

Characteristics of sloth bear attacks and human casualties in North Bilaspur Forest Division, Chhattisgarh, India

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Abstract: Sloth bears (*Melursus ursinus*) are endemic to the Indian subcontinent and frequently come into conflict with humans. In the North Bilaspur Forest Division, a total of 137 attacks (resulting in 11 deaths) occurred between April 1998 and December 2000. Most (54%) incidents took place during the monsoon season. Attacks occurred (45%) early in the morning (0400–0800 hrs) more frequently than at other times; human activities at the time of attack were most frequently defecation (27%); locations of attacks were in kitchen gardens, crop fields, and in adjoining forests. A single bear was involved in a majority (56%) of incidents, but groups of 2 (20%) and 3 (21%) bears were also involved. Attacks were predominantly by a single bear (93%) and rarely by 2 (4%) or 3 bears. In most cases, the attacking bear ran away (55%) or was chased by other people (39%) or livestock. Most victims suffered multiple injuries (52%); single injuries on legs (25%), hand (12%), and head (8%) regions were also recorded.

Key words: bear attacks, India, *Melursus ursinus*, North Bilaspur Forest Division, sloth bear

Ursus 16(2):263–267 (2005)

The sloth bear (*Melursus ursinus*) is endemic to the Indian subcontinent and is found in India, Sri Lanka, Nepal, Bhutan, and Bangladesh. In India, sloth bears are distributed from the southern tip of the Western Ghat mountains to the foothills of the Himalayas. Habitat degradation due to increased human population (Cowan 1972, Johnsingh 1986, Schoen 1990), diminished food resources (Murthy and Sankar 1995, Rajpurohit and Chauhan 1996), and increased poaching for its gall bladder (Laurie and Seidensticker 1977, Servheen 1990, Garshelis et al. 1999) have led to declines in sloth bear populations. Because forest areas outside parks and reserves have decreased, remaining populations of sloth bear are becoming increasingly fragmented (Garshelis et al. 1999). The sloth bear is included in Schedule I of the Indian Wildlife (Protection) Act 1972 (amended 2002) and in Appendix I of CITES.

The North Bilaspur forest division (NBFD) is in the state of Chhattisgarh. India's largest sloth bear population (approximately 10,000 bears) is reported to occupy the tropical dry deciduous forests states of Chhattisgarh

and Madhya Pradesh in central India (Servheen 1990). Sloth bears are locally considered to be one of the most dangerous wild animals. Sloth bears reportedly can attack without apparent provocation (Gee 1964), and may encounter humans when they raid croplands or when people enter forests to collect non-timber forest products (NTFP; Garshelis et al. 1999). Sloth bears raid a variety of crops and occasionally scavenge on cattle carcasses (Laurie and Seidensticker 1977, Rajpurohit and Chauhan 1996, Rajpurohit and Krausman 2000). Human-sloth bear conflicts in Madhya Pradesh (which earlier included Chhattisgarh as well) have been reported from 17 forest divisions and 13 protected areas. Most of the attacks were recorded in managed forests outside protected areas (Rajpurohit and Chauhan 1996).

The forests of NBFD are patchy, fragmented, and interspersed with agricultural fields and villages with high human and cattle population. In Pendra and Marwahi administrative ranges of NBFD, sloth bears are considered nuisances by local people. The inhabitants are poor tribal people who suffer considerably from economic loss of crops, mauling, and sometimes killing by sloth bears. The objectives of this study were to describe sloth bear attacks and human injuries. We define an "attack" as an encounter that ends with human injury or death.

