

Sloth bears and anthropogenic risks in Karnataka, India

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Abstract: Sloth bears (*Melursus ursinus*) fall victim to anthropogenic hazards, including snares, small crude explosive devices, open wells, and roads, as well as gunshots, barbed wire, and mob attacks. While conducting rescue efforts in the southern state of Karnataka, India, Wildlife SOS collected data on 20 snare incidents, 8 crude explosive device incidents, 7 roadkill incidents, 5 open well incidents, 2 gunshot attacks, 1 barbed wire incident, and 1 mob attack that occurred between 2006–2007 and 2013–2019. Female sloth bears fell victim to anthropogenic risks more often than did males (68% vs. 32%), and 23% of the females had cubs or were pregnant. This study suggests that anthropogenic risks form a threat to the sloth bear populations in Karnataka, India. Our suggestions to mitigate these threats to sloth bears include stiffer penalties for the use of snares and crude explosive devices, putting lips on all open wells, and working with road agencies and forest departments to construct additional wildlife crossings.

Key words: India, *Melursus ursinus*, open wells, poaching, roadkill, sloth bear, snares, wildlife hazards

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The large and growing human population in India ensures that habitat loss and the encroachment of human activity are the greatest risks to many species of wildlife, including the sloth bear (*Melursus ursinus*). The sloth bear is patchily distributed throughout India, as well as the lowland areas of Nepal and the island of Sri Lanka. It is listed as Vulnerable on the International Union for Conservation of Nature Red List as a result of habitat loss and habitat deterioration (Dharaiya et al. 2016). Urban development, wild areas converted to agricultural fields, and habitat degradation are all ongoing problems. However, sloth bears are known to persist in areas close to villages and in degraded habitats (Akhtar et al. 2004). This ability may be, at least in part, the result of several specialized characteristics that this species possesses. First, sloth bears are myrmecophagous, and approximately half of their diet consists of termites or ants (Garshelis et al. 1999, Sacco and Van Valkenburgh 2004). Termites and

ants often thrive in small patches of disturbed habitat, so sloth bears often have a reliable food source even in the midst of degraded habitats. Secondly, sloth bears have a small home range (Joshi et al. 1995, Akhtar et al. 2006, Ratnayeke et al. 2007) compared with other species of bears. For example, the home range of a female sloth bear has been estimated at 9.4 km² in Nepal and 12.4 km² in central India, and that of a male sloth bear at 14 km² in Nepal and potentially larger in India (Joshi et al. 1995, Yoganand et al. 2005). This is very small when compared with brown bears (*Ursus arctos*), whose home ranges may be >1,000 km² (Graham and Stenhouse 2014). Sloth bears have small and often overlapping home ranges, so viable populations are able to persist in a relatively small area for a bear species (Ratnayeke et al. 2007). Thirdly, sloth bears, including adult males and females with dependent young, are socially tolerant of one another (Joshi et al. 1999), which may allow for more bears to occupy a smaller area if there are enough resources. Lastly, sloth bears are largely nocturnal (Joshi et al. 1999, Akhtar et al. 2004, Bargali et al. 2012, Ramesh et al. 2013, Arun et al. 2021), which is beneficial in avoiding direct contact with humans. However, none of these attributes are exceptionally useful in avoiding anthropogenic risks.

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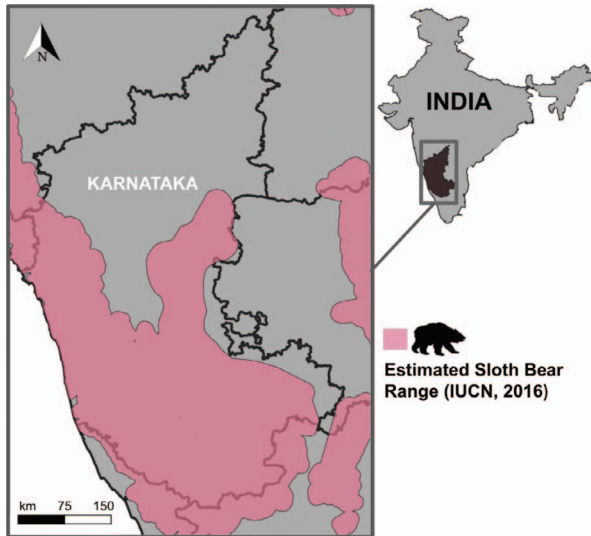


