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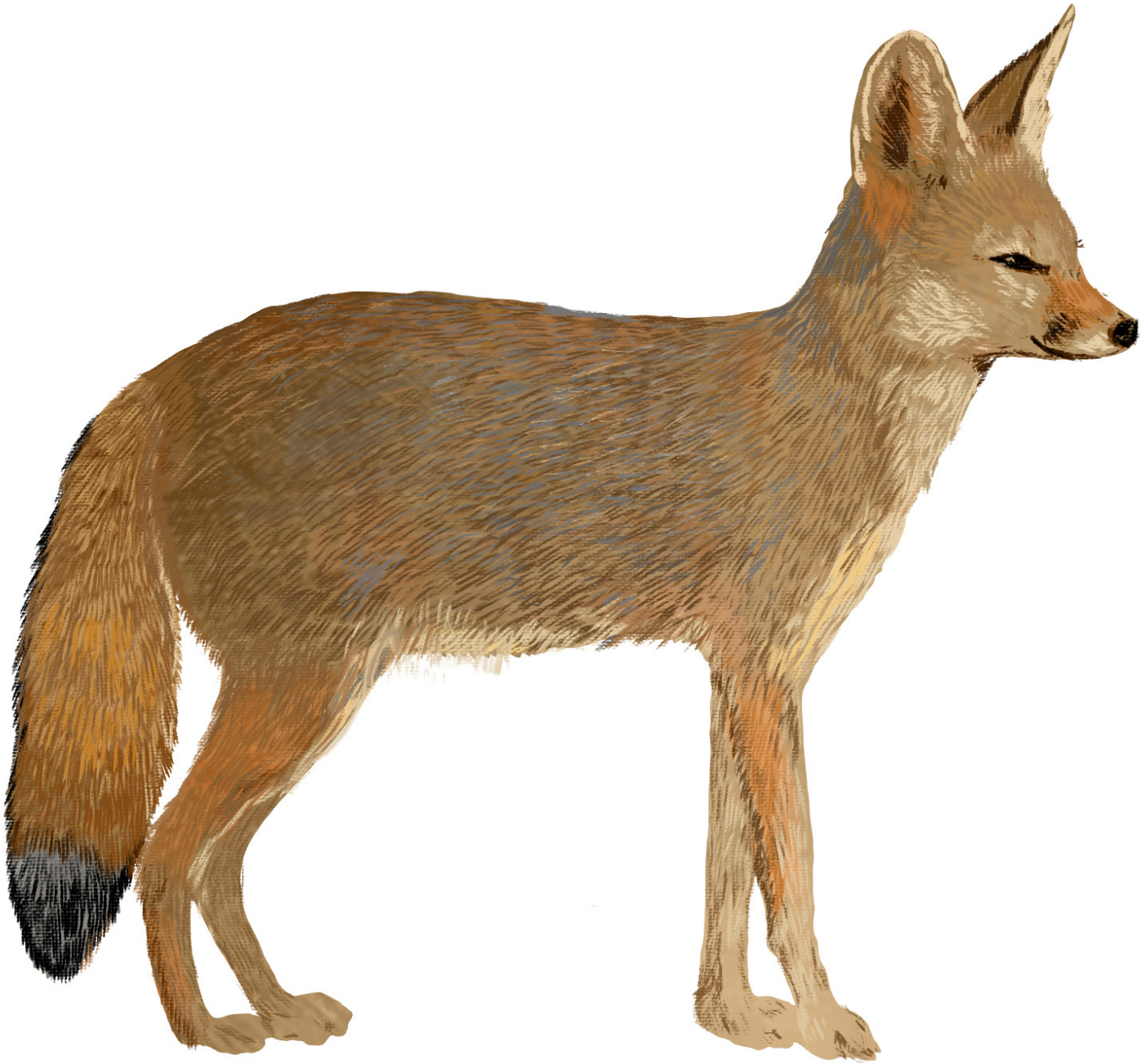

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COMMUNICATION

First record of leucistic Sloth Bear *Melursus ursinus* Shaw, 1791 (Mammalia: Carnivora: Ursidae) in Panna Tiger Reserve, India

Sankarshan Chaudhuri [1], Supratim Dutta [2] & K. Ramesh [3]

[1,2,3] Department of Landscape Level Planning and Management, Wildlife Institute of India, P.O. Box 18, Chandrabani, Dehradun, Uttarakhand 248001, India.