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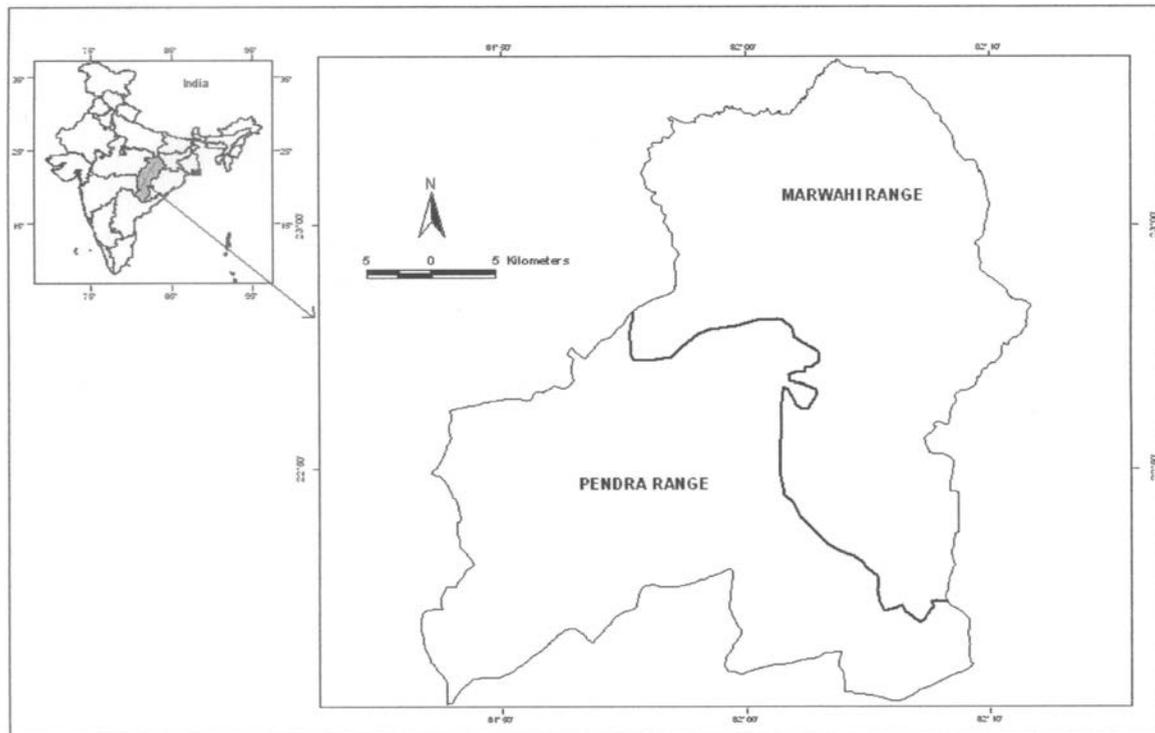


Fig. 1. The 1,396-km² study area in Pendra and Marwahi administrative ranges (regions) of the forest department in the state of Chhattisgarh in central India, for a 1998–2000 study of sloth bear attacks.

Study area

The study area includes about 1,396 km² of Pendra and Marwahi administrative ranges (regions) of the forest department of NBFDP in the state of Chhattisgarh in central India (Fig. 1). The study area lies between 81°45'–82°13' E longitude and 22°40'–23°07' N latitude. Out of the total study area, patchy forest occupied about 337 km². Topographically, the region includes the Chhattisgarh plains and hilly regions of Maikal Range. Most of the forest fragments consist of small hillocks with boulders that offer safe den sites to sloth bears. There were more active den sites in Marwahi Range than in Pendra Range (Akhtar 2003), where almost all den sites were situated in hillocks of big boulders.

We recognized 3 distinct seasons in the study area: summer (Mar–Jun), monsoon (Jul–Oct), and winter (Nov–Feb). Sloth bear diets in this area include jamun (*Syzygium cumini*), bel (*Aegle marmelos*), ber (*Ziziphus mauritiana*), and mahuwa (*Madhuca indica*) (Bargali 2003). During summer, mean temperatures exceed 40°C; during winter mean temperatures are 9.7°C. The average annual rainfall is 1,381mm. The study area

included 178 villages and had a human population of about 180,000 and cattle population of about 150,000.

