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continued on the back inside cover

Cover: Whale Shark *Rhincodon typus* and Reef - made with poster colours. © P. Kritika.



## First photographic evidence of Indian Pangolin *Manis crassicaudata* Geoffroy, 1803 (Mammalia: Pholidota: Manidae), in Colonel Sher Jung National Park, Himachal Pradesh, India

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**Abstract:** The Indian Pangolin *Manis crassicaudata* is 'Endangered' on the IUCN Red List. We report the first photographic evidence of its presence in Colonel Sher Jung National Park of Paonta Valley in Himachal Pradesh. Camera-traps (n = 64) were used to assess the diversity and abundance of terrestrial mammals. Over 1,912 trap nights, we documented 16 mammals, of which the Indian Pangolin was photo-captured at a single camera-trap station with two independent records. Although the presence of species has been indicated in a few studies conducted in the study area, no photographic evidence of the Indian Pangolin from the National Park has previously been reported. We strongly recommend additional fieldwork in and around the protected area to learn more about the Indian Pangolin's distribution, habitat use, and ecology.

**Keywords:** Activity pattern, camera-trapping, conservation, distribution, Manidae, *Shorea robusta*, Shivalik hills, small mammals.

The Indian Pangolin is categorised as Endangered (EN) in the IUCN Red List of Threatened Species (Mahmood et al. 2019). Due to the rapidly declining population of this species in India (Kumar et al. 2016; Aditya et al. 2021) and across its range (Mahmood et al. 2012; Baillie et al. 2014; Latafat & Sadhu 2016), the species is listed in CITES Appendix I (CITES 2017) as well as in Schedule I of the 2022 amendment of the Indian Wildlife

(Protection) Act, 1972. The Indian Pangolin, a member of the Pholidota order and Manidae family, is one of the two pangolin species found in the Indian subcontinent (Kumar et al. 2016). The other is the Chinese Pangolin *Manis pentadactyla*, listed as 'Critically Endangered' on the IUCN Red List (Challender et al. 2019).

The Indian Pangolin, also known as the Thick-tailed Pangolin, is a medium-sized mammal with 11-13 rows of scales covering its dorsal surface (Mahmood et al. 2020). Because the species lacks teeth, it relies on the salivar-coated tongue to reach and lap up insects, ants, and termites present in deep crevices (Mahmood et al. 2020). When threatened, it quickly rolls into a ball, with the tail curled over the head, exposing only the protective scales (Mahmood et al. 2020). The Indian Pangolin is distributed across southern Asia, from parts of eastern Pakistan to much of the Indian subcontinent (except the Himalaya and the north-east, where the Chinese Pangolin is found), as well as south of the Himalaya, Bangladesh, southern Nepal, and Sri Lanka (ZSI 2002; Srinivasulu & Srinivasulu 2012; Aditya et al. 2021). The species inhabits various habitats, including tropical,

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**Competing interests:** The authors declare no competing interests.



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sub-tropical, dry-mixed evergreen, sub-mountain, and riverine forests (Roberts 1977; Phillips 1981).

Pangolins are declining in numbers across their range despite being a protected species (Mahmood et al. 2012). The species faces major threats from hunting for meat, spiritual & ritualistic uses, and use in traditional medicines (scales) (Anon 1992; Brown et al. 1996). Globally, pangolins are the most trafficked animals (Baillie et al. 2014; Zhou et al. 2014; Challender 2015; Challender et al. 2015), and according to TRAFFIC India, almost 6,000 pangolins were poached in India between 2009 and 2017 (Ghosh 2020).

**MATERIALS AND METHODS**

**Study area**

Colonel Sher Jung National Park, also known as Simbalbara National Park (SNP), is located in the Paonta Valley of Sirmour District, Himachal Pradesh, India, and covers an area of 27.88 km<sup>2</sup> (30.4058–30.4703 N & 77.4550–77.5239 E) (Figure 1). The elevation range of the study area lies at 580–700 m. The region’s hilly

