

Human-Large Carnivore Conflict in Nepal's Lowland National Parks

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Abstract

Human-animal conflict is one of the most widespread and urgent problems facing wildlife protection. Any direct or indirect interaction between people and animals that has an adverse effect on either party is referred to as human-wildlife conflict. Since many carnivore species have suffered greatly because of increased conflict levels with populations. Because of their extensive home ranges and food needs, which increasingly coincide with those of humans, large carnivores in particular are prone to such confrontations. A thorough search was conducted using many databases, including PNAS, Diversity and Distributions, Journal of Applied Ecology, Trends in Ecology & Evolution, The Royal Society, Diversity and Distributions, and ScienceDirect, to get studies on the human-large carnivores' conflict in Nepal's National Park. After a rigorous screening process, 29 articles were selected, reviewed, and analysed, published between 2014 and 2024, to determine the large carnivore species involved in conflicts and the root cause of large carnivore conflicts in lowlands of Nepal's national park. The most popular sampling technique is the semi-structured questionnaire survey, which is followed by key informant interviews and focus group discussions. Nationally, it found that the resource collection, agricultural activities, livestock grazing, and illegal hunting near or inside parks induced the human-carnivore conflicts. The Bengal tiger and common leopard are two main carnivores engaged in conflicts. To exchange best practices and keep using innovative methods for significant human-wildlife conflict mitigation in protected areas, it is critical that various levels of government, non-governmental organizations, and civil societies work together effectively.

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Introduction

Human-animal conflict is one of the most widespread and urgent problems facing wildlife protection (Lozano *et al.*, 2019; Paudel *et al.*, 2024). Any direct or indirect interaction between people and animals that has an adverse effect on either party is referred to as human-wildlife conflict (Pettigrew *et al.*, 2012; Naha *et al.*, 2018). Since many carnivore species have suffered greatly because of increased conflict

levels with populations, human-carnivore conflict is seen as a significant conservation and rural livelihood concern (Dar *et al.*, 2009; Tiwari *et al.*, 2024).

Because of their extensive home ranges and food needs, which increasingly coincide with those of humans, large carnivores in particular are prone to such confrontations (Macdonald and Sillero-Zubiri, 2002; Dar *et al.*, 2009). Conflict results



from competition for space and ungulate food species since large carnivores are compelled to reside closer to humans (Gurung *et al.*, 2008; Massé, 2016). The majority of conflict events happen when animals go around and beyond the boundaries of protected areas into areas that are dominated by humans (Koziarski *et al.*, 2016; Mekonen, 2020), this type of conflict can be the leading cause of carnivore death in and around protected areas (Shepherd *et al.*, 2014; Benson *et al.*, 2023).

Large carnivores like Bengal tigers (*Panthera tigris*), common leopards (*Panthera pardus*), sloth bears (*Melursus ursinus*), wild dogs (*Cuon alpinus*), and striped hyenas (*Hyaena hyaena*) are found in different national parks of Nepal's lowlands (Rai, 2013; Lamichhane, 2019; Upadhyaya *et al.*, 2020; Bodgener *et al.*, 2023; Lamichhane *et al.*, 2024). Several methods, such as semi-structured questionnaire surveys, key informant interviews, and focal group discussions, primarily focused on collecting the data on human-wildlife conflicts (Ogra *et al.*, 2008; Liu *et al.*, 2011; Joshi, 2020; Khatri *et al.*, 2024; Rawal *et al.*, 2024).

Ecosystem sustainability depends on a healthy balance between carnivores and their prey. The emphasis on iconic carnivores, as seen by the notable rise in the number of tigers in Nepal since 2010, may unintentionally result in conflicts with people and cattle if there is a shortage of prey (DNPWC & DFSC, 2022; Tiwari *et al.*, 2024). To exchange best practices and keep using innovative methods for significant human-wildlife conflict mitigation in the area, it is critical that various levels of government, non-governmental organisations, civil societies, and impacted communities work together effectively (Aryal, 2022; Pant *et al.*, 2023; Pathak, 2023).