[1] chaudhurisankarshan@gmail.com, [2] supratim@wii.gov.in, [3] ramesh@wii.gov.in (corresponding author)

Abstract: The first photographic evidence of a leucistic Sloth Bear from Panna Tiger Reserve, Madhya Pradesh, was obtained during a camera trapping survey conducted during 2019–2021. Despite the wide distribution of Sloth Bears in the Indian sub-continent, leucism is extremely rare to find. This record evokes the need for scientific reporting of such encounters and further research on the causal factors of leucism with respect to the species' ecological and conservation implications.

Keywords: Camera trapping, central India, coat colour, leucism, Madhya Pradesh, melanin, ursid, Vindhya Hills.

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Author details: Sankarshan Chaudhuri is a senior researcher at the Department of Landscape Level Planning and Management, Wildlife Institute of India and is posted in the Panna landscape, central India. He is associated with research on aspects of quantitative ecology, human-wildlife conflict, and the conservation of large carnivores. Supratim Dutta is working as a senior researcher at the Department of Landscape Level Planning and Management, Wildlife Institute of India, with a research focus on movement ecology, quantitative ecology and behavioural ecology of large carnivores in the central Indian landscape. K. Ramesh is a senior scientist and Head of the Department of Landscape Level Planning and Management at the Wildlife Institute of India in Dehradun, Uttarakhand, India. His specializations are landscape ecology, restoration of species and habitats, human-wildlife conflict resolution, and applications of technologies in biodiversity conservation.

Author contributions: SC, SD & KR- Concept, design, and supervision. SD- Data collection. SC & SD- Data synthesis, analysis, and interpretation. SC- Manuscript writing. SC, SD & KR- Manuscript review and comments. KR- Funding acquisition.

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INTRODUCTION

The different colouration of pelage and or integuments in mammals is generally an outcome of the presence of pigments, especially melanin, and its different intensities cause various hues in coat colours (Slominski et al. 2004). Such colour variations in mammals and understanding the factors responsible for such occurrences have gained significant attention among biologists for centuries. The anomalies in pigmentation, or more specifically, the hypopigmentation, result in the lower production of pigments, leading to "albinism," "leucism," or "piebaldism" in birds and mammals (Abreu et al. 2013; Grouw 2013). Unlike albinism, which only affects melanin production, leucism is a congenital hypopigmentation condition characterized by either reduced or no integumentary pigmentation, but affected individuals retain normal eye colour (Grouw 2013).

In the wild, carnivores exhibited the second-most (after Eulipotyphla) number of records of leucism (Olson & Allen 2019). The Eulipotyphla group includes animals like hedgehogs, moles, shrews, and solenodons (Douady et al. 2002). The extreme rarity of leucistic morph in the animal kingdom could be linked with their odds of getting selected in nature, as these individuals may suffer from reduced foraging opportunities and communication, increased threats, as well as physiological disadvantages, which are often poorly understood (Caro 2005). Hence, it is imperative to document the presence of such colour anomalies in different taxa and determine the causal factors, in addition to their distribution and survival probability.

While the leucistic occurrence among a few large carnivores (such as tigers and lions) is well reported (Cho et al. 2013; Xu et al. 2013), records of leucistic bears are still extremely rare, except for the Kermode Bear, which is the leucistic form of American Black Bear (Marshall & Ritland 2002). India is the home of four species of bears, namely Sloth Bear, Himalayan Black Bear, Himalayan Brown Bear, and Sun Bear. The Sloth Bear *Melursus ursinus* is the most widely distributed, and is categorised as 'Vulnerable' due to the declining population trend (Dharaiya et al. 2016). Nevertheless, no scientific literature on leucistic Sloth Bears or the remaining three other species exists so far, although a few newspaper articles of photographic capture of leucistic and piebald individuals exist from central and western India (Tere 2019; Chatterjee 2020; TNN 2022). Albinism in Sloth Bears has previously been reported in Chhattisgarh State in central India (Bharos 1988). Between the years 1886 and 2013, a few instances of albino, white, and red-brown conditions in bears have been compiled with occurrences reported from central India, Bihar, and Orissa (Odisha) in Singh (2014) and Mahabal et al. (2019). Such sporadic occurrences of rare leucistic and albino Sloth Bears certainly require more comprehensive documentation.

