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Research Article

Insights on human-sloth bear conflict in and around eco-sensitive zone: Chhota Udepur, Gujarat, India

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Abstract

An ecologically sensitive zone and a non-protected forest in Chhota Udepur district together form a corridor between two wildlife sanctuaries in Gujarat, India. The area has a high incidence of human-bear conflict, with 103 incidents recorded from 2008-2020, corresponding with a rise in the sloth bear (*Melursus ursinus*) population. People rely on the forests for the collection of natural resources and often encounter wildlife, including sloth bears. Our study found that males (n = 73, 70.9%) were more frequently attacked by sloth bears than females. Encounters were high during the summer (n = 46, 44.6%) and the monsoon season (35.9%), with most attacks during the day. Interaction with sloth bears was highest in the forested areas (59.8%), followed by farms (34%) when locals were working. We recorded 7.9 (±5.1 SD) bear attacks per year in the area. Our findings revealed that the temporal overlap between locals and sloth bears inside forests was the cause of conflicts. Regulation of human movement and bear safety education may reduce the attacks and mitigate the human-bear conflict in this important corridor within the sloth bear landscape in Gujarat.

Keywords: bear safety education, corridor, human-bear conflict, non-protected forest, sloth bears

Introduction

Several factors are affecting negative interaction between human and wildlife mainly socially, economic, political, religious and mostly ecologically (Aryal et al., 2018; Dai et al., 2022). Large mammals such as Felidae, Ursidae, Canidae and suidae damage mostly humans and their property (Bombieri et al., 2023). These conflicts significantly increased over the past decade due to the encroachment of human settlements and increased anthropogenic activities have disrupted numerous ecosystems inhabited, shrinking their habitats and exacerbating human-wildlife conflicts (Morales-Gonz´ alez et al., 2020).

Sloth bears (*Melursus ursinus*) inhabit India, Sri Lanka, and Nepal (Dharaiya et al., 2016). They are currently listed as vulnerable by the International Union for Conservation of Nature and Natural Resources (IUCN) (Dharaiya et al., 2016). Their populations are declining due to several anthropogenic pressure. Furthermore, restricting food resources and direct competition between bears and humans for food resources are also considered a major species conservation threat as human–bear conflicts increase (Chauhan & Rajpurohit, 1996). Sloth bears are considered among the most unpredictable wild animals and most of their conflict is in an attempt of self-defense and accidental attacks on humans (Singh et al., 2018). A rise in anthropogenic activities in the non-protected forests has led to degradation of habitat, reduced forest cover and food availability. The eastern limits of Gujarat, India, are marked by the Aravalli Ranges, connecting to Rajasthan, and the hills of Vindhya, connecting to Madhya Pradesh (Mesaria et al., 2023) and sloth bears (*Melursus ursinus*) are distributed in this area. Human population growth, deforestation, and agricultural development conversion have resulted in reduced sloth bear habitat resulting in forest patches intermingled within human-dominated landscape (Dharaiya et al., 2016). The changes in habitat results in sloth bears using agricultural land and approaching human settlements in search of food that increase the probability of human-sloth bear encounters and conflicts (Garcia et al., 2016; Debata et al., 2016; Singh et al., 2018; Rathar et al., 2022; Rabari & Dharaiya, 2022; Malik et al., 2023).

According to the Gujarat forest department, sloth bear population was estimated to have increased from 220 (2001) to 358 (2022) in Gujarat state. Central Gujarat had an estimated 196 sloth bears in 2016 of which 54 were in the Chhota Udepur District and this area is considered a potential corridor connecting two protected areas (Dharaiya & Singh, 2018; Mesaria et al., 2023). With the rise in human population and increase in forest-based resource use, the interaction with bears is escalating.

The objective of our study was to assess human conflicts with sloth bears in Chhota Udepur from the year 2008-2020 by collecting secondary data from Chhota Udepur Forest Division, Gujarat, India. We also identified and understood sloth bear attack patterns in the study area. Based on the findings, we proposed conflict mitigation strategies for the non-protected areas of Chhota Udepur, Gujarat, India.

Material and methods

Study area

The Vindhya Range gains height in the east of the Chhota Udepur forest division and extends over the eastern part of the Gujarat State, India and lies between 21°50'00 and 22°50'00 N and 72°50'00 and 74°10'00 E (Fig. 1). The northern forested part of Chhota Udepur is linked with Ratanmahal Wildlife Sanctuary and on its eastern side it is linked with the state of Madhya Pradesh. On the western side of Chhota Udepur the forested area is linked with the Jambughoda Wildlife Sanctuary. The corridor area between these sanctuaries is 665 km2, flat at the plateau, undulating with broken ridges of hills and rugged towards the south and east. The major water body in the corridor is the Sukhi dam covering 29 km2. The central and western parts of the district are linked by national (NH758) and state highways (SH63) as well as district roads.