Methods

Human large carnivore conflict was searched in Human Dimension of wildlife (<https://www.tandfonline.com>), Journal of Wildlife Management (<https://bioone.org/journals/journal-of-wildlife-management.com>) PNAS (<https://www.pnas.org>), The Royal Society (<https://www.rspb.royalsocietypublishing.org>), Diversity and Distributions (<http://onlinelibrary.wiley.com>), Journal of Applied Ecology (<http://bessjournals.onlinelibrary.wiley.com>), ScienceDirect (<http://www.sciencedirect.com>), and Google search engine (<http://scholar.google.com>) during November 2024 with the inclusion of keywords like "Human wildlife conflict in protected area of Nepal" followed by other interchanging words like large-carnivores, conflicts, national park, Nepal, etc. When the keyword "Human large carnivore conflict in National Park of Nepal" was entered into the search engine, 20,900 research papers (Google Scholar), 230 research papers (Science Direct), three research papers (Trends in Ecology & Evolution), and four research papers (PNAS) were found. Only papers that were appropriate for the topic were downloaded after the titles and abstracts of every piece of literature were examined. The study aims, results, and discussion were thoroughly examined, and the literature included in these publications' references was looked up and preceded in the same way as earlier studies. For the literature review, the published articles from the last 10 years (2014 to 2024) were considered.

The following criteria were selected for either the inclusion or exclusion of the articles:

- Articles that included human-large carnivore's conflict in the national park of Nepal were selected; anything other than human-large carnivores was discarded.
- Articles that focused on the species of large carnivores and elements influencing the cause of human-large carnivore conflict were chosen, but comparable research conducted on herbivores was disregarded.
- Full-text articles were only chosen for literature review; articles without abstracts were excluded.

Human-large carnivore conflict in the lowlands National Park of Nepal from all 29 articles was analysed and summarized. If articles contain the human-wildlife conflict data of both large and

small carnivores and herbivores, only human large carnivore's conflicts' data were summarized and included.

Only 29 scientific articles from different journals were studied for literature review.

Results

Spatial distribution of conflict by large carnivores

According to 29 reviewed articles on large carnivore conflict, data from the last ten years (2014 to 2024) shows that, higher conflicts by large carnivores was done on Chitwan National Park ($n = 10$), followed by Bardiya National Park ($n = 8$), Banke National Park ($n = 5$), Shuklaphanta National Park ($n = 3$), and Parsa National Park ($n = 3$; Fig. 1) in the Terai region of Nepal.

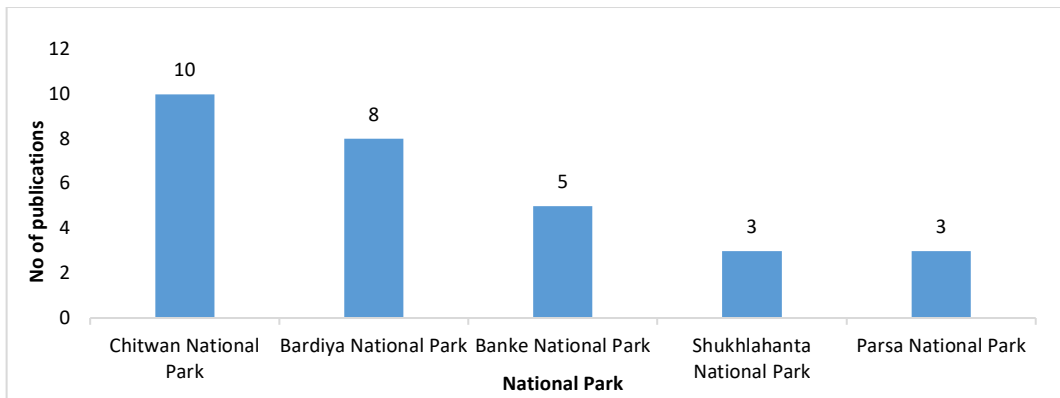


Fig. 1. Bar graph showing a number of publications on different national parks.

Survey methods

Out of 29 published articles, the most commonly used methods were semi-structured questionnaires ($n = 10$), followed by questionnaires and key informant interviews ($n = 6$), household surveys and key informant

interviews ($n = 5$), questionnaires with focal group discussions ($n = 4$), and secondary sources of data ($n = 4$; Fig. 2) that were used to collect the data on large carnivore conflict in Nepal's lowland national parks.

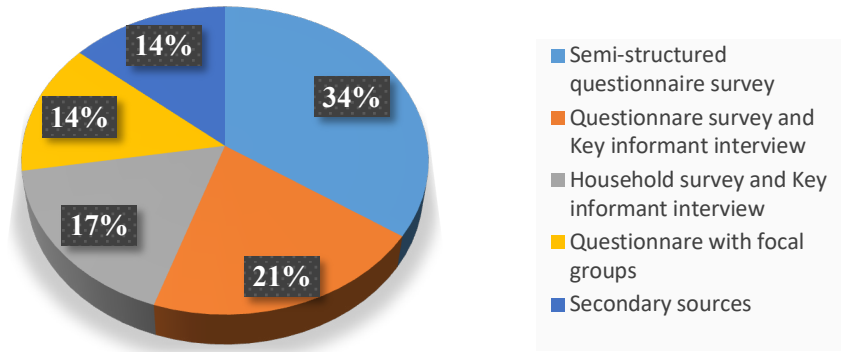


Fig. 2. Pie chart showing the sampling methods.