STUDY AREA AND METHODS

Panna Tiger Reserve (PTR) is situated in the Vindhya Hill range of central India (Image 1). The total area of PTR is 1,574 km^2, which includes core and buffer zones of 542 km^2 and 1,032 km^2, respectively. The PTR has a varied terrain, ranging from flat areas to steep escarpments, with an elevation range of 164–555 m. Ken River is the only major perennial water source, which flows through PTR, dividing it into two parts (i.e., eastern and western). The major forest type of PTR is tropical dry-deciduous (Champion & Seth 1968). There are three different seasons in PTR, i.e., summer or hot season (March–June, mean maximum temperature 45°C), monsoon (July–October, average rainfall 1,100 mm), and winter or cold season (November–February, mean minimum temperature 5°C). Major tree species of PTR include Teak *Tectona grandis*, Tendu *Diospyros melanoxylon,* and Kardhai *Anogeissus pendula* (WII 2022). PTR harbours significant mammalian diversity, such as the Indian Tiger *Panthera tigris*, Leopard *Panthera pardus*, Striped Hyena *Hyaena hyaena*, Grey Wolf *Canis lupus*, Sloth Bear, Chital *Axis axis*, Sambar *Rusa unicolor*, Wild Boar *Sus scrofa*, Nilgai *Boselaphus tragocamelus*, Chinkara *Gazella bennettii*, and Chousingha *Tetracerus quadricornis* (WII 2022). The core zone includes three villages, while the buffer zone holds 63 villages.

Systematic camera trap surveys were conducted in PTR during 2019–2021 (Image 1) as a part of the ongoing research project entitled "Tiger Reintroduction and Recovery Programme in Panna Tiger Reserve, Madhya Pradesh", under permit number Technical/4301, dated 09/06/2015, issued by the principal chief conservator of forest (Wildlife Division), Madhya Pradesh, India. The study area was gridded (2 km^2), and double-sided motion-censored camera traps were deployed (Cuddeback C1) in each grid following the protocol of all India Tiger estimation (Jhala et al. 2019). Each year, the camera trap survey was conducted during cold and hot seasons (Image 1), except for 2021, when the cold season was the only sampling period. The camera traps were placed on the forest roads and trails to maximize the detection of carnivores (Karanth et al. 2011) and remained active