Human use

In both Pendra and Marwahi Ranges most bear den sites were close to human habitation, suggesting to us forced use of degraded habitat. Because of extreme hot summers in central India and lack of irrigation facilities, people depend mainly on the southwest monsoon for agricultural practices. During non-cropping season, people depend on NTFP collection. Some species of importance to bears are also collected by villagers, including flowers and fruits of mahuwa, and fruits of bel, char (*Buchanania lanzan*), jamun, and tendu (*Diospyros melanoxylon*). Collection of NTFP not only disturbs bears but also limits their availability for bears (Bargali et al. 2004).

Methods

Information on human mauling and killing was collected during April 1998 to December 2000 from records of the forest department and through interviews. Victims were interviewed directly; in case of death of

Table 1. Incidents of human mauling and killing by sloth bears in Pendra and Marwahi administrative ranges (regions) in the state of Chhattisgarh in central India during Apr 1998–Dec 2000.

Range	Men		Women		Children		Total
	Mauled	Killed	Mauled	Killed	Mauled	Killed	
Pendra	16	2	13	3	3	0	37
Marwahi	62	2	19	4	13	0	100
Total	78	4	32	7	16	0	137

the victim, information was collected either by interviewing family or witnesses to the incident. Information on human casualties including sex, activity of victims, place of casualty, seasonal variation, bear group size, characteristics of bear attacks, and injuries were collected via a questionnaire.

Results

Of the 178 villages, 122 recorded bear attacks or damage to crops. During the study period, 137 attacks were reported, 11 of which (8%) were fatal (Table 1). Of these attacks, 100 occurred in Marwahi Range and 37 in Pendra Range. Victims of mauling were mostly adult men ($n = 78$), followed by adult women ($n = 32$), and children ($n = 16$). There were more deaths among women ($n = 7$) than among men ($n = 4$).

Most (54%, $n = 74$) incidents were recorded during the monsoon season (Fig. 2; $\chi^2 = 27.7$, 2 df, $P < 0.01$). More incidents occurred during the early morning hours of 0401–0800 than later in the day ($\chi^2 = 117.4$, 11 df, $P < 0.01$; Fig. 3). More incidents occurred when victims were engaged in defecation (27%; $\chi^2 = 26.2$, 5 df, $P < 0.01$; Fig. 4) than other activities. Attacks were also recorded when people were walking within villages,

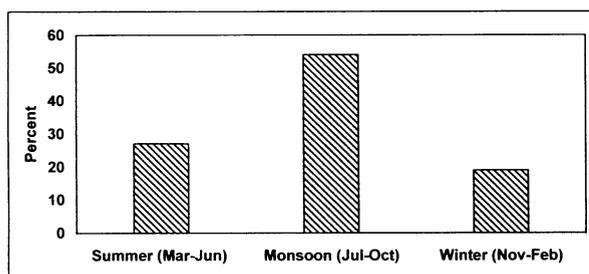


Fig. 2. Seasonal variation of sloth bear attacks in Pendra and Marwahi administrative ranges (regions) in the state of Chhattisgarh in central India, Apr 1998–Dec 2000 ($n = 137$).

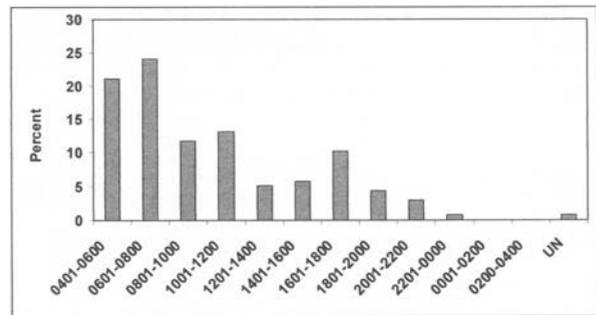


Fig. 3. Time of occurrence of human mauling and killing by sloth bears in Pendra and Marwahi administrative ranges (regions) in the state of Chhattisgarh in central India, Apr 1998–Dec 2000 ($n = 137$).

in crop fields, in forests, or busy with cattle grazing, farming and NTFP collection.

