OCCUPANCY AND HABITAT USE OF SLOTH BEAR (*MELURSUS URSINUS*) IN MUKUNDARA HILLS TIGER RESERVE, RAJASTHAN, INDIA

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ABSTRACT

Project was undertaken to study sloth bear occupancy and habitat use in MHTR. Direct encounter and sign survey along trail roads were used for presence absence survey. Habitat type and activity were measured whenever bear were sighted. Vegetation count was also carried out during the survey for measuring the habitat suitability for sloth bears in MHTR. All locations of scats, tracks or other bear signs were plotted on QGIS map using a Garmin GPS.

Bears occupied mainly the dense forest adjoining the villages, six dens of sloth bear were identified; occurrence of sloth bear den in the study area reflected the favorable habitat for bears. Sloth bears were encountered 54 times during the survey. Data collected from the 132 sample plots indicated that the available habitat was mixed forest (53%), scrub land (15.1%), open land (15.1%) land near water (11.3%) and whereas crop represented nil available habitat type. Occurrence of bear sign was high in mixed forest, followed by land near water bodies, open land, scrub; agricultural fields received the nil use.

Introduction

Mukundara Hills Tiger Reserve (MHTR) is located in Kota, South-eastern Rajasthan in India with an area of 729 sq km and harbors a sizeable sloth bear population (*Melursus ursinus*). The landscape is mostly patchy, fragmented, degraded and interspersed with crop fields and 23 human habitations.

Presently in MHTR, although the forests are highly disturbed and degraded, they still support a sizeable population (n=42) of sloth bears that can be compared with bear population in other protected areas of India, Nepal and Sri Lanka. Study area forms a large contiguous patch of forest, connecting the fragmented forests of Rajasthan with Madhya Pradesh, therefore needs to be quantified and mapped on broad scale land use maps so that necessary steps could be taken to protect and restore such habitats.

Sloth bears estimated to number between 6,000 and 11,000 individuals, remain widely distributed in India and are found in most areas where large patches of forest exist[16]. However, the population is fragmented into several relatively large

but disconnected units (plus a few other isolated forest patches) and each of these units is further fragmented into forest patches of various sizes and degree of isolation. Moreover, not all of these forest areas are equally good as sloth bear habitat.

The forests of the Western Ghats and the Central Indian highlands are currently the two strongholds of the sloth bear[18]. The populations in Terai/Shivaliks and in the north-eastern India have probably become isolated from the rest and face high poaching pressure. In terms of forest type, dry and moist deciduous forests together hold the major proportion of the sloth bear population (about 90%). About 30% of the forest remaining in India is dry deciduous type and these forests hold about 50% of the sloth bear population. However, sloth bears appear to occur at higher densities in the moist deciduous forests compared to other forest types[18].

Major threats to this species are habitat loss and poaching[1,11]. Habitat has been lost, degraded and fragmented by overharvest of forest products (Timber, fuel wood, fodder, fruits and honey), establishment of monoculture plantations (*e.g.* teak, eucalyptus), settlement of refugees and expansion of agricultural areas, human settlements and roads[12]. Poaching, mainly for the commercial trade in bear parts has been reported[9,13] but its

current extent and impact on bear populations is uncertain.

Sloth Bear in MHTR is an important species and they are in fairly good number in this PA. The forest areas of Jhamara, Koyla Kui, Ambapani, Laxmipura, Borkui, Karoundi, Kanjar form an ideal habitat for Sloth Bear in MHTR. Jhamra and Borkui are well known for Sloth Bears[15]. In this paper an attempt has been done to study the suitability of habitat and habitat use pattern to sloth bears in MHTR.

Objectives of the study were:

To assess the distribution and population abundance of sloth bears in relation to habitat characteristics in the MHTR and to quantify habitat use pattern.