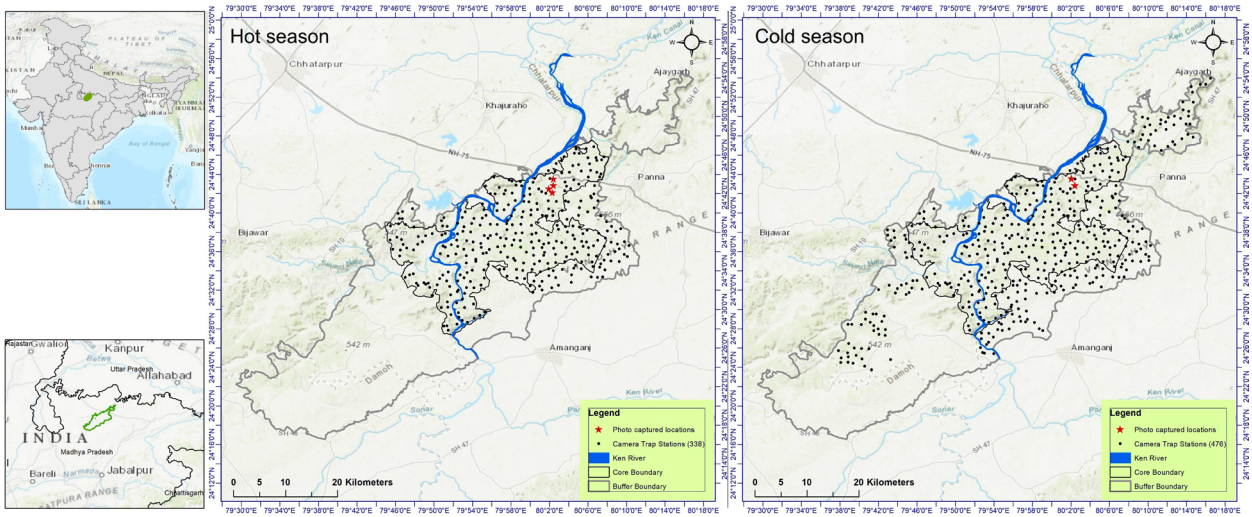

Image 1. Location of Panna Tiger Reserve in central India and camera trap locations during two seasons, i.e., summer or hot season and winter or cold season, from 2019 to 2021. The locations where the leucistic Sloth Bear was photo-captured, were marked (red stars) and represented season-wise.

on a 24-hour basis for 30 days. Photographs of Sloth Bears were considered independent if they were taken ≥30 minutes apart.

RESULTS

In the hot season of 2019, the first photograph of a leucistic adult female Sloth Bear (Image 2A, Image 2B) was obtained from camera traps in the core zone of PTR, accompanied by one yearling (≥ one year of age) with a natural (black) coat colour (Image 2C,D). Similarly, a leucistic adult female Sloth Bear carrying two cubs (≤ one year, natural coat colour) on its back was detected twice during the hot season of 2020 (Image 2E,F). Lastly, in the cold season of 2021, a total of four detections was obtained of leucistic Sloth Bears (three single individuals, one with a yearling) from camera traps (Image 2G,H). All the photo-captures (n = 9) were obtained from five unique camera trap locations in the core zone of PTR during hot and cold seasons, with an average distance of 1.06 km (ranging 0.57–2.57 km). Out of these five locations, the leucistic bear was detected from four and two locations (one unique and one previously observed location in the hot season) during hot and cold seasons, respectively (Image 1). Photographs of Sloth Bears showed the retention of the normal eye colour, along with a light brown pelage (Image 2A,B) due to the reduction of melanin production, which confirmed the case of leucism in Sloth Bears in PTR (Bahar Baviskar, pers. comm. 15.vii.2024).

Overall, the photographic captures of leucistic Sloth Bears were rare, consisting of 0.4–1.40 % of the total Sloth Bear photo-captures across the years and seasons. For the leucistic Sloth Bears, the number of photo-captures ranged 2–4, with a relative abundance index (RAI) of 0.02–0.04 captures per 100 trap-nights, whereas the number of photo-captures and RAI for Sloth Bears with normal colouration varied 215–634 and 1.48–6.88 captures per 100 trap-nights, respectively (Table 1). Leucistic Sloth Bears were detected in less than 1% (0.64–0.90 %) of the total camera trap locations; however, Sloth Bears with normal colouration were recorded 47.45–67.50 % of the total camera trap locations during each year and season (Table 1).

DISCUSSION

Evidence of the leucistic Sloth Bear's presence in Panna Tiger Reserve was provided, which is perhaps amongst the very few ever-reported from the central India and other parts of the country in the scientific literature (other than newspaper reports). Anecdotal occurrences of "brown" Sloth Bears were previously reported by naturalists and hunters (Pocock 1933; Prater 1980; Brander 1982). The leucistic bears found in PTR also showed a light brown coat colour (Image 2), indicating similarities with the past records of such "brown" Sloth Bears. Sloth Bears are individually unidentifiable since they do not have uniquely marked pelage (Prater 1965). As discussed previously, the

Table 1. Details of photographic captures in Panna Tiger Reserve, Madhya Pradesh, India, showing the number of camera trap nights, the total number of photo captures, and the relative abundance index (RAI) of Sloth Bears with normal colouration and leucistic ones. The number of camera trap locations is given where individual morphs were photo-captured. The data were obtained from camera trapping surveys conducted during three cold seasons (2019–2021) and two hot seasons (2019 and 2020). RAI is the number of photo captures per 100 trap nights.