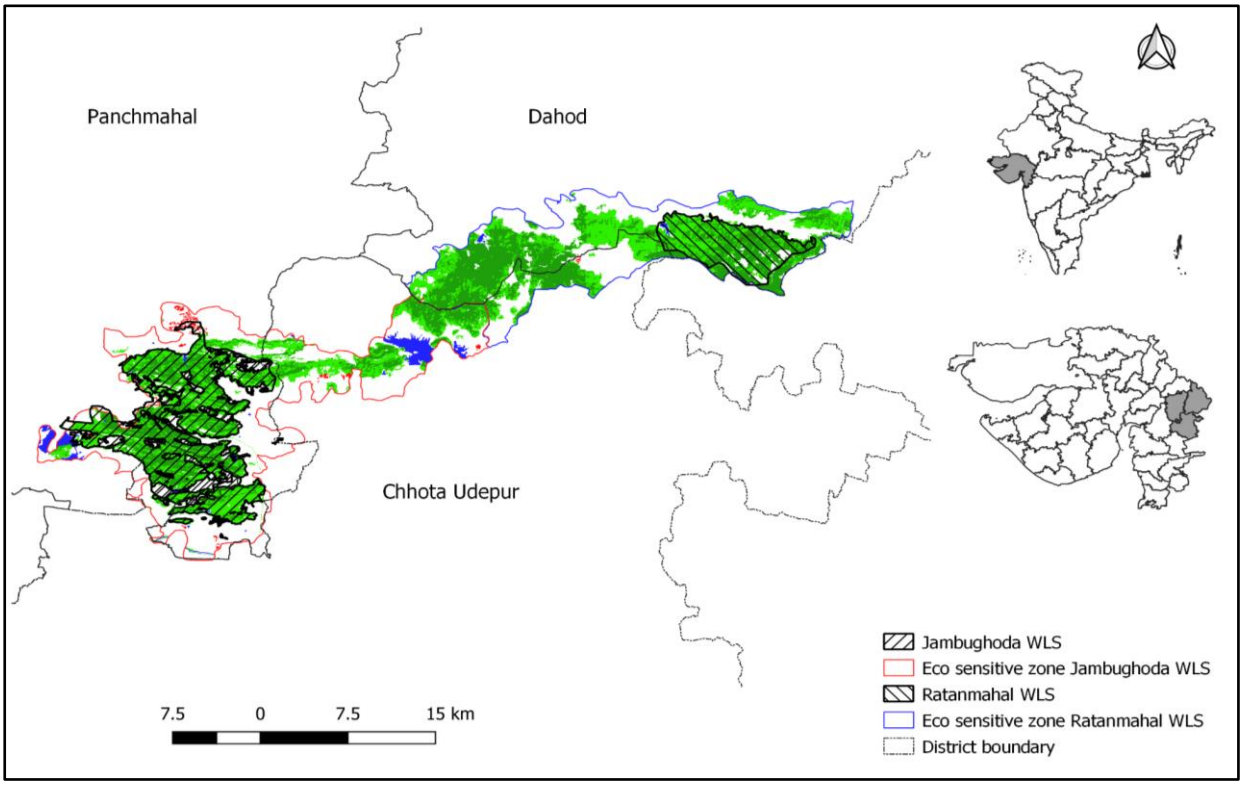

Figure 1. The corridor connecting Jambughoda and Ratanmahal Wildlife Sanctuary

Part of the forest in the northeast region falls are Dry Teak forest (type 5A/C1b) and are a mixed deciduous forest with teak as a dominant species (Champion and Seth 1968). Forests in the southeast region are Southern dry mixed deciduous forests (type 5A/C3) (Champion and Seth 1968). Chhota Udepur has a minimum of 5°C in winter (November to February) and a maximum of 47°C in summer (March to June). The mean annual rainfall approx. 1175 mm occurs mostly during monsoon season (July to October).

There are 5 forest ranges in the Chhota Udepur district and of these 4 ranges; namely, Chhota Udepur, Dolariya, Jetpur-Pavi and Rangpur with 47 villages have prevalent sloth bear attacks. There are 891 villages with a total population of 909,799, out of which 78.4% of the population belongs to scheduled Tribes (mainly Bhils, Patelias, Naikas and Rathwa Kolis) (Census, 2011). Agriculture uses primitive methods resulting in low incomes and people usually supplement their income with cattle, manual labor, and collecting and selling various forest produce such as fodder, timru leaves (*Diospyros melanoxylon*), mahua (*Madhuca indica*) flowers and seeds, tamarind (*Tamarindus indica*).