Conflict incidents versus large carnivore species

After a review of 29 articles, with the help of different survey methods (Fig. 3), the highest number of conflicts with humans was with the

Bengal tiger ($n = 25$), followed by the common leopard ($n = 21$), sloth bear ($n = 4$), wild dog ($n = 1$), and striped hyaena ($n = 1$; Fig. 3) that were enlisted in different national parks.

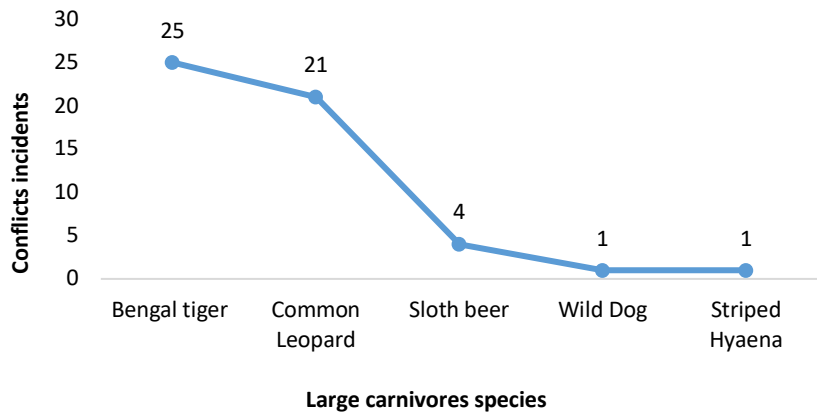


Fig. 3. Line graph showing the different large carnivore species engaged in conflicts.

Human-large carnivore conflicts in the National Park of Nepal

Total five species of large carnivores involved in conflict at Chitwan National Park, with only two

species at Bardiya, Banke, Parsa, and Shuklaphanta National Park. Conflict with tigers and leopards, were found to be common in all lowland national park of Nepal (Fig. 4).

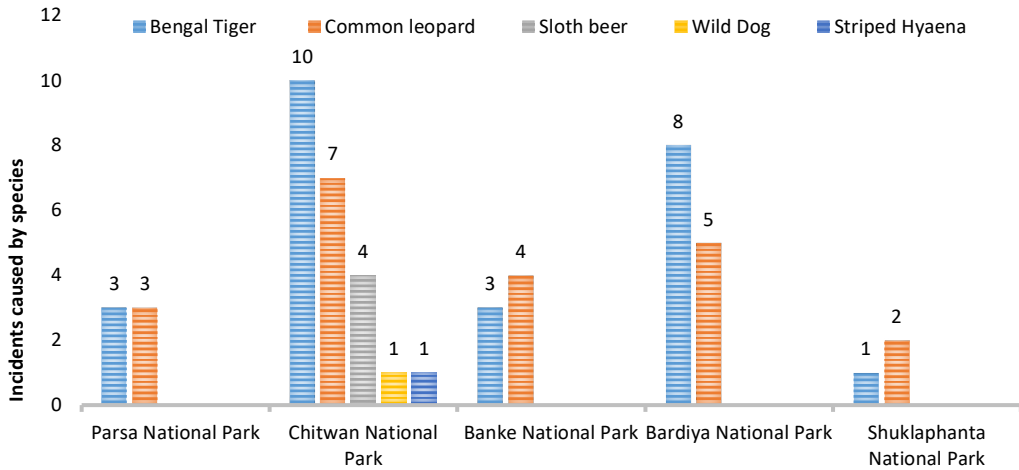


Fig. 4. Bar graph showing the conflict caused by large carnivores in different national parks.

Cause of human-large carnivore conflict

Reviewed articles show that more conflict incidents of human with large carnivore arises while collecting forest resources (48%), while

working on croplands or agricultural fields (24%), while grazing the cattle near park areas (17%), and during poaching or illegal hunting in the park (11%; Fig. 5).

