

Assessing the Effectiveness of Forest Frontline Staff towards Human Sloth-Bear Interaction: A Survey-Based Study in Odisha, India

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SUMMARY

Numerous protected areas are facing a deep crisis due to negative human-wildlife interactions. Reduced forest cover and food resources outside protected areas have led to increased human-sloth bear conflicts, including frequent mauulings. This study focuses on understanding the crucial role of forest frontline staff in mitigating human-bear conflicts. Odisha boasts an extraordinary variety of flora and fauna, including the sloth bear. We aimed to assess the contribution of forest staff to managing and helping prevent negative interactions. As part of this project, several activities were conducted to facilitate community education and spread awareness about early warning systems, strategies for conflict resolution, authentic data collection by the forest frontline staff, long-term roles in driving policy implementation, planning emergency responses in situations of conflict, monitoring human activities around the fringe areas, and potentially striving to maintain positive public relations. By utilizing a semi-structured questionnaire survey, we aim to assess the overall effectiveness of capacity-building programs in enhancing the skills, knowledge, and organizational capacity of professionals engaged in wildlife conservation on the ground, who have the first direct response to any situation and can make a significant difference in handling any incidents. The findings provide valuable insights into the strengths and limitations of existing initiatives and offer recommendations for optimizing future capacity-building strategies to mitigate human-bear conflict in Odisha, India.

Keywords: Frontline staff, Wildlife management, Community outreach, Policy implementation, Coexistence

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INTRODUCTION

Human-wildlife interaction poses a significant threat to the survival of endangered species globally, particularly large mammals. Instances from various countries underscore the gravity of human-wildlife conflict, emphasizing the need for a comprehensive analysis to understand the issue and conservation efforts (Chauhan, 2005; Thapa et al., 2024). Protected areas, considered crucial for biodiversity conservation, face a deep crisis due to negative human-wildlife interactions, resulting in incidents such as human casualties, livestock depredation, and crop damage caused by various wild animals, including elephants, tigers, lions, sloth bears, leopards, and

herbivores across different regions of India (Aditya and Ganesh, 2022; Pereira et al., 2024; Chakravarthy, 2025).

With rapid development and a rising human population leading to the encroachment of wildlife habitats, the likelihood of human-wildlife interactions ultimately increases. The term "human-wildlife conflict" is now commonly used to describe situations involving negative interactions between humans and wildlife. The escalating competition between humans and wildlife for shared space and food resources poses a significant challenge (Ferraz et al., 2025).

The sloth bear *Melursus ursinus* (Shaw, 1791) is widespread, endemic to the Indian subcontinent, and is one of the four *Ursidae* species. It is reported from the Western Ghats to the foothills of the Himalayas (Bargali et al., 2005; Dharaiya and Rabari, 2022). Historically, the sloth bear's range throughout India has been fragmented and reduced due to extensive deforestation for developmental activities. The current sloth bear population in India is confined to protected areas and areas outside protection in proximity to human habitations. Due to its declining population and ongoing anthropogenic threats to its habitat, the sloth bear is listed under Schedule I of the Indian Wildlife Protection Act of 1972 and Appendix I in CITES, designated as vulnerable in the IUCN Red Data Book. The objective of this study was to conduct capacity-building training programs for frontline forest staff and to understand the current scenario of human-bear interactions and the level of awareness among the frontline staff towards them.

MATERIALS AND METHODS

Meetings were arranged within the Balasore forest division of Odisha, providing a multidisciplinary platform for discussion and exchange of experiences and knowledge among senior researchers, conservationists, forest department officers, and frontline forest staff. The survey used a discussion-based approach to collect and share information on the current status of awareness and knowledge among field forest staff responsible for maintaining and protecting the species, while minimising potential threats to its habitat. A semi-structured questionnaire was designed to gather quantitative data on the experiences, perspectives, and challenges faced by frontline forest staff in Odisha. The questionnaire was developed based on insights from the literature review, ensuring alignment with existing knowledge while addressing specific gaps identified.