We used data on sloth bear attacks from 2008-2020 that were collected from the office of the deputy conservator of forests, Chhota Udepur forest division to gain insights into human-bear conflicts. Information such as, village, name of the victim, gender, age, time of the attack, season, year, and location of the attacks were available. Based on the available location we classed them into forests, farms, villages, and roads. We categorized the age groups of the victims as 0-10 years old, 11–20 years old, 21–30 years old, 31–40 years old, 41-50 years old, 51-60 years old and 61-70 years old. We divided each day into 6-hour classes (12:00 am-5:59 am; 6:00 am-11:59 am; 12:00 pm-5:59 pm; 6 pm-11:59 pm) to analyze temporal patterns of attacks. Statistical analyses such as the t-test (*t*) were used to find significant differences between groups (male–female and various age groups) and to understand the seasonality in sloth bear attacks, a t-test was performed for three periods (i.e., winter-summer, winter-monsoon, and summer-monsoon). We compared the seasons to examine the differences in cases using an independent sample t-test. The significance level for all tests was α=0.05. Data collected were used to estimate the seasonal and annual mean, percentage (%), and standard deviation (SD). Chi-square test (X^2) to understand differences in factors associated with conflict. Attack locations were mapped on the forest cover of the study area and used the heatmap tool for the conflict hotspot map in Q-GIS 3.36.1® (Fig. 5).

Results

We collected data on 103 attacks from 2008-2020. Many attacks were from Chhota Udepur range (49%) followed by Jetpur-Pavi (27%), 13% attacks were recorded in Dolariya and 11% in Rangpur (Fig. 2). An average of 7.9 attacks/year (±5.1 SD) were recorded. Of the 103 incidents where the victim's sex was recorded, males (n=73) comprised the majority (70.9%) with 29.1% females (n=30).