Group size of bears involved in attacks was most often 1 (56.2%), although group sizes of 2 (19.7%) and 3 (21.2%) bears were also recorded. Irrespective of the group size involved, including mother with cubs, attacks were most frequently by a single bear (92.7%). Two bears were involved in 3.6% of the incidents, and in 2.2% of the incidents 3 bears were reported to have attacked the victim. Forty incidents involved a mother with one or more cubs.

Bears most commonly (36.5%) attacked by running on all four legs and knocking the victim down. The second most common (28.5%) mode was attacking by standing on their hind leg (Table 2). More rarely (1.5%), bears tried to climb a tree to attack the victim in the tree.

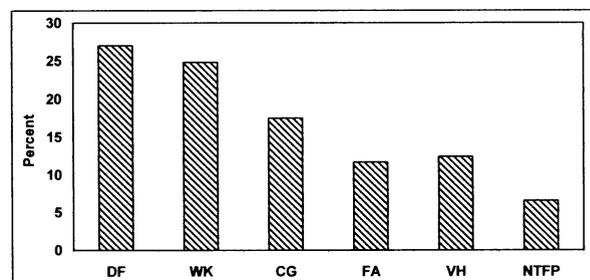


Fig. 4. Activity of victims at the time of attacks by sloth bears in Pendra and Marwahi administrative ranges (regions) in the state of Chhattisgarh in central India, Apr 1998–Dec 2000, based on interview of victim, relative, or witness ($n = 137$). Abbreviations: DF = defecation, WK = walking, CG = cattle grazing, FA = farming, VH = vicinity of house, NTFP = collecting non-timber forests products.

Table 2. Mode of sloth bear attack and human posture at the time of attack in Pendra and Marwahi administrative ranges (regions) in the state of Chhattisgarh in central India, Apr 1998–Dec 2000.

Range	Bear		Victim		Unknown		
	2LS ^a	4LS ^b	climb	jumped	fell	sitting	
Pendra	13	15	0	0	2	2	5
Marwahi	26	35	2	1	12	5	19
Total	39	50	2	1	14	7	24

^a2LS: Bear stood on hind legs.

^b4LS: Bear on fore and hind legs.

In a few incidents, victims became unconscious or fell to the ground. Most victims were attacked on their legs, 17 on their hands (12.4%), and 15 on other parts of their bodies. There were 71 cases of multiple injuries to the victims. Victims suffered injuries such as fractures and severed body parts (eyes, scrotal sac). On 53 occasions, victims survived when people nearby shouted and chased the bear away; in 4 cases, cattle or dogs rushed toward the bear, chasing it off.

Following the attack, bears most commonly (54.7%) fled the area. In 2 incidents, bears were killed by other people after having killed their victims (Table 3). In both of these cases, bears were observed to eat body parts of the victim. When villagers and family members reached the site, rather than fleeing, bears attacked the crowd, at which point family members or people accompanying the victim fought and killed the bear (in one case with a thick, heavy stick, and in the other with a heavy stone).

Discussion

Because of extensive damage to already degraded habitat and collection of NTFP by the locals, bears face a shortage of food resources and direct competition with humans for common food resources (Murthy and Sankar 1995, Rajpurohit and Chauhan 1996). In NBFD, bears frequently explored human habitation and cultivation areas in search of food, which in turn resulted in increased encounters with humans, occasional injury or death, and extensive damage to agricultural or horticultural crops (Bargali 2003). Bears mauled more men than women, possibly because men were more frequently active in places and times that coincided with bear movements, or were involved in activities such as collection of NTFP or going to markets or other villages. Women and children tended to stay at home more and move in larger groups.

With the onset of monsoons and increased vegetation cover, people begin agricultural activities. We believe

Table 3. Mode of survival of victims of sloth bear attacks in Pendra and Marwahi administrative ranges (regions) in the state of Chhattisgarh, central India, Apr 1998–Dec 2000.