terrain is representative of the lower Shivalik that further emerges into the middle and upper Shivalik. The western boundary of the National Park is shared with the Kalesar National Park of Haryana Forest Division. The sanctuary has a subtropical climate with hot summers and severe winters. The summer temperatures touch as high as 46°C and winter temperature drops to 6°C with a mean annual rainfall of 1,260 mm (Singh et al. 1990). The area, regarded as the westernmost limit of Sal distribution in India (Chand 2014), is covered by moist Sal-bearing forests and northern dry mixed deciduous forests (Champion & Seth 1968). The prominent mammal species are the Common Leopard *Panthera pardus*, Himalayan Brown Goral *Nemorhaedus goral*, Sambar *Rusa unicolor*, Barking Deer *Muntiacus muntjac*, Asiatic Wild Pig *Sus scrofa*, Golden Jackal *Canis aureus*, Indian Crested Porcupine *Hystrix indica*, Spotted Deer *Axis axis*, Himalayan Palm Civet *Paguma larvata*, and Yellow-throated Marten *Martes flavigula* (Chand 2014).

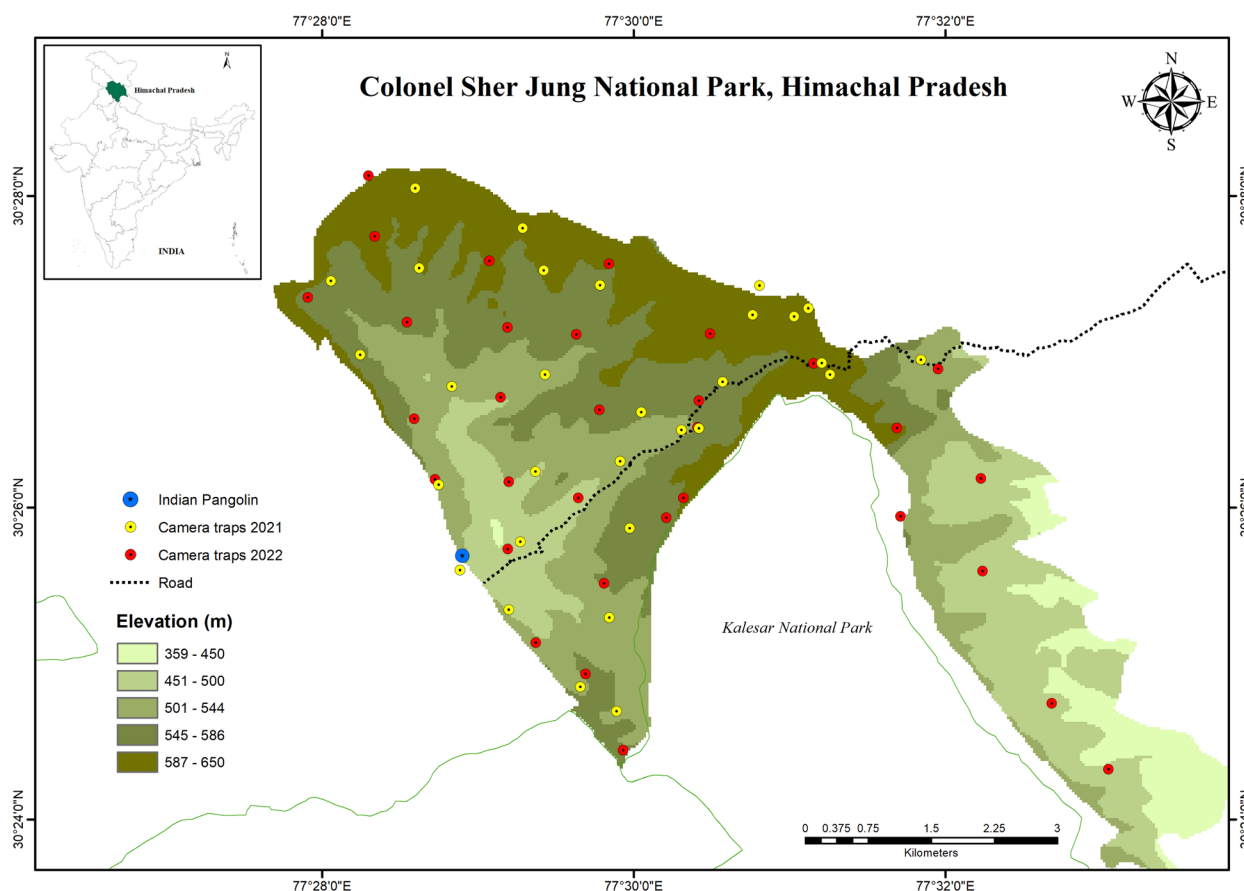


Figure 1. A map of the study area (Colonel Sher Jung National Park or SNP) shows camera-trap locations and location of the detected Indian Pangolin.