Fig. 1. Location of Karnataka, India, where Wildlife SOS collected data on anthropogenic incidents involving sloth bears (*Melursus ursinus*) that occurred between 2006–2007 and 2013–2019.

25 years. An agreement between the Karnataka Forest Department and Wildlife SOS began with the establishment of a life-time sloth bear care facility in 2005, primarily organized for the rescue and rehabilitation of sloth bears saved from the dancing bear practice. In addition to the captive bear facility, the Karnataka Forest Department entered into an agreement with Wildlife SOS that enabled Wildlife SOS to assist the forest department in the rescue of conflict wild animals within the state. For >15 years, Wildlife SOS has been working in the state of Karnataka rescuing sloth bears from human hazards and documenting these risks. This paper reports on sloth bears that fell victim to anthropogenic hazards between 2006–2007 and 2013–2019. These hazards include snares, crude explosive devices, open wells, roadways, gunshots, barbed wire, and mob attacks.

Study area

The state of Karnataka is very biodiverse, with >12% of the state forested. Karnataka has 3 predominant geographic zones: a coastal region bordered by the Arabian Sea, a hilly region comprising the Western Ghats, and the plains and rocky scrub jungle of the Deccan Plateau (Fig. 1). Sloth bear habitats in Karnataka are considered to be some of the highest quality remaining habitat for the species (Puri et al. 2015). The Western Ghats habitat is largely covered by moist broadleaf forests and is consid-

ered one of the world's biodiversity hotspots. The Deccan Plateau and surrounding areas of eastern Karnataka are largely covered by agricultural lands interspersed with protected patches of wilderness. These preserved forests are generally composed of scrub jungles (*Acacia* spp., *Albizia* spp., *Cassia* spp., and *Ziziphus* spp.) interspersed with boulders and caves. These areas remain unaltered, largely owing to their ruggedness, which makes them unsuitable for agriculture. As these wilderness areas diminished in size and distribution, many species (such as tigers [*Panthera tigris*]) disappeared, whereas others (such as sloth bears and leopards [*P. pardus*]) continued to thrive.

Methods

Wildlife SOS conducts wildlife rescues throughout the state of Karnataka for many species of wildlife, including sloth bears. When information is forwarded by Forest Department officials to Wildlife SOS about an injured, trapped, or dead sloth bear, a rapid response team is sent to rescue the animal or determine the cause of death. All the calls are referred to Wildlife SOS by the Karnataka Forest Department, often by Range Forest Officers. The sloth bear is a schedule I wildlife species; therefore, as a mandate, Forest Department officials are physically present at all bear rescues.

All incidents are documented by date, location of the incident, type of incident, gender of the bear, estimated age of the bear, and the result of the incident. The age of the bear was estimated by personnel involved in the raising of >100 sloth bear cubs to adulthood and >15 years of experience working with sloth bears of all ages at the Wildlife SOS Sloth Bear Rescue Centers. Physical characteristics used to estimate the age included head size, dentition, overall body size, claw color, and sometimes body weight.

Results

We documented 44 events that involved sloth bears subjected to anthropogenic risks. Of these, snares were the most common (45%, $n = 20$), followed by crude explosive devices (18%, $n = 8$), roadkills (16%, $n = 7$), and open wells (11%, $n = 5$). Less common were gunshot (5%, $n = 2$), barbed wire (2%, $n = 1$), and mob attacks (2%, $n = 1$; Fig. 2).