Study area

Mukundra Hills Tiger Reserve (MHTR) is named after the two continuous flat topped and almost parallel hills with the narrow central ridges, which are a part of Vindhyan Range system extending from river Chambal to Kalisindh and are approximately 80 km in length and 2 to 5 km in width. MHTR lies between 24° 38´ to 25° 7' N Latitude and 75°26' to 76°11´ E Longitude. MHTR consists of 417.17 sq km as core area and 342.82 sq km as buffer area with a total area of
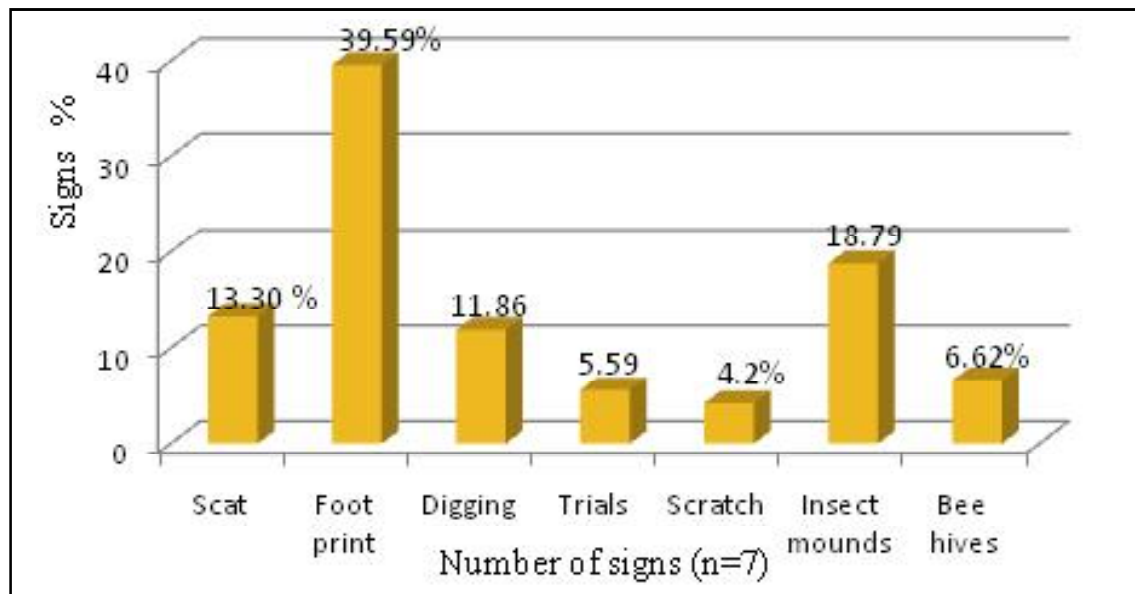

Fig. 1: Types of sign record during survey in MHTR

759.99 sq km.

Climatic condition of study area

The Vindhyan range lies in the semi-arid belt of the country. The climate of the reserve is subtropical, characterized by long and intense hot summer, with low rainfall and short but acute winter. The summer season commences from early March and the heat soon gets intensive in April. The weather is sultry as the rocks get heated during the day, resulting in hot winds, which continue till late in the night. The rainy season commences from late June and continues till September. The winter commences from November; the coldest months being December-January and the temperature, drops down to 7°C.

Faunal diversity

The reserve renders protection to rare and endangered fauna such as leopard, sloth bear, honey badger, four horned antelope, gagroni tota, *etc*. Some of the resident species of this mysterious reserve are wild boar, wolf, jackal, sambar, chital, nilgai, and chinkara. The reserve is also home to a number of birds and reptiles[15].

Methodology

Abundance and distribution

Protected land within MHTR was surveyed using line transect method and maps to determine sloth bear presence or absence. Interviews were conducted with firsthand knowledge of the Forest dept. of the area and assistance from local villagers;

reports were verified by surveying grid cells for sloth bear signs such as tracks, scats, termite mound count, bee hives and diggings to identify areas used by sloth bears. Vegetation count was also carried out during the survey for measuring the habitat suitability for sloth bears in MHTR. All locations of scats, tracks or other bear signs were plotted on QGIS map using a Garmin GPS.

Habitat use pattern

To quantify habitat use pattern on sloth bear habitats, reconnaissance survey was carried out, 66 linear transects were laid out at randomly in all available habitats and land use categories by sloth bear. Each transect was 2 km in length and sample plots of 10 m radius at 100 m intervals were examined. Bear sign was recorded within 5 m of either side of each transect. We recorded presence or absence of bear sign, including diggings, scats, and claw marks. We also recorded information on habitat variables including terrain, vegetation type, tree and shrubs species, number of cut and lopped (cutting of branches for fuel or fodder) trees, presence of cattle dung, and termite mounds. Terrain was divided into 4 broad categories: flat, undulating, gentle and steeply sloped. The density of fruiting trees near villages was estimated using a plot-less sampling method (nearest 10-tree method). Scats found at bear den and sampling plots along transects were collected.