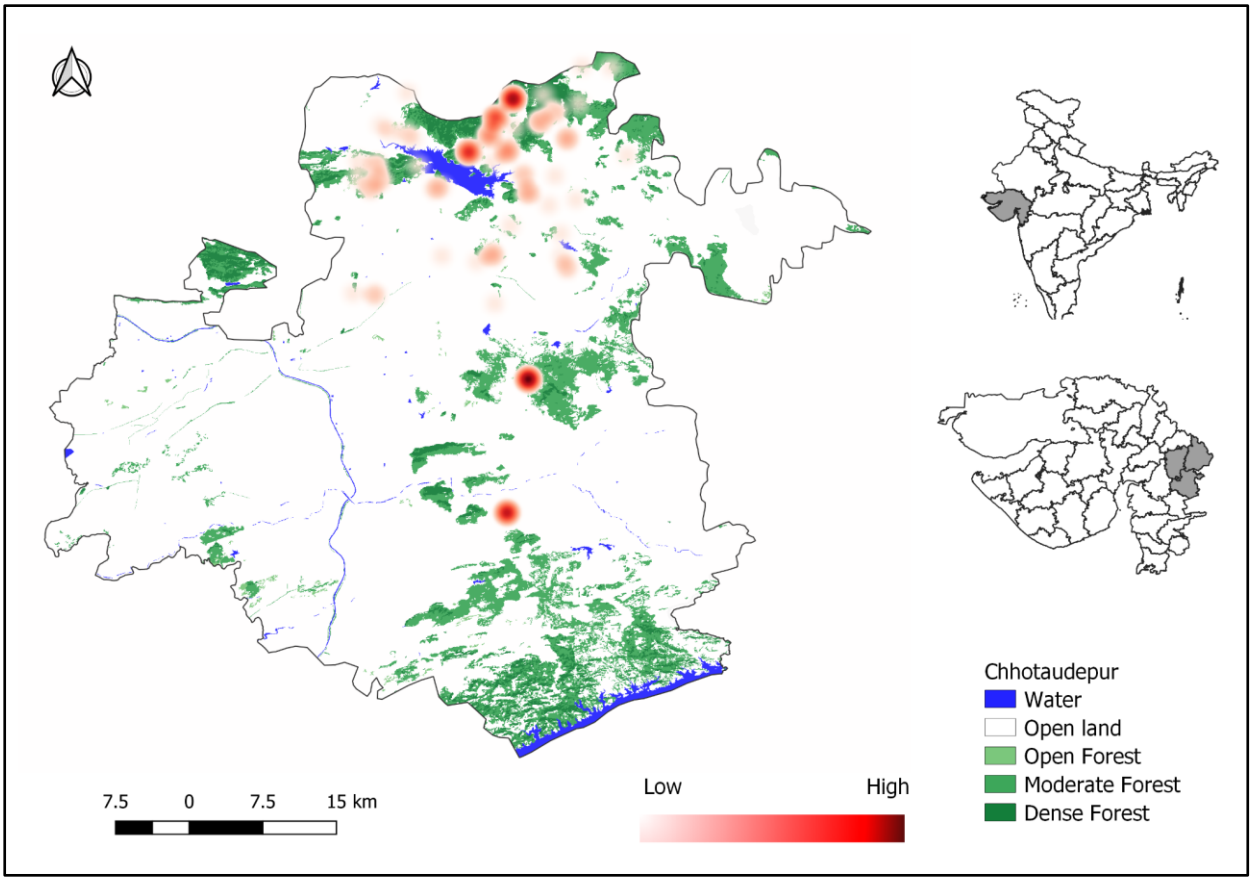

Figure 2. Human-sloth bear conflict in Chhota Udepur district

Locations were available for 97 attacks and most of the conflicts took place in forests (59.8%), 34% within farms, 4.1% in villages, and 2.1% on roads (Fig. 3). Attacks were predominantly in forests at 62.9% (17/27) for females and 58.5% (41/70) for males. Attacks on farms was 75.8% (25/33) male and 24.2% (8/33) female. For NTFP collection, 41.6% (n = 5 out of 12) of female victims were attacked as compared to 22.0% (n =9 out of 41) of male, and 33.3% (n = 4 out of 12) of female were attacked during defecation as compared to 2.4% (n = 1 out of 41) for male. 31.7% (n=13 out of 41) attacks have occurred on the males who were passing through the forest edges compared with women (16.6%, n=2 out of 12). Majority of the cases involving females,

occurred during summer (60%, n = 18) whereas attacks on male were more frequent during the monsoon season (43.8%, n =32).

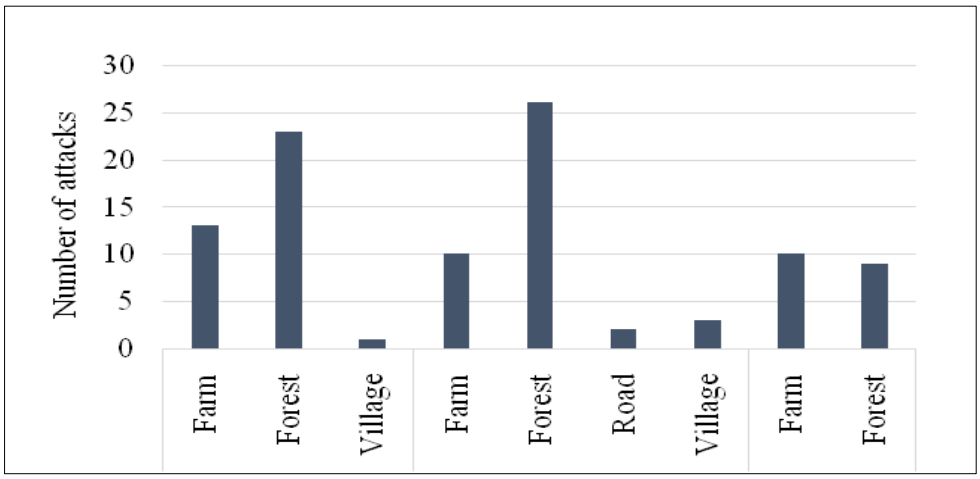

Figure 3. Number of sloth bear attacks (n = 97) in various locations in the study area

Victims ranged from 9 to 65 years of age (mean=39). Of these, 42% of attacks were on individuals 41-50 years old (n=29), followed by individuals 31-40 (n=12) and 21-30 years old (n=12) with 17.39% victims. 10% of age group 51-60 (n=7) and 5.8% (n=4) belonging to 61-70 suffered the sloth bear attack injuries. Pearson chi-square test showed no significant difference in the age groups of the victims, $\chi 2$ (24, n = 69) = 28, p =0.26. There was no significant difference between the mean age of male (42.8, SD = 12.3) and female (30.94, SD = 13.6) victims, (t-test, df=68, t = 1.844, p= 0.07). Of the 103 attacks, the highest attacks were recorded in 2013 (n = 19) and 2014 (n = 16). The sloth bear attacks show a significant seasonal variation with respect to the gender of victims ($\chi 2$=6.93, p=0.03). Most attacks occurred in summer (20.4%, n = 21), followed by monsoon (11.7%, n = 12) and August (10.7%, n = 11) (Fig. 4).