### Camera-trap survey

Mammals were photographed using camera-traps in SNP. Camera-trap locations were unbaited and selected based on accessibility, terrain features, animal trails, and nallahs (seasonal drainages) with carnivore signs (Marinho et al. 2018). At each location, a single Cuddeback X-Change™ colour model (Cuddeback, Green Bay, WI, USA) with motion sensors was deployed, and a time lag of 1s was set between animal detections. Cameras were fastened to trees at 30–45 cm above the ground for an average of 30 days for both years. A total of 64 camera-trap locations were utilised in a grid-based approach (grid size: 1 km<sup>2</sup>) during two sampling periods: March 2021–May 2021 (n = 31) and April 2022–May 2022 (n = 33). Camera-traps were monitored at regular intervals, and after the completion of each camera-trapping session, the photographs were examined for images of animals. Mammals were identified with the help of literature by Johnsingh & Manjrekar (2012) and Menon (2014). Photographic captures were taken at or more than 30 minutes apart from each other were considered independent events (Silver et al. 2004; Di Bitetti et al. 2006).

### RESULTS

We recorded 21 mammals (camera-trapping: 16, direct sightings: 5, carnivores: 8, non-carnivores or herbivores: 13) over 1,912 trap nights (Table 1, Figure 1). We recorded the species from one station with two independent captures. Both captures occurred at night, i.e., 0013 h and 0058 h.

The species was recorded in a miscellaneous type of forest. The vegetation around the camera-trap station comprised *Diospyros melanoxylon*, *Ougeinia oojeinensis*, *Anogeisis latifolia*, *Shorea robusta*, *Murraya paniculata*, *Woodfordia fruticosa*, *Arthraxon lanceolatus*, along with climbers of *Bauhinia vahlii*. The species was recorded on an animal trail along a ridge that is also used by the local communities to extract forest resources, primarily fodder.

### DISCUSSION

The Indian Pangolin was detected during the sampling period of 2022. However, during the 2021 sample period, the camera-trap was deployed near the same location, on the same trail, for 40 trap nights, but no evidence of the species was recorded. Despite intensive sampling, failure to record the species over the 2021 sampling period may also indicate the rarity of species from the study region.

The presence of Indian Pangolin has been

**Table 1. Information on sampling and photo-captured Indian Pangolin in SNP, Himachal Pradesh, India.**

Sampling information		
Sampling period	Mar 2021–May 2021	April 2022–May 2022
Mammals recorded through camera-trapping	15	16
Mammals recorded through direct sighting	5	0
Camera-traps	31	33
Trap-nights	887	1025
Information on Indian Pangolin		
Geographic coordinates (Latitude, Longitude)	-	30.4282°N, 77.4817°E
Total number of photos	-	2
No. of Independent photos	-	2
Duration of camera placement	-	09/04/2022 to 19/05/2022 (41 days)
Date & time of photo-captured events	-	09/05/2022, 0013 h & 0058 h
Elevation	-	501 m
Terrain	-	Rugged
Location	-	Animal Trail
Habitat type	-	Upper-temperate mixed-broadleaved forest
Habitat (Forest type)	-	Miscellaneous
Tree species around the camera trap	-	<i>Diospyros melanoxylon</i> , <i>Ougeinia oojeinensis</i> , <i>Anogeisis latifolia</i> , <i>Shorea robusta</i> , <i>Murraya paniculata</i>
Ground Cover	-	Dry leaves and grass
Distance to nearest human settlement	-	0.3 km

documented across the Shivalik hills in India (~300–1,000 m) (Joshi 2016; Bhandari et al. 2019; Kumar et al. 2022). Although this is the first photographic evidence regarding the presence of species in SNP, its presence has been reported in a few studies conducted in the National Park (Bhargav 2009; Chand 2014); however, no further information or evidence was provided. Furthermore, Sharma & Saikia (2009) did a study on the faunal diversity of the SNP, in which they reported the presence of species in the National Park based on scales of a dead animal collected in June 2005, with no sightings or proof given. The Indian Pangolin has also been reported from the Kalesar National Park (KNP) in Haryana (Sehgal et al. 2022), which borders our study area, i.e., SNP.