Result

We conducted interviews in 19 villages

TABLE-1 Sloth Bear habitat use and habitat availability in MHTR, 2011-2013

Habitat type	Proportional availability	Plots	Plots with bear signs	Use %	Expected use%	Dug out mounds/ ha	Scats/ha
Mixed forest	0.530	70	45	64.2	35.8	.109	.080
Crop field	0.053	7	0	0	100	0	0
Open land	0.151	20	4	20	80	.027	.022
Scrub	0.151	20	2	10	90	.045	.036
Land near water	0.113	15	12	80	20	.082	.056
Total		132	63				

within the study area to enquire sloth bear presence or absence. Approximately 70% of the interviewers reported that the sloth bear occurred in forest patches close to their villages and many had regular sightings of sloth bear near water points. About 25% of the interviewers reported that there were no sloth bear in their vicinity. A small number of respondents 5% were uncertain about the presence or absence of bears in the adjoining forest of their villages.

Linear transects were placed within the study area, covering all areas representing the bear use. Transect surveys were conducted every month except monsoon period. Apart from very few direct encounters with sloth bears in the area, we used sign surveys to study the presence of sloth bear in MHTR. Sign survey data further confirmed the distribution range of bears and was recorded during the study period from 2011 to 2013. Bear sign was used to supplement and corroborate information obtained from interviews with local villagers (Fig.- 1).

Habitat use

Data collected from the 132 sample plots indicated that the available habitat was mixed forest (53%), scrub land (15.1%), open land (15.1%) land near water (11.3%) and whereas crop represented nil available habitat type (Table 2). Goodness-of-fit test showed that bear use of each habitat category differed from the occurrence of habitat categories within the study area (x^2 = 15.66, 4 d.f, á = 0.05). Occurrence of bear sign was high in mixed forest, followed by land near water bodies, open land, scrub; agricultural fields received the nil use.

The sign survey study revealed the pattern of habitat use by sloth bear in the MHTR. Bears occupied mainly the dense forest adjoining the villages. We located three dens of sloth bear and further confirmed by finding scats and tracks within or nearby the den. Occurrence of sloth bear den in the study area reflects the favorable habitat for the bear.

Vegetation inside the MHTR revealed that the habitat is very suitable for sloth bears. The seasonal fruit trees like *Zyzyphus jujuba, Ficus sp., Diospyros melanoxylon, Madhuca indica, Cassia fistula, Aegle marmelos, Lantana camera*, *etc* were commonly found in and were interspersed throughout the habitat in the mixed forest.

Discussion

Large home range requirements, low

TABLE-2 : Terrain type used by sloth bear in MHTR

S. No.	Terrain types	Total plots	Plots used by sloth bear
1	Flat land	40	30
2	Undulating land	60	55
3	Gentle slope	20	10
4	Steep slope	12	5

population densities and low reproductive rates of bears were responsible for the decline of the population throughout documented. Poor population coupled with low breeding rate of sloth bear is extremely susceptible to habitat alteration and overkilling in there ranges in Sri Lanka[10,12]. Despite these factors *M. ursinus* was the only species well protected and it is present in a number of protected areas in India[11].