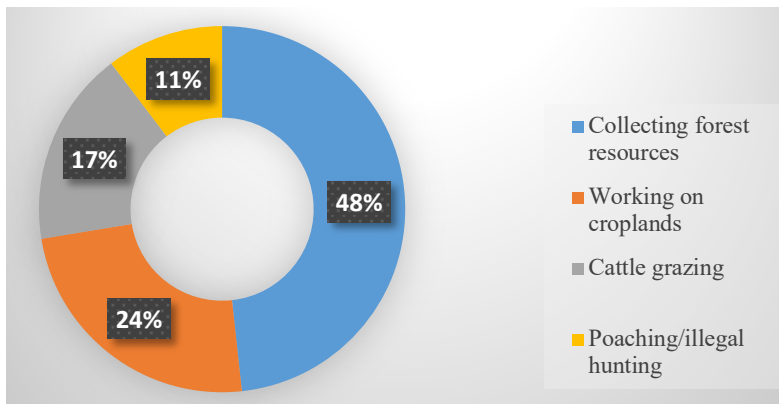


Fig. 5. Doughnut Chart showing the percentage of human large carnivore conflicts.

Discussion

Articles from last ten years (2014-2024) were reviewed only after the Government of Nepal has implemented Wildlife Damage Relief guideline 2013, which aims to increase the level of tolerance of wildlife damage (GON, 2013). Chitwan National Park has the most conflict with large carnivores because human activity in

community forests is still relatively high, as people primarily cut fodder (Gurung *et al.*, 2008; Bhattarai *et al.*, 2019), heavily depend on park resources for their livelihood, leading to illegal activities (Nepal & Weber, 1995; Timsina, 2014), and it also has a higher number of tigers than other national parks (Dhungana *et al.*, 2018; Kandel *et al.*, 2022), while Parsa and

Shuklaphanta have significantly fewer large carnivores (DNPWC and DFSC., 2022). Better compensation schemes and livestock management strategies might have shaped the low conflicts in Parsa and Shuklaphanta National Parks (Krafte *et al.*, 2018; Ugarte *et al.*, 2019).

The Bengal tiger and common leopard have the highest number of conflicts with humans. Tigers frequently live in locations that overlap with agricultural grounds, which can lead to more contacts with humans (Warrier *et al.*, 2020; Kandel *et al.*, 2023). People enter forests for resources (Dhungana *et al.*, 2018); human disturbance (Bhattarai & Kindlmann, 2018) and tiger territory behaviour (Diepstraten *et al.*, 2022) cause conflict in heavily settled regions (Cheng, 2024; Figel, 2023) with tigers and leopards. Recovery of tiger populations can displace leopards into more human-dominated habitats, resulting in more conflict with humans (Bargali & Ahmed, 2018; Penjor *et al.*, 2022). Leopards have a higher tendency to prey on livestock, leading to increased conflict with humans (Bhattarai & Fischer, 2014; Franchini & Guerisoli, 2023; Dhakal *et al.*, 2023), while the avoidance behaviour of wild dogs (O'Neill *et al.*, 2020) and hyenas (Gonhi *et al.*, 2024) shows the least conflict.

Conflicts occur when people collect resources like fodder or fuelwood near protected areas (Bhattarai & Fischer, 2014; Acharya *et al.*, 2016). Closer to the park boundaries, higher the incidence of conflict (Lamichhane *et al.*, 2017; Dhungana *et al.*, 2018). Grazing (Khan *et al.*, 2022), illegal hunting (Gangaas *et al.*, 2013; Soofi *et al.*, 2019), agricultural practice, and human settlements near protected areas (Tafesse, I. S., 2020; Park, S. E., 2020) are major causes of

human-large carnivore conflict in protected areas.

Conclusion

In this review, different types of sampling methods, spatial distribution of human-large carnivore conflicts, large carnivore species involved in conflict, and the main causes of conflicts with humans in lowland national parks are presented. Semi-structured questionnaire surveys, key informant interviews, and focal group' discussions are major sampling methods used for collecting data on human-large carnivore conflict. Different species of large carnivores involved in conflicts were the Bengal tiger (*Panthera tigris*), common leopard (*Panthera pardus*), sloth bear (*Melursus ursinus*), Asiatic wild dog (*Cuon alpinus*), and striped hyena (*Hyaena hyaena*) were recorded. More incidents of human-large carnivore conflicts were in Chitwan National Park, while the least incidents were in Shuklaphanta National Park. Review covering multiple databases from all National Parks of Nepal and languages would be useful for minimizing or coexisting with human-large carnivore conflicts and guiding future conservation efforts.

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