The study adheres to ethical guidelines, ensuring informed consent, confidentiality, and voluntary participation of the Frontline Forest staff. Ethical approval was obtained from relevant institutional review boards, and participants were briefed on the purpose and potential implications of the study. Data were analyzed and graphs were designed with the help of MS Excell.

STUDY AREA

Odisha located on the eastern coast of India (20.2376° N, 84.2700° E), is renowned for its rich biodiversity, encompassing diverse ecosystems ranging from dense forests to coastal plains (Mishra et al., 2023). This ecological diversity places Odisha at the forefront of conservation efforts, necessitating the crucial role of forest frontline staff in safeguarding its unique flora and fauna. Among the challenges faced by these

frontline workers, human-bear conflicts have emerged as a significant issue, demanding careful consideration and strategic intervention (Debata et al., 2017).

The Balasore forest division in Odisha (Figure 1) boasts an extraordinary variety of flora and fauna, including numerous endangered and endemic species. The state is home to lush deciduous forests, wetlands, and grasslands, providing habitats for diverse wildlife such as elephants, leopards, various deer species, and notably, the Indian sloth bear (*Melursus ursinus*). This biodiversity makes the region ecologically sensitive and emphasizes the need for effective conservation measures.

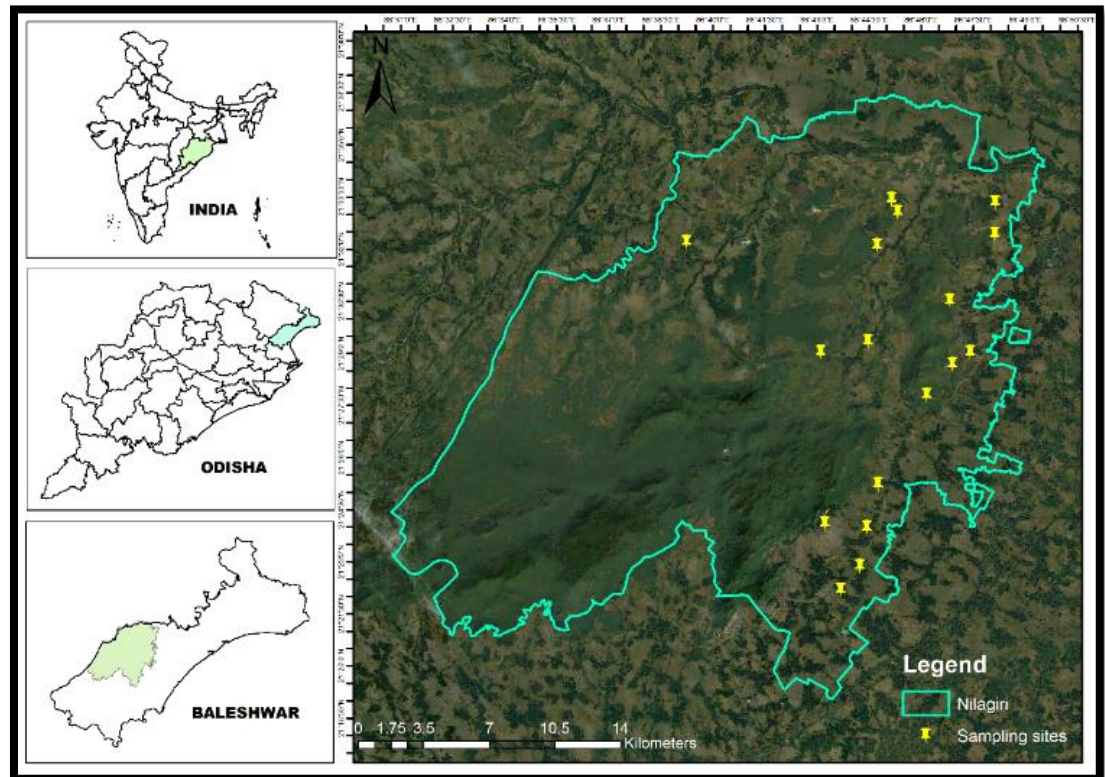


Figure 1: Study area map of Balasore Forest Division, Odisha, India with marked sites within the Nilgiri block.