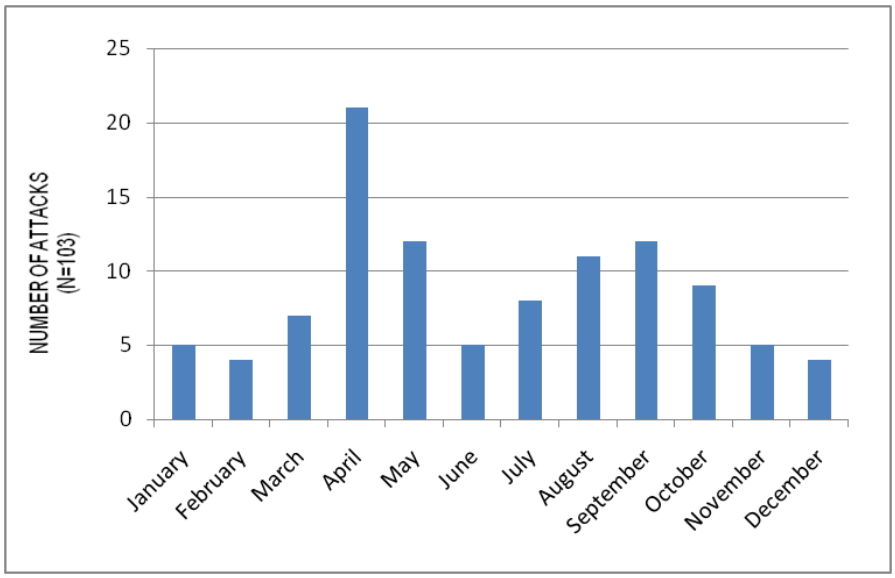

Figure 4. Record of sloth bear attacks (n = 103) on humans in Chhota Udepur, Gujarat, India, (2008-2020)

Seasonally, 44.7% of the attacks occurred in summer (n = 46), 35.9% during monsoon (n = 37) and 19.4% in winter (n = 20). 26 attacks in forest and 10 attacks in farms are recorded in summer, whereas 23 attacks in forest and 13 attacks are noted in monsoon.

Seasonal attacks show that in summer were more frequent than those of the monsoon and winter. There was a significant difference between combinations of winter- summer and winter-monsoon whereas no significant difference was found between summer-monsoon. (Table 1)

Table-1: Results of t-test for comparison of combinations of seasons of sloth bear encounters with victims

Group A	**Winter**			**Summer**			**Mean Difference**	**95% CI for Mean difference**	***T***	***df***	***p***
Conflict cases	***M***	***SD***	***n***	***M***	***SD***	***n***					
	4.5	0.57	18	11.25	7.15	45	-6.75	-15.508, 2.008	-1.886	6	0.04
Group B	**Winter**			**Monsoon**			**Mean Difference**	**95% CI for Mean difference**	***T***	***df***	***p***
Conflict cases	***M***	***SD***	***n***	***M***	***SD***	***n***					
	4.5	0.57	18	10	1.82	40	5.5	- 7.8427, - 3.1572	-5.745	6	0.01

Group C	Summer			Monsoon			Mean Difference	95% CI for Mean difference	*T*	*df*	*p*
Conflict cases	***M***	***SD***	***n***	***M***	***SD***	***n***					
	11.25	7.15	45	10	1.82	40	1.25	-7.7613, 10.2613	0.339	6	0.09

Most cases (26.86%, n = 18) occurred between 9:00 am - 11:59 am followed by 22.38% (n = 15) between 6:00 am- 8:59 am and 10.44% (n=7) attacks between 3:00 am- 5:59 am. 11.94% (n=8) attacks are recorded between 3:00 pm – 5:59 pm and 10.44% (n=7) attacks between 6:00 pm – 8:59 pm. The difference between attack timing and location was not significant, p> 0.05. In the study area, 33 attacks took place in morning (6:00 am to 11:59 am), 13 attacks in the afternoon (12:00 pm to 5:59 pm), 10 attacks in the evening (6:00 pm to 11:59 pm) and 11 attacks in the night time (12:00 am to 5:59 am). Throughout the three seasons, attacks were high in the morning time (Fig. 5) with 19 attacks in the morning and no attacks in winter afternoon and evening.