The Indian Pangolin is an understudied species (Mahmood et al. 2015); detailed studies on the species across its range and the Shivalik hills are still required to formulate conservation strategies. Due to increased



Image 1. Independent photographs (n = 2) of photo-captured Indian Pangolin in SNP, Himachal Pradesh, India.

demand in the trade market, the Indian Pangolin is under severe collection pressure (Mahmood et al. 2020). According to studies and available data, around 1,700 Indian Pangolin scales were trafficked internationally between 2011 and 2017; however, considering a lot of trade goes undetected, the actual number of animals involved is likely higher (Challender & Waterman 2017).

Steps must be taken to prevent hunting and to halt the Indian Pangolin trade chain. The exact population of the species in concern is unidentified (Kumar et al. 2016). Thus, to ensure the long-term persistence of the Indian Pangolin, further research is needed to understand the distribution, population, and threats to the species. Setting up pangolin rescue and rehabilitation centres

and breeding centres (Hua et al. 2015) could also help the pangolin population recover in the future.

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### Communications

#### Asiatic Black Bear *Ursus thibetanus* attacks in Kashmir Valley, India

– Aaliya Mir, Shanmugavelu Swaminathan, Rashid Y. Naqash, Thomas Sharp & Attur Shanmugam Arun, Pp. 22355–22363

#### Food habits of the Red Fox *Vulpes vulpes* (Mammalia: Carnivora: Canidae) in Dachigam National Park of the Kashmir Himalaya, India

– Kulsum Ahmad Bhat, Bilal A. Bhat, Bashir A. Ganai, Aamir Majeed, Naziya Khurshid & Muniza Manzoor, Pp. 22364–22370

#### Status distribution and factors affecting the habitat selection by Sambar Deer *Rusa unicolor* in Pench Tiger Reserve, Madhya Pradesh, India

– Abdul Haleem & Orus Ilyas, Pp. 22371–22380

#### Assessing illegal trade networks of two species of pangolins through a questionnaire survey in Nepal

– Nikita Phuyal, Bipana Maiya Sadadev, Reeta Khulal, Rashmi Bhatt, Santosh Bajagain, Nirjala Raut & Bijaya Dhama, Pp. 22381–22391

#### First occurrence record of Indian Roundleaf Bat *Hipposideros lankadiva* in Rajasthan, India

– Dharmendra Khandal, Dau Lal Bohra & Shyamkant S. Talmale, Pp. 22392–22398

#### Food availability and food selectivity of Sri Lanka Grey Hornbill *Ocyrceros gingalensis* Shaw, 1811 in Mihintale Sanctuary, Sri Lanka

– Iresha Wijerathne, Pavithra Panduwawala & Sriyani Wickramasinghe, Pp. 22399–22409

#### Conservation significance of Changaram wetlands - a key wintering site for migratory shorebirds and other waterbirds in the western coast of Kerala, India

– Jasmine Anand, H. Byju, Aymen Nefla, S. Abhijith, Omer R Reshi & K.M. Aarif, Pp. 22410–22418

#### Long-term monitoring of pelicans in National Chambal Sanctuary, India

– Lala A.K. Singh & Rishikesh Sharma, Pp. 22419–22429

#### A checklist of avifauna of Mangalore University, Karnataka, India

– K. Maxim Rodrigues, K. Vineeth Kumar, Vivek Hasyagar, M.C. Prashantha Krishna & Deepak Naik, Pp. 22430–22439

#### Biology of *Bhutanitis ludlowi* Gabriel, 1942 (Lepidoptera: Papilionidae) Bumdeling Wildlife Sanctuary, Bhutan

– Tshering Dendup, Namgay Shacha, Karma Tempa & Tez Bdr Ghalley, Pp. 22440–22447

#### Biodiversity of butterflies (Lepidoptera: Rhopalocera) in the protected landscape of Nandhour, Uttarakhand, India

– Hem Chandra, Manoj Kumar Arya & Aman Verma, Pp. 22448–22470

#### A comparison of four sampling techniques for assessing species richness of adult odonates at riverbanks

– Apeksha Darshetkar, Ankur Patwardhan & Pankaj Koparde, Pp. 22471–22478

#### Floristic diversity of native wild ornamental plants of Aravalli Hill Range: a case study from district Rewari, Haryana, India