RESULTS

According to the frontline staff, when asked about people's dependency on beekeeping, it is observed to be evenly split (Figure 2a), suggesting a balanced distribution of opinions or observations within that group. This balance implies that there is no clear consensus among frontline staff on whether people in their range are dependent on beekeeping. The graph reflects an equal likelihood of finding individuals or communities who are and aren't reliant on beekeeping in the specified area. When inquired about the community's perception of bears, it is noted that 37% express support for bears by the local community (Figure 2b); this indicates that the significant majority of the community is against bears. The opposition might be based on concerns about safety, property damage, or other factors.

Only around 7% of forest frontline staff have reported "yes" to noticing bears attacking humans and causing damage to crops (Figure 2c, d). The small

percentage of those who have noticed such incidents implies that these occurrences are relatively uncommon or infrequent based on the respondents' experiences or might remain unnoticed or unrecorded. According to the forest ground staff, a significant majority (67%) of negative interactions between humans and sloth bears are attributed to the collection of Non-Timber Forest Products (NTFP) and livelihood dependency. Open defecation and other unspecified reasons contribute to a lesser extent (10%) (Figure 2e).

As suggested by the responders, the majority of bear-human conflicts are reported during the summer season (63%) (Figure 2f). Winter also contributes significantly to conflicts (20%), while the other seasons have lower percentages. These responses provide valuable information about when bear-human conflicts are most prevalent, with summer being the peak season according to the respondents. Fifty-three percent of respondents suggest that roadkills pose a threat to sloth bears in the specified range, while the rest (47%) say no (Figure 2g). This indicates that a significant portion of the surveyed group believes roadkills are a concern for sloth bears in the area.

A significant proportion of respondents (40%) attribute the entry of bears into human-modified landscapes to a shortage of food (Figure 2h). Some respondents (13%) point to both habitat loss and a shortage of food as reasons. According to the forest staff, a significant majority (50%) (Figure 2i) attributes human-sloth bear conflicts to a combination of multiple factors. Shortage of food is identified as a major contributing factor by 20% of respondents. All respondents indicate that the sloth bear is listed under Appendix I of CITES and report 100% (Figure 2j). This suggests unanimous agreement among the surveyed individuals regarding the classification of sloth bears. In the context of CITES, Appendix I includes species that are threatened with extinction, and international trade in specimens of these species is generally prohibited for commercial purposes. The response implies a clear understanding or acknowledgment by the respondents that sloth bears fall under this highest level of protection according to CITES, emphasizing the conservation concern for this species (Figure 2k).

A total of 57% of respondents identify the morning as the peak time for human-sloth bear conflicts (Figure 2l), while 33% mention the evening. The distribution of responses provides insights into when people believe human-sloth bear conflicts are more likely to occur, with the morning being the predominant time according to the survey. This also highlights the increased human activity and movement into forested patches for NTFP collection during the morning hours, along with open defecation, which increases the likelihood of human-bear interactions that can result in injury or loss of life. Eighty-three percent of Frontline Forest staff respondents indicate that they have never reported snare traps for bears (Figure 2m), suggesting that there might be a significant gap or lack of reporting on the presence of snare traps. This could imply challenges or barriers in communication, awareness, or reporting mechanisms among frontline forest staff regarding this specific issue. The high percentage of "no" responses indicates a potential need for increased efforts in training, communication, or the establishment of more effective reporting systems to address the issue of snare traps targeting bears.