Snares

Of the 20 wild sloth bears caught in snares that Wildlife SOS attempted to rescue, 12 (60%) were eventually released back to the forest where they had initially fallen

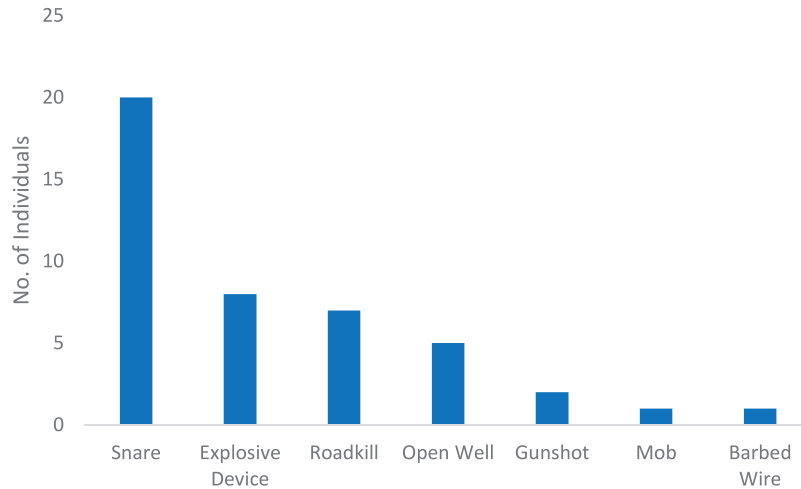


Fig. 2. The number and type of anthropogenic risk incidents that sloth bears (*Melursus ursinus*) fell victim to from 2006 to 2007 and 2013 to 2019 in Karnataka, India.

victim to the snares, except for 1 case. Four bears (20%) died in snares, or from the wounds they suffered, and 4 bears (20%) were put into lifetime care at the Wildlife SOS, Bannerghatta Bear Rescue Centre (BBRC), because their injuries were too debilitating to release them back into the wild. Twelve of the 20 bears were female, and 8 were male. Over half of these sloth bears (55%, $n = 11$) were estimated to be ≤ 2 years old, and 45% ($n = 9$) were estimated to be ≥ 5 years old.

Ten snares (50%) were in agricultural areas, 3 (15%) were in forest or scrublands, and 7 (35%) did not have the locational descriptions. The average distance of those found in agricultural fields was $>2,000$ m from forest edges. Two of the 3 snares found in forest or scrublands were <300 m from agricultural fields and 1 was >800 m from an agricultural area.

There was a spike in the number of bears caught in snares ($n = 12$) between the months of August and December (Fig. 3). This period is the main agricultural harvest season, a time when bears enter agricultural areas for crop raiding. Eight bears (40%) were caught in snares outside of the main harvesting season (Fig. 3). Three of them were snared in scrub, 1 in an agricultural area, and 4 were caught in undocumented locations.

Crude explosive devices

Crude explosive devices killed 8 bears. Seven (88%) were females and only 1 (12%) was male (Fig. 3). All 8 sloth bears were estimated to be ≥ 4 years old. Seven of the crude explosive devices (88%) were set in agricultural fields. The closest crude explosive device to the

forest edge was 40 m from edge and the furthest was >12 km from edge. Only one crude explosive device was set inside of a forest area (12%) and it was <100 m from the forest edge. Three bears (38%) were killed in January, two (25%) in May, and one (13%) each in March, June, and July (Fig. 3). The location where each dead sloth bear was found was likely not the location where the incident occurred because wounded bears often wander from the crude explosive device.

Open wells

Two (40%) of 5 bears, not including cubs, died from injuries sustained from a fall into a well or from being unable to escape the well. Both were females and one had 2 cubs that survived the fall and were rescued by Wildlife SOS. The cubs presently reside at the BBRC. The 3 other bears (60%; 2 females and 1 male) were rescued by Wildlife SOS and eventually released back to the wild. The average distance of these wells from forest edges was 648 m (range = 10–1,900 m).

