black bears, brown bears and leopards.

Conclusion

When resources are scarce, the economy is a major motivator for human-wildlife coexistence because local people are hesitant to acknowledge the presence of wildlife when they are economically harmed by wildlife and frequently kill wild animals illegally, thereby negatively impacting wildlife conservation.

Because livestock rearing is one of the primary economic livelihoods of the people living in the study area, they are also affected by the same problem. Researchers should investigate the diversity and density of the area's carnivorous predator and herbivorous prey population, as well as conduct household socioeconomic surveys in the villages. The analysis of wildlife and socioeconomic data obtained from such studies will assist forest managers in identifying real-world solutions to reduce HWC, thereby assisting in wildlife conservation. Quick and efficient compensation mechanisms by the forest and wildlife department or community-based livestock insurance schemes, improvements in night-time livestock shelters, and other community-based supervised livestock grazing practices could all contribute to a reduction in HWC in the region.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s42965-022-00290-6.

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