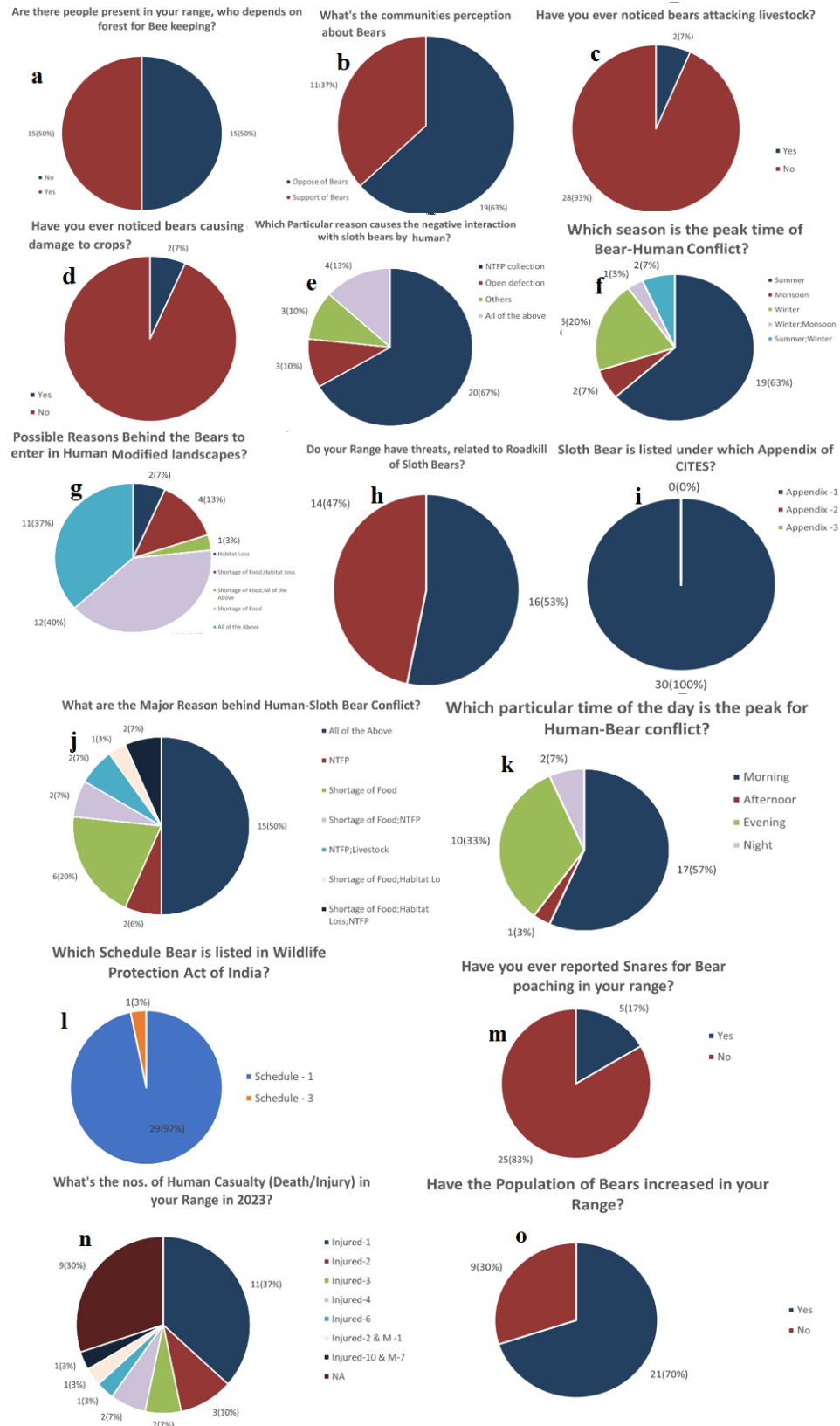


Figure 2: Responses from the Forest frontline staff of Odisha Forest department regarding Human-Sloth Bear conflict.

Improved awareness and reporting mechanisms could contribute to better conservation and protection of bear populations in the surveyed areas.

The majority of responses (30%) (Figure 2n) indicate that data on human casualties from the year 2023 is not available. It's important to note that the unavailability of data for a significant portion may suggest limitations in monitoring or reporting systems related to human-sloth bear conflicts in the specified range. Seventy percent of Frontline Forest staff said that the populations of bears have increased in their specified ranges (Figure 2o), suggesting a perception among the surveyed individuals that bear populations are on the rise. However, it's important to note that perceptions may not always align with scientific data, and factors like local awareness, monitoring efforts, and ecological changes can influence people's views. To make more accurate assessments of bear populations, it's advisable to rely on scientific studies and population surveys conducted by wildlife authorities or research organizations. They use systematic methodologies to gather data and assess population trends more comprehensively.