Roads

Seven bears, not including cubs, died from vehicle collisions. Three incidents occurred within the same 400 m of road in Sulikeri at Hosur Cross, two of which happened within roughly 30 m of one another. One of the 3 deaths involved a mother with cubs, and a second involved an adult female. The third incident involved an adult male and was approximately 400 m from the other 2 incidents. Clearly these incidents occurred in a movement corridor for bears; also, maternal dens are known to exist within 2 km.

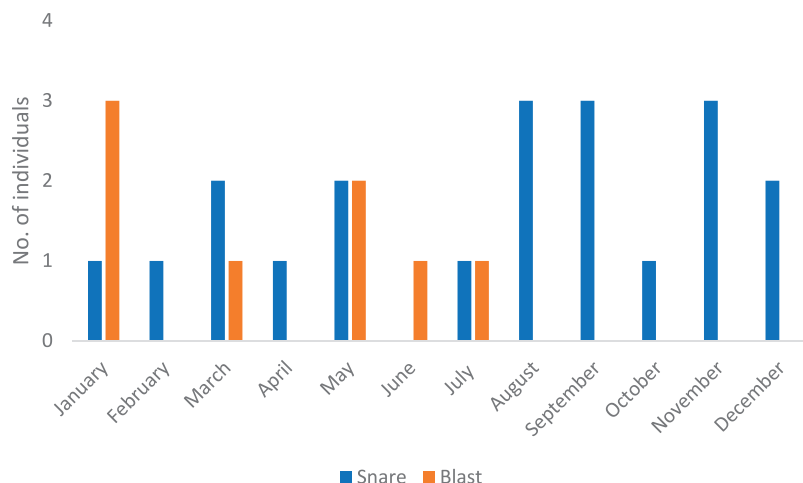


Fig. 3. The number of snare and explosive device blast incidents that sloth bears (*Melursus ursinus*) fell victim to by month from 2006 to 2007 and 2013 to 2019 in the state of Karnataka, India.

Of the remaining 4 incidents, two involved a mother with cubs, one involved a lone female, and one involved a male. In one of the cases involving a mother with cubs, maternal dens were documented roughly 800 m from the road. The incident with the male sloth bear occurred on a road adjacent to the Shettihalli Wildlife Sanctuary.

Barbed wire fence

One sloth bear was rescued after being entangled in a barbed wire fence. This bear was brought back to the BBRC so its wounds could be treated and given time to heal. It was eventually released back to the wild close to the place it was found.

Gunshots and mob

Two bears were killed by gunshots: 1 male and 1 female. The male was shot by a police officer after the bear attacked a person. The female bear was found dead of a gunshot wound with no other evidence. One male bear, involved in a human–bear conflict, was beaten to death by a mob.

Gender differences

More females ($n = 30$, 68%) than males ($n = 14$, 32%) were injured or killed by human-caused hazards (Fig. 4). Roughly 37% ($n = 11$) of the females were juveniles (<2 yr of age) and roughly 36% ($n = 5$) of the males were juveniles. Additionally, 7 of these females (23%) either had cubs or were pregnant.

Discussion

Snares

Snares, highly effective at capturing wildlife of all types, are used throughout India and are made from widely available and inexpensive products, such as wires and cables (Scotson et al. 2015; Gray et al. 2017; O’Kelly et al. 2018a,b). In Karnataka, snares are generally not baited, nor are they associated with fence lines that are occasionally used to funnel animals to the snare. Snares are generally set for bush meat as food, the primary targets being wild boar (*Sus scrofa*) and Indian hare (*Lepus nigricollis*). Sloth bears are not killed for food, nor are they highly valued for their parts in India. Thus, they appear to be unintentional victims of snares.