– Pradeep Bansal, Amrender Singh Rao, Surender Singh Yadav, M.S. Bhandoria & S.S. Dash, Pp. 22479–22493

#### Flowering and fruiting of Tape Seagrass *Enhalus acoroides* (L.f.) Royle from the Andaman Islands: observations from inflorescence buds to dehiscent fruits

– Swapnali Gole, Sivakumar Kuppusamy, Himansu Das & Jeyaraj Antony Johnson, Pp. 22494–22500

### Short Communications

#### Status of Swamp Deer *Rucervus duvaucelii duvaucelii* (G. Cuvier, 1823) in grassland-wetland habitats in Dudhwa Tiger Reserve, India

– Sankarshan Rastogi, Ashish Bista, Sanjay Kumar Pathak, Pranav Chanchani & Mudit Gupta, Pp. 22501–22504

#### First photographic evidence of Indian Pangolin *Manis crassicaudata* Geoffroy, 1803 (Mammalia: Pholidota: Manidae), in Colonel Sher Jung National Park, Himachal Pradesh, India

– Nidhi Singh, Urjit Bhatt, Saurav Chaudhary & Salvador Lyngdoh, Pp. 22505–22509

#### The Marine Otter *Lontra felina* (Molina, 1782) (Mammalia: Carnivora: Mustelidae) along the marine protected areas in Peru

– José Pizarro-Neyra, Pp. 22510–22514

#### First record of the genus *Acropyga* Roger, 1862 (Hymenoptera: Formicidae: Formicinae) in Kerala, India

– Merin Elizabeth George & Gopalan Prasad, Pp. 22515–22521

#### First report of a coreid bug *Aurelianus yunnananus* Xiong, 1987 (Hemiptera: Heteroptera: Coreidae) from India

– Hemant V. Ghate, Pratik Pansare & Rahul Lodh, Pp. 22522–22527

#### First record of the long-horned beetle *Niphona fuscatrix* (Fabricius, 1792) (Coleoptera: Cerambycidae: Lamiinae) from the Western Ghats, India

– Yogesh K. Mane, Priyanka B. Patil & Sunil M. Gaikwad, Pp. 22528–22532

#### Incidence of *Clinostomum complanatum* (Trematoda: Clinostomidae) in *Trichogaster fasciata* (Actinopterygii: Osphronemidae), the first report from Deepor Beel, Assam, India

– Bobita Bordoloi & Arup Kumar Hazarika, Pp. 22533–22537

#### *Sauromatum horsfieldii* (Araceae): a new addition to the flora of Manipur, northeastern India

– Kazuhrii Eshuo & Adani Lokho, Pp. 22538–22542

#### *Rhynchostegiella menadensis* (Sande Lac.) E.B. Bartram and *R. scabriseta* (Schwagr.) Broth.: two new records of mosses (Brachytheciaceae: Bryophyta) for peninsular India

– V.K. Rajilesh, C.N. Manju & R. Prakashkumar, Pp. 22543–22547

### Notes

#### Installation of hot boxes for conservation in the last nursery roost of Greater Horseshoe Bats *Rhinolophus ferrumequinum* in Austria

– Lukas Zangl, Alexander Gutstein, Wolfgang Paill, Edmund Weiss & Peter Sackl, Pp. 22548–22550

#### New prey record of giant ladybird beetle *Anisolemnia dilatata* (Fabricius) (Coccinellidae: Coleoptera) feeding on Som Plant Aphid *Aiceona* sp.

– Suprakash Pal, Biwash Gurung, Ponnusamy Natarajan & Partha Sarathi Medda, Pp. 22551–22555

### Book Review

#### Book Review - Under the Feet of Living Things

Editors — Aparajita Datta, Rohan Arthur & T.R. Shankar Raman

– Review by Melito Prinson Pinto, Pp. 22556–22558

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