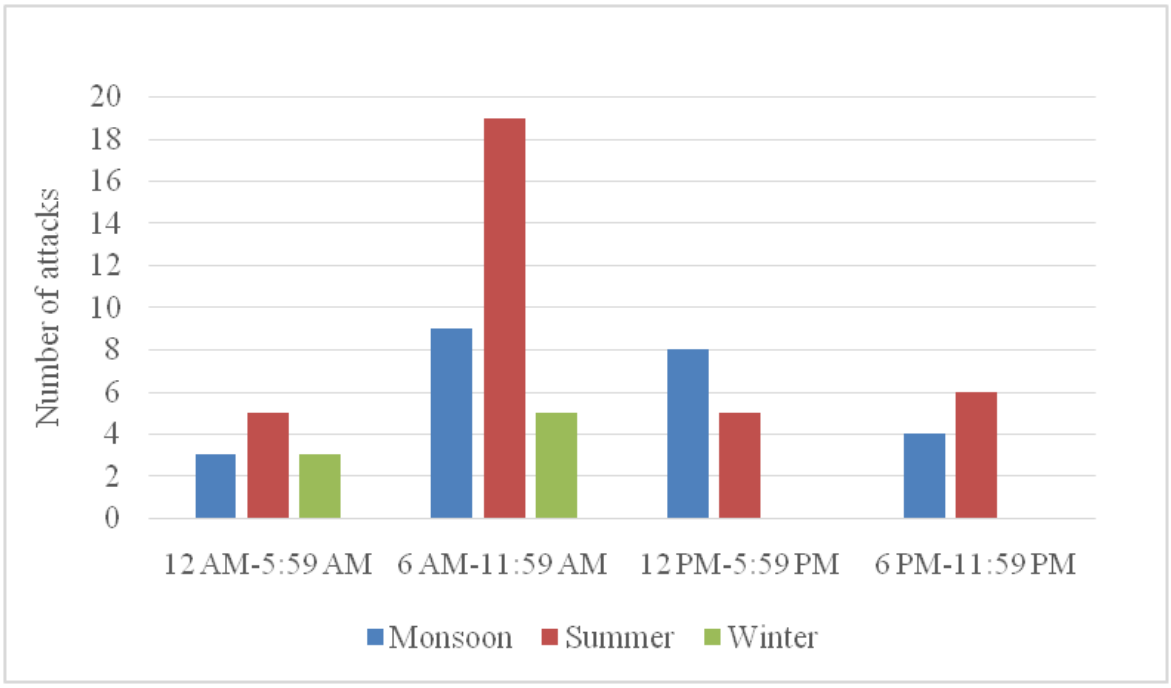

Figure 5: Number of attacks (n=67) occurred throughout 24 hours in various season in the study area

Information on the victim's activity was available for 53 cases, of which 32 occurred in forests and half of the encounters took place when the victim was involved in Non-timber forest products (37.5%, n=12). 28% of attacks have happened while the victim was passing through the forest, in 12.5% (n =4) cases the victim was grazing their livestock in the forest, 6% (n=2) during firewood collection, 9.37% (n=3) encounters occurred when the victim was using the forest for activities like defecation in open and washing clothes (6.25%). In the case of the Non-Timber

Forest Products (NTFP) collection, 25% (n=3) of each attack occurred during the collection of timru leaf, mahua flowers, lac, and grass. On farms (n=15 cases) 53% of attacks occurred while working in farms, 27% during farm visits, 13% while tending cattle, and 7% while defecating.

Discussion

Human-sloth bear conflict is common throughout its global distribution and most areas where human and sloth bear coexist. Sloth bear attacks have increased significantly throughout India and specially in the non-protected areas (Sharp et al., 2022) similar observation from Sri Lanka during the last century (Ratnayeke et al., 2014). Krishna Raju et al. (1987) reported 20-30 sloth bear maulings/year in Andhra Pradesh. Our data suggest that sloth bear attacks have increased but in the last few years it is under control due to management implications, better habitat management, and our education and outreach program "Aatmvat Servabhuteshu" (Mesaria et al. 2022). The sloth bear population increased in this area and simultaneously human population and their dependency on forest products also increased in the region.

Habitat degradation and agriculture practices near the forest boundaries and non-protected areas have been reported as a likely cause for sloth bears foraging on cultivated crops as well as the fruiting species near human habitation (Garshelis et al., 1999; Bargali et al., 2005, 2012) and also kitchen gardens of village houses (Bargali et al., 2012). Mahua is widely used in this region to produce local vine (alcoholic drinks); however, the leaves and leftovers are disposed of outside the village home, which becomes an attractant for bears (Mevada & Dharaiya, 2010; Mewada et al. 2019) and we found the plastic of that vine from the sloth bear scats (Shalu et al., 2023). Sloth bears in the Jessore Wildlife Sanctuary (northernmost sanctuary in Gujarat state) are mainly using the forest patches where the food was available (Sukhadiya et al., 2013) and habitat fragmentation was considered to have facilitated the increase in human–bear conflicts in north Gujarat (Dharaiya, 2009).

Based on the season in north Bilaspur, study revealed that the most frequent attacks were recorded from August till October, January and May (Chauhan et al., 1999; Rajpurohit & Krausman, 2000; Bargali, 2004). Human–sloth bear conflict has been reported from many parts of central India (Madhya Pradesh and Chhattisgarh) (Chauhan & Rajpurohit, 1996, Bargali et al., 2005).

In central Gujarat, sloth bear attacks were frequent during summer and monsoon season with few attacks in winter. The majority of sloth bear attacks in the neighboring state of Chhattisgarh occurred during the monsoon season (Bargali et al., 2005). For the collection of seeds, people

stay in the forest the whole night till early morning because the economic value of seed is higher than any other product (Mesaria et al., 2023).