Although snares are used year-round in Karnataka, they appear to be most problematic for sloth bears from August through December when crops (mainly peanuts, sunflower seeds, and corn) are most abundant. Farmers attempt to take advantage of the crop raiding as a means to obtain meat by setting more snares in agricultural areas during this season. Outside of the harvesting seasons, snares are still used, but are more often set illegally within forests (Fig. 5).

Crude explosive devices

Using crude explosive devices to poach wildlife is a crime in India that carries a very stiff penalty (Arun et al. 2018). Nevertheless, homemade explosive devices are used in southern India by farmers to remove depre-

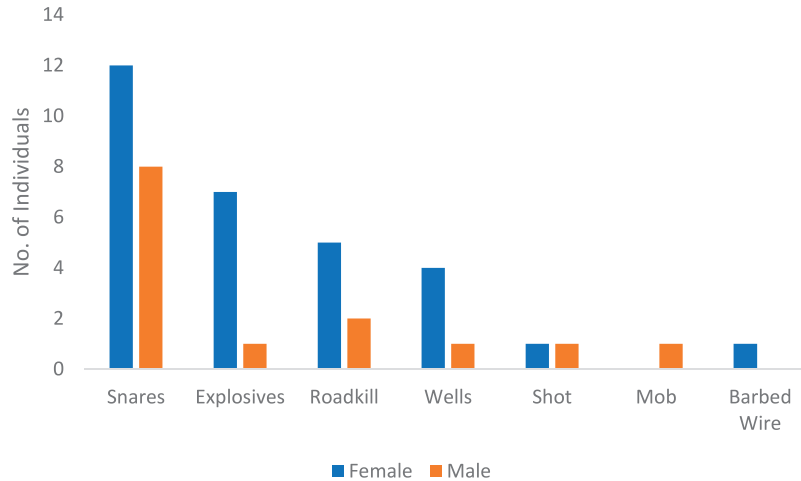


Fig. 4. The number of anthropogenic incidents, from 2006 to 2007 and 2013 to 2019 that sloth bears (*Melursus ursinus*) fell victim to by gender in the state of Karnataka, India.

wildlife and to obtain bush meat, but do not appear to be used with regularity throughout central or northern India. These crude explosive devices are made from mining supplies and are generally hidden within a food item (usually corn or fruit or in the gut and gut waste of poultry or small ruminants [sheep and goat]) that is enticing to herbivores or omnivores. People who use crude explosive devices in Karnataka tend to put them out during the night, largely outside of the cropping season when food is scarcer and farmers have more time on their hands, and pick them up in the morning before cattle or humans might be injured. Unfortunately, these devices are indiscriminate killers.

Open wells

Approximately 8.7 million open wells (as opposed to bore wells) are scattered across the Indian subcontinent (The New Indian Express 2017). An open well is a hole dug far enough to reach the water table and is most common in rural areas. A village may typically have as many as 200 wells (Aggarwal 2000). Open wells range in size from 2 m to 20 m in diameter and 1 m to 70 m in depth (Aggarwal 2000, The New Indian Express 2017). Many of these wells are currently in use (with water present), but a large number have been abandoned as a result of a lack of water (water table drawdown) or saltwater intrusion. Open wells represent an imminent threat to Indian wildlife because they are frequently without barrier walls to prevent animals from falling in; nor do they provide any form of escape for animals that do fall. A wide variety of organisms have been rescued from these wells, includ-

ing humans, domestic dogs, sheep and cattle, elephants (Elephantidae), tigers, lions (*Panthera leo*), leopards, sloth bears, snakes, and myriad of other fauna. Wildlife that fall into dry wells are often killed instantly or suffer lingering deaths if not rescued. Those falling into water-filled wells and not rescued will drown and suffer a painful death, in turn polluting village water supplies (Rajankar et al. 2009). Sloth bears fall into open wells that border protected forests and wells that are >1.5 km from protected habitat.