DISCUSSION

As Odisha undergoes population growth and urbanization, the frequency of human-bear interactions is likely to increase. Forest frontline staff need specialized training to cope with the evolving nature of conflicts and to implement proactive measures to mitigate potential threats. Urbanization and infrastructure development lead to habitat loss and fragmentation, forcing wildlife into closer proximity to human settlements (Bombieri et al., 2023). Increasing competition for resources, especially in areas where bears find food, results in conflicts over crops and livestock (Baral et al., 2021). Improper waste disposal attracts bears, increasing the frequency of encounters and conflicts (Prajapati et al., 2021). Changes in climate patterns affect food availability and migration routes, influencing bear behavior and increasing conflicts (Behera et al., 2022).

Given the complexities of human-bear conflicts in Odisha, a richly biodiverse state holding a viable population of Sloth Bears in India, understanding the experiences and perspectives of frontline forest staff becomes crucial. Existing literature highlights the complexities of human-bear conflicts globally and emphasizes the need for context-specific strategies. Although sloth bear interactions with humans are frequently reported in Odisha through print and electronic media, limited efforts have been made to understand this situation in Odisha, except Debata et al. (2017), whose study primarily focused on the northern Odisha region. Limited research has been conducted on the unique challenges faced in Odisha, making this study significant in addressing the local dynamics. The experiences and perspectives of frontline staff provide crucial insights into the ground-level realities of human-bear conflicts. Their insights into the local context, awareness, challenges faced, and the effectiveness of existing conservation strategies are pivotal for designing targeted interventions and fostering coexistence between humans and bears.

Assessing the experiences of frontline staff is instrumental in identifying human-sloth bear conflict hotspots because these personnel are closely familiar with locations where conflicts repeatedly occur based on historical conflict records and field observations. For example, Spatio-Temporal Patterns and Source-Dispersion Modeling

Towards Sloth Bear–Human Conflict Management in Central India used long-term forest department conflict records (2009–2019) to identify spatial conflict hotspots and understand recurring human–sloth bear interactions (Chaudhuri et al., 2022). Pinpointing these hotspots enables the strategic allocation of resources and interventions to areas where they are most needed, optimizing the impact of conservation efforts (Wilson et al., 2005). Their experiences provide valuable context, offering insights into the specific challenges faced by wildlife and communities alike. This localized knowledge is essential for tailoring conservation initiatives to address the unique ecological and socio-economic factors at play. By assessing their experiences, conservationists can refine and improve conflict resolution strategies, ensuring that interventions are not only effective but also considerate of the unique circumstances faced by frontline staff in the field. Adequately trained frontline staff can contribute significantly to data collection and monitoring efforts. This data is invaluable for researchers and conservationists in understanding the dynamics of human–bear conflicts, identifying trends, and implementing adaptive management strategies.

CONCLUSION

Human–sloth bear conflict has emerged as an important conservation and management challenge in Odisha due to increasing anthropogenic pressures, habitat degradation, and dependence of local communities on forest resources. The present study emphasizes the indispensable role of frontline forest staff in addressing such conflicts through rapid response, community engagement, awareness generation, monitoring, and implementation of conservation measures at the ground level. The findings indicate that the collection of Non-Timber Forest Products and livelihood dependency are major factors contributing to negative human–sloth bear interactions, while seasonal variation, particularly during summer, further intensifies conflict occurrences. Although direct incidents of sloth bear attacks and crop damage were reported at comparatively lower levels, community perceptions towards sloth bears remain largely unfavorable, highlighting the need for continuous conservation education and coexistence-based approaches.

The study further demonstrates that capacity-building and training programs significantly improve the preparedness, knowledge, and efficiency of frontline forest staff in conflict mitigation and wildlife management. Strengthening institutional support, enhancing field-level coordination, promoting scientific data collection, and encouraging community participation are essential for effective long-term management of human–bear conflict. Additionally, creating alternative livelihood opportunities and improving awareness among local communities can reduce dependency on forest resources and minimize conflict situations. Overall, empowering frontline forest staff through regular training, adequate resources, and policy support can play a vital role in promoting sustainable coexistence between humans and sloth bears in Odisha and contribute substantially to biodiversity conservation efforts in the region.

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