Presently in MHTR, although the forests are highly disturbed and degraded, they still support a sizeable population of sloth bears that can be compared with bear populations in other protected areas of India, Nepal and Sri Lanka. Bears were found to take rest in dens during the daytime and rarely came out during this period due to the activities of people and livestock. While walking along the transects, the sighting of bears was very difficult in MHTR so an alternative way was taken under consideration for the presence and abundance of sloth bear by indirect sign survey (Fig 1) of bear such as scats (13.30%), diggings (11.86%), scratch marks (4.2%), insect mounds (18.79%), bee hives 6.62%), appearance of fruiting trees used by the sloth bear for feeding, tracks (5.95%) and foot prints (39.50%) on which sloth bear has walked. Although rigorous data were not collected, it appeared that bears emerged from shelter sites in late evening and after nocturnal foraging, returned to dens in early morning. However, because we did not monitor den sites in the darkness, our observations may not accurately reflect this aspect of the bears' use of day dens. People ventured into the forests for livestock grazing and collection of non-timber forest produce and fuel wood. The presence of villagers on the landscape
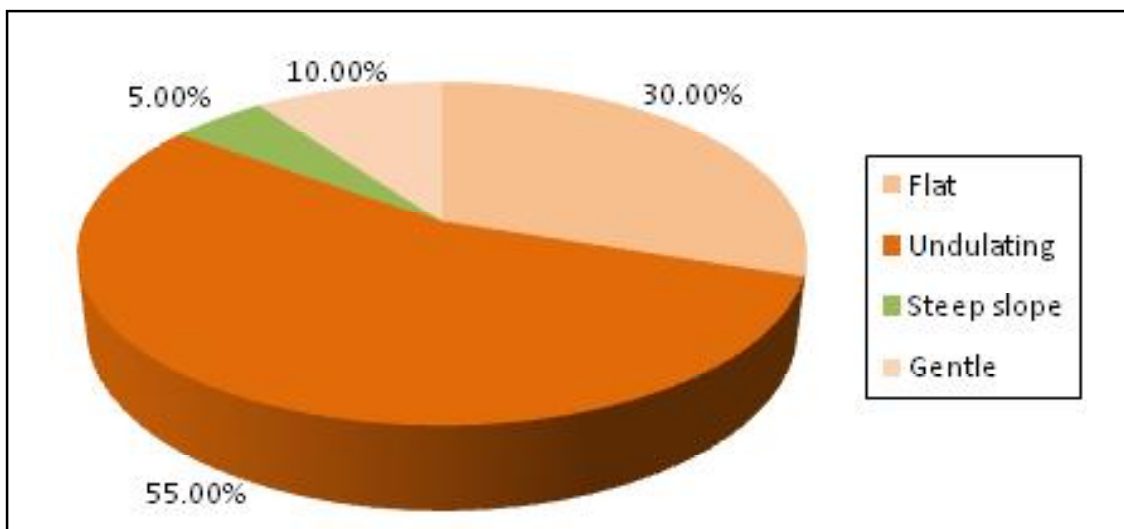
Fig. 2 : Habitat use by sloth bear in MHTR

during daylight may restrict bear movement and result in bears remaining in or near dens until dark. Temperature may have played a role in determining when bears emerged in hot weather during the summer (March–June) and monsoon (July–September) seasons. Hillocks provided cool and safe shelter during the summer. Bears were observed to move toward water just after the onset of darkness in summer. The space under the large boulders of hillocks also provided shelter to other animals including leopard, hyena, jackal, *etc,* Food availability and intensity of human disturbance may have influenced when sloth bears emerged from and returned to their dens.

Recommendation

Forest areas along the fringes of sloth bear distributional range and isolated habitats need to be managed specifically for bears. Field methods to assess habitat, estimate relative densities and monitor population trends need to be developed. Field surveys to assess the status of populations and habitat condition throughout the sloth bear range are urgently needed. Anecdotal information on distribution needs to be updated by reliable field surveys. It was suggested that the sloth bear distribution should be mapped in relation to forest cover, and discrete population units need to be delineated[8]. These population units should be the focus of conservation strategies, such as the inclusion of additional protected reserves, corridors

between areas, and buffer zones around protected areas. Regeneration of forests outside reserves and restoration of degraded habitats would significantly expand the habitat for sloth bears. Although difficult, managing forests in human dominated landscapes to meet the resource needs of both the local people and wildlife is essential for successful conservation. Attending to the problem of bear-human conflict and managing it in a site-specific way will help generate local support for conservation. Villagers also increasingly remove or cut fruit trees (*e.g., Zyzyphus jujube)* near villages that provide important foods for sloth bears. Thus, there is a need for education and awareness among the villagers about the significance of these trees for bears, feeding habits of bears and living in harmony with bears. Villagers also collect flowers and fruits of *Madhuca indica, Aegle marmelos, Zyzyphus jujube* and *Z. nummularia*, which are important food items of sloth bears. A ban on collection of these items may need to be considered. Hence, we recommend that the Forest Department restore bear habitat, especially food availability in forests, through planting of fruit-bearing tree species. We also recommend that efforts be made to reduce human dependence on forest products, to regulate human movements in the forests and to stop or reduce stone extraction, grazing and removal of firewood and timber from hillocks that have day dens. In addition, local

residents need to be educated about bear biology, conservation and ways to avoid bear encounters.

We also recommend that residents be involved in forest and bear management.

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