Roads

Like most wildlife, sloth bears occasionally become victims to vehicle collisions. Being black in color and predominantly nocturnal makes them difficult to notice when crossing a road, even though traffic is less frequent at night in these areas. The fact that 4 of the 7 roadkill situations involved a mother with cubs could potentially mean that the mother was moving more slowly while crossing the road while carrying cubs on her back. In the area where 3 sloth bears were killed within 400 m, the Forest Department and the Road Department are planning to build an underpass for wildlife to allow safe passage.

Guns, barbed wire, and mobs

Guns are rare in India because they are prohibited by law, except with special permits. Although we have only recorded 2 sloth bear deaths by gunshot, one by a policeman and the other unknown, some gun holders do shoot wild boar in the evenings and after dark. It has been



Fig. 5. Snares and tools collected from sloth bear (*Melursus ursinus*) habitats in Karnataka, India, where Wildlife SOS collected data on anthropogenic incidents involving the bears that occurred between 2006–2007 and 2013–2019.

reported that some sloth bears have been shot unintentionally because they were mistaken for a wild pig.

Barbed wire can have a negative impact on many species of wildlife, badly maiming or killing, much in the same way that snares do. Additionally, sloth bears are occasionally killed by mobs. Generally, this occurs when a person has been attacked and others mob the bear to halt the attack and neutralize the threat.

Gender

We found that more females than males were injured or killed (68% vs. 32%). Studies of other bear species and human–bear conflict, including crop raiding, damage to property, and attacks, have reported males to be the predominant gender involved (Rogers et al. 1976, Bunnell and Tait 1981, Beckmann and Berger 2003, Merkle 2013).

Like other bear species, male sloth bears have larger home ranges and disperse across the landscape more than do female bears (Rogers 1987, Joshi et al. 1995, Yoganand et al. 2005, Støen et al. 2006, Ratnayeke et al. 2007, Zedrosser et al. 2007). Therefore, we expected young males to dominate as victims to these hazards, which was not the case. We also did not expect to see mothers with cubs, or pregnant mothers, involved as often as we did.

Though this is still a relatively small sample size, our findings indicate that females may be more at risk from human hazards than are males. Our findings could also be the direct result of a skewed gender ratio in the wild. Presently the gender ratio of wild sloth bears remains unknown. Alternately, our findings could be the result of social competition among sloth bears. Females may be forced into suboptimal habitat because males are larger (Prater 1986, Garshelis et al. 1999) and are therefore more likely to retain greater holding power over critical resources, such as safe den sites and feeding areas (Ruckstuhl 2007). This may place the females in closer proximity to anthropogenic risks. Finally, recent studies in eastern Karnataka documented that maternal dens are often located near forest edges where protected areas border agricultural areas (Arun et al. 2021; Shanmugavelu, unpublished data). This penchant for mother bears, and pregnant bears, to den near the forest edges may make them more susceptible to the anthropogenic risks that often occur just outside of protected areas.

Management implications

Our findings suggest that anthropogenic risks may have a significant impact on sloth bear populations on the Deccan Plateau. Raising awareness about the threat they pose to wildlife is an important step in mitigating the damage they cause. Snares are the most common anthropogenic risk on the Deccan Plateau, and probably one of the most widely distributed anthropogenic risks across India. Organizing snare patrols to gather snares in or around protected forests, as well as stiffer penalties for using snares, could be useful in combating the use of these indiscriminate traps. We also recommend harsher penalties for poaching with crude explosive devices. Several steps can be taken to help mitigate vehicle–sloth bear collisions, including building underpasses in key areas as well as placing illuminated sloth bear crossing signs at key crossing areas. Additionally, more speed cameras can be placed near key crossing areas, thereby enforcing reduced speeds. When possible, open wells should have a lip associated with them and a means of escape, such as a plank or large branch, if an animal should fall into

it. Open wells could also be surrounded by thorny vegetation to keep wildlife out or completely covered if no longer in use.

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