Year	Camera trap effort (Trap-nights)	Total number of photographic captures		Relative abundance index (RAI; # per 100 trap-nights)		Number of camera trap locations where Sloth Bears were photo-captured	
		Sloth Bears with normal colouration	Leucistic Sloth Bears	Sloth Bears with normal colouration	Leucistic Sloth Bears	Sloth Bears with normal colouration	Leucistic Sloth Bears
2019 Cold season	14,500	215	0	1.48	0	136	0
2019 Hot season	11,719	634	3	5.41	0.025	211	3
2020 Cold season	12,813	394	0	3.07	0	192	0
2020 Hot season	7161	493	2	6.88	0.03	164	2
2021 Cold season	9261	284	4	3.06	0.04	149	2

presence of leucistic Sloth Bears is scarce in the wild (and like other mammals as well), and given such rarity, it seemed logical to consider it as a single individual. The nighttime photographs of the leucistic individual hinder us from firmly declaring it as the same one, primarily due to the exposure of white flash. Sloth Bears are not territorial and can occur in relatively high densities compared to other bear species (Garshelis et al. 1999; Joshi et al. 1999). The occurrence of leucistic individuals was found clustered (inter-camera trap distance ranged 0.67–2.57 km) in the northern part of the PTR, probably indicating highly localized suitable habitats and or small home ranges of Sloth Bears, especially for females with offspring. Although coat colour could play a role in the communication of carnivores, including ursids (Caro et al. 2017; Eizirik & Trindade 2021), it is poorly understood; hence, the evolutionary or behavioural advantages or disadvantages of being leucistic remained unknown for Sloth Bears, as well. The leucistic adult female was detected with offspring in 2019 and 2020, indicating successful breeding in consecutive years, given all the photo captures were of the same individual.

Leucism in mammals could also be an indication of inbreeding due to habitat fragmentation (Bensch et al. 2000). Singh (1999), while discussing the range of colour variations in tigers, did mention such apprehensions through chapters on conservation and biological implications in the light of melanistic tiger in Similipal Tiger Reserve, Odisha. The PTR is one of the protected areas (PAs) which offers the best quality habitats in its landscape for wildlife. However, the connectivity (for the large carnivores, such as tigers) between PTR and other PAs is still highly fragmented (Makwana et al. 2023). Moreover, very little is known about the habitat connectivity and effect of fragmentation on the genetics of Sloth Bears (Dutta et al. 2015); hence, this finding may not be inferential but long-term monitoring of the occurrences of leucistic bears in this landscape would be insightful in determining underlying factors behind leucism and any probable conservation implications. Due to the rarity and striking colouration, leucistic organisms are often at risk of poaching (Owen & Skimmings 1992), which warrants protection, especially if a species is vulnerable with a declining population, such as Sloth Bears (Dharaiya et al. 2016). A targeted conservation approach for leucistic individuals may not be required in PTR at present; rather strengthening the protection of the Sloth Bear population should be considered, especially in the outside PAs (human-dominated landscapes) where leucistic bears can occur with normal-coloured individuals. Also, physiologically, the coat colour of leucistic bears could negatively impact individual fitness in terms of thermoregulation in tropical countries (Caro 2005).

Monitoring elusive threatened species through camera traps has gained global attention in the past two decades (Burton et al. 2015). Long-term camera trap surveys, such as All India Tiger Estimation (Jhala et al. 2019), have the potential to detect and monitor the occurrences of such unique colourations in mammals, especially elusive carnivores. Researchers are encouraged to document and report the presence of leucistic individuals and other colour anomalies in mammals from the long-term camera trap studies (and other relevant field techniques) and determine the underlying reasons for any probable future conservation implications.

Image 2. Photographs of leucistic Sloth Bears obtained from camera trap surveys in Panna Tiger Reserve, Madhya Pradesh, India, during 2019–2021: A,B—In the 2019 hot season, a single adult leucistic female was detected | C,D—Followed by a leucistic female with a yearling (> 1 year age) | E,F—A female with cubs (<1 year) were detected during the hot season of 2020 | G,H—In the cold season of 2021, a single adult individual and a female with a yearling were detected.

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