Range	Bear		Rescued	Rescued	Rescued	Unknown
	left	killed	by people	by cattle	by dog	
Pendra	24	2	10	0	0	1
Marwahi	51	0	43	2	2	2
Total	75	2	53	2	2	3

that the higher incidence of attacks during monsoons was due to the increased presence of people in crop fields for farming and protection of crops from bears as well as cattle grazing in the forests areas. Bears are known to raid groundnut and maize crops, and the presence of people in forested areas attending grazing livestock probably added to the probability of encounters with a bear. Because there are no crops in fields during summer and winter, bears rely heavily on fruiting trees (especially *Ficus* species, Bargali 2002). Deserted crop fields are used for cattle grazing, which reduces disturbance in forests and reduces the chance of an encounter. As well, during summer bears emerged from their dens early in the evening and entered the forest where they were likely to encounter people venturing into forests for the NTFP collection or simply traveling on footpaths.

Following parturition in January and February, mothers with cubs remained mostly near their dens, not venturing far from their dens until March. With shorter winter days (and possibly to avoid conflicts with humans), bears emerged from their dens mostly after it became dark and people had ceased their activities.

Single bears were implicated in a majority of attacks. In cases of a mother with one or more cubs, most attacks involved only the mother. Bears usually fled after attacking. In most incidents, bears attacked while running and pushed their victims using their fore legs or head, which may explain why the most common injuries were to victims' legs. Multiple injuries and deaths appear to result when victims struggled with the bear.

Management implications

Under the given socioeconomic and political framework, one way to mitigate human–sloth bear conflicts is to minimize the ill effects of socioecological conditions. Education and awareness programs on the ecology and behavior of sloth bears and on mitigation strategies

should be initiated for villagers in affected areas. In the fragmented and degraded forest areas, habitat protection should be carried out to sustain the existing sloth bear population.

In Nbfd, villagers still possess the remnants of a conservation ethic; there is a need to involve village forest communities in the mitigation of the problem by providing all possible support to them. Village committees should be involved in education and awareness programs, in preventing illegal cutting and lopping of trees, and in helping the forest department control forest fires and protect forests. People involved in implementing such measures should be suitably rewarded. To avoid conflicts with bears early in the morning, incentives should be created for villagers to construct toilets in their houses using easily available, low-cost material. Villagers should avoid cultivating maize and groundnut crops near den sites and should change agricultural patterns by growing crops of less interest to bears. We recommend that encroachment on forest land and mining activities in the vicinity of hillocks, which are potential den sites for bears, be banned immediately.

Because they lack irrigation, local people depend on the monsoon for agriculture. During the non-growing season, people depend on NTFP collection. Leaves of mohline (*Bauhinia vahlii*) and sal (*Shorea robusta*) are collected by villagers, and tendu leaves (*Diospyros melanoxylon*) are collected by the forest department. These leaves are used in making plates and bidi (a crude form of a cigarette which is made by wrapping tobacco in leaves from tendu). Villagers can be provided employment by establishing cottage industries for making bidi and plates. Villagers can be motivated to make ropes and bamboo products. This will help in generate employment for the locals and reduce their dependence on forests.

Increasing incidents of human–bear conflict in Chhattisgarh, as well as in Madhya Pradesh (Rajpurohit and Chauhan 1996) and many other parts of the country (Garshelis et al. 1999), together with the loss of forested areas outside parks and reserves, pose a major threat to the survival of sloth bears. Timely identification and protection of areas with intact forests with substantial bear populations is essential for the conservation of sloth bears.

Acknowledgments

We thank V.B. Sawarkar, former Director, Wildlife Institute of India, for his cooperation and guidance. We thank P.K. Mishra, former PCCF Madhya Pradesh Forest Department, and staff of both Madhya Pradesh

and Chhattisgarh state forest department for their help and cooperation. We also thank Panna Lal, WII, and our field assistants P. Singh and late K. Kumar for their assistance. Finally we thank all villagers and victims for their cooperation during the fieldwork.

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Received: 26 February 2004

Accepted: 13 May 2005

Associate Editor: R. Shideler