Garcia et al. (2016) interviewed 71 sloth bear attack victims from 202 villages in north Gujarat in 2008–2009 indicating the conflict and interaction of locals with sloth bears. These studies suggest conflict with sloth bears in the northern parts of Gujarat, but insights on sloth bear conflicts from central Gujarat are unavailable. The middle-aged people (31 - 50) were attacked more because they were more likely to be engaged in outdoor occupations such as collection of forest produce or agriculture around the forested areas and livestock-based activities more than the younger (11 – 30) and older (51 – 70) age groups (Mesaria et al., 2023). These timings are related to sloth bear activities and tribal are most actively present in the forest and farms. Thus, human conflicts with sloth bears appear to vary spatially across the range of the species. The locals in the Chhota Udepur district are involved mainly in forest-based activities and their primary occupation is farming, leading them to encounter sloth bears throughout the year (Mesaria et al., 2022; 2023). Attacks during Non-timber Forest Product collection were more likely because the locals visited the forest early morning in large numbers and in disjointed different groups to get engaged in the NTFP collection activity noiselessly, increasing their chances of sudden encounters with sloth bears.

Conclusion

The attacks in the study area indicated the temporal overlap between locals and bears. This reflects more bear encounters in the forest areas than the villages with few exceptions where sloth bears wander in the search of water in villages. High human activities in the forest might be a cause of escalating conflict issues. It was also found that human and bear activity overlapped in the crepuscular periods, often greatly in the morning and the period of overlap is longer in the warm and wet seasons. It is recommended that definite timing should be allowed and followed by the locals to avoid interaction with bears. And advise the locals go in groups and carry a stick and torch. It is also important to keep light bulbs on in their respective farms during nighttime to keep sloth bears away from hiding; especially in the maize farms. A bear safety program should be initiated to educate locals about the ecology of the bears and prevalent conflict.

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References

Aryal, A., Morley, C. G. & McLean, I. G. (2018). Conserving elephants depend on a total ban of ivory trade globally. Biodiversity and Conservation, 27(1), 2767–2775.

Bargali, H. S. (2004). The ecology of the problematic sloth bear (*Melursus ursinus*) and mitigation of human bear conflict in Bilaspur forest division, Madhya Pradesh. Ph.D. thesis, Wildlife Institute of India, Dehradun.

Bargali, H. S., Akhtar, N. & Chauhan, N. P. S. (2005). Characteristics of sloth bear attacks and human casualties in North Bilaspur Forest Division, Chhattisgarh, India. Ursus, 16(2), 263–267.

Bargali, H. S., Akhtar, N. & Chauhan, N. P. S. (2012). The sloth bear activity and movement in highly fragmented and disturbed habitat in central India. Ursus, 7(4): 312–319.

Bombieri, G., Penteriani, V., Almasieh, K., Ambarl, H., Ashrafzadeh, M. R., Das, C. S., et al…. (2023). A worldwide perspective on large carnivore attacks on humans. PLoS Biology, 21(1), 1-15. e3001946. https://doi.org/10.1371/journal.pbio.3001946

Champion, H. G. & Seth, S. K. (1968). A revised survey of forest types of India. Government of India Press pp. 404.

Chauhan, N. P. S. & Rajpurohit, K. S. (1996). Study of animal damage problems in and around protected areas and managed forest in India *PhaseI*: Madhya Pradesh, Bihar and Orissa. Wildlife Institute of India, Dehradun, India.

Chauhan, N. P. S., Bargali, H. S. & Akhtar, N. (1999). Human Sloth bear conflicts in the state of Madhya Pradesh, India. Paper presented in 12th International Conference on Bear Research and Management 13 – 18 October, 1999 at Poiana Brasov, Romania.

Dai, Y., Li, Y., Xue, Y. et al…. (2022). Mitigation Strategies for Human–Tibetan Brown Bear (*Ursus arctos pruinosus*) Conflicts in the Hinterland of the Qinghai-Tibetan Plateau. Animals, 12, 1422. https://doi.org/10.3390/ani12111422

Debata, S., Swain, K. K., Sahu, H. K. & Palei, H. S. (2016). Human–sloth bear conflict in a human-dominated landscape of northern Odisha. India. Ursus, 27(2), 90–98.

Rabari, V. & Dharaiya, N. (2022). A systematic review on the feeding ecology of Sloth Bear *Melursus ursinus* Shaw, 1791 in its distribution range in the Indian subcontinent. Journal of Threatened Taxa, 14(12), 22329-22336.

Dharaiya, N. & Singh, C. P. (2018). Habitat suitability and corridor habitat suitability and corridor analysis for sloth bear in Gujarat using remote sensing and ecological modeling. Final Technical Report. Space Application Centre. Indian Space Research Organization (ISRO).

Dharaiya, N., Bargali, H. S. & Sharp, T. (2016). *Melursus ursinus*. The IUCN Red List of Threatened Species 2016: e.T13143A45033815. Available: http://dx.doi.org/10.2305/IUCN.UK.20163.RLTS.T13143A45033815.en

Dharaiya, N. (2009). Evaluating habitat and human-bear conflicts in north Gujarat, India, to seek solutions for human-bear coexistence. Rufford Small Grants Foundation.

Garcia, K. C., Joshi H. M. & Dharaiya, N. (2016). Assessment of human–sloth bear conflicts in North Gujarat, India. Ursus, 27, 5–10.

Garshelis, D. L., Joshi, A. R., Smith, J. L. D. & Rice, C. G. (1999). Sloth bear conservation action plan. In Bears, Status Survey and Conservation Action Plan. (Eds.) Servheen, C., Herrero, S. & Peyton, B. IUCN/SSC Bear and Polar Bear Specialist Groups, IUCN, Gland, Switzerland. pp. 225–240.

Census. (2011). https://www.census2011.co.in/ accessed on 20/09/2024

Krishna Raju, K. S. R., Krishna Murthy, A. V. R. G., SubbaReddi, C., Prasad Reddy, N. A. V., Lokaranjan, R. & Shankar, K. J. N. G. (1987). Status of wildlife and habitat conservation in Andhra Pradesh. Journal of Bombay Natural History Society, 84, 605-619.

Malik, A., Singh, C. P., Dharaiya, N. & Padate, G. (2023). Potential connectivity for sloth bear habitats in Western India's landscape. European Journal of Wildlife Research 69(6), 118.

Mesaria, S., Desai, P. & Dharaiya, N. (2022). Conservation undeterred: avirtual sloth bear conservation awareness program during the COVID-19 pandemic. International Bear News, 31(1), 15–16.

Mesaria, S., Desai, P., Patel, S., Gadhavi, D., Giordano, A. J. & Dharaiya, N. (2023). Livestock depredation by leopards, associated economic losses, and financial compensation to communities in Chhota Udepur district of central Gujarat, India. Human–Wildlife Interactions, 17(1), 8

Mevada, T. & Dharaiya, N. (2010). Seasonal dietary composition of sloth bear (*Melursus ursinus*) in the reserve forest of Vijaynagar, north Gujarat, India. Tigerpaper, 37(2), 1.

Mewada, T. P., Tiwari, U. L. & Kotia, A. (2019). Fruiting species influence the seasonal use of the habitat by Sloth bear in and around Balaram Ambaji Wildlife Sanctuary, Gujarat, India. Notulae Scientia Biologicae, 11(2), 183-190.

Morales-González, A., Ruiz-Villar, H., Ordiz, A. & Penteriani, V. (2020). Large carnivores living alongside humans: Brown bears in human-modified landscapes. Global Ecology and Conservation, 22, e00937.

Palei, H. S., Debata, S., & Sahu, H. K. (2020). Diet of sloth bear in an agroforest landscape in eastern India. Agroforestry Systems, 94(1), 269-279.

Rajpurohit, K. S. & Krausman, P. M. (2000). Human–sloth bear conflicts in Madhya Pradesh, India. Wildlife Society Bulletin. 28, 393-399.

Rather, T. A., Tajdar, S., Kumar, S. & Khan, J. A. (2020). Seasonal variation in the diet of Sloth Bears in Bandhavgarh Tiger Reserve, Madhya Pradesh, India. Ursus, 31(12), 1-8.

Ratnayeke, S., Van Manen, F. T., Pieris, R. & Pragash, V. S. J. (2014). Challenges of large carnivore conservation: Sloth bear attacks in Sri Lanka. Human Ecology, 42, 467– 479.

Shalu, M., Shruti, P., Pratik, D. & Nishith, D. (2023). Food from the Neighbors: Sloth Bear Savoring the Debris Left by Tourists and Locals in Eco-Sensitive Zone of Chhota Udepur District, Gujarat, India. Proceedings of the Zoological Society, Springer India, 76(2), 202-204. https://doi.org/10.1007/s12595-023-00484-3

Sharp, T. R., Smith, T. S., Swaminathan, S. et al…. (2022). Sloth bear attacks: regional differences and safety messaging. Scientific Report, 12, 39-43. https://doi.org/10.1038/s41598-022-07974-y

Singh, N., Sonone, S. & Dharaiya, N. (2018). Sloth bear attacks on humans in central India: Implications for species conservation. Human Wildlife Interactions, 12, 338–347.

Sukhadiya, D., Joshi, J. U. & Dharaiya, N. (2013). Feeding ecology and habitat use of sloth bear (*Melursus ursinus*) in Jassore Wildlife Sanctuary, Gujarat, India. Indian Journal of Ecology, 40(1), 14-18.