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Cover: Digital illustration of Smooth-coated Otter *Lutrogale perspicillata* by Dupati Poojitha. Reference from the picture taken by Rana & Sugandhi.

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COMMUNICATION

Range extension records of Tibetan Snowcock, Tibetan Sandgrouse, and Western Tragopan in Uttarakhand, India

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Abstract: The study reports photographic evidence of range extension for three avian species: Western Tragopan *Tragopan melanocephalus* (Gray, 1829), Tibetan Snowcock *Tetraogallus tibetanus* (Gould, 1854), and Tibetan Sandgrouse *Syrrhaptes tibetanus* (Gould, 1850) based on camera trap surveys conducted in the Bhagirathi Basin, Uttarakhand. These detections represent a noteworthy eastward range extension for all three species and refine the current understanding of their biogeographic distributions in the western Himalaya. The Western Tragopan, previously known to extend eastward only up to the Govind National Park and Wildlife Sanctuary in the Garhwal Himalaya, lacked photographic confirmation until now. Similarly, the Tibetan Snowcock and Tibetan Sandgrouse were historically regarded as trans-Himalayan specialists, confined primarily to the high-altitude regions of Ladakh, Himachal Pradesh, and Sikkim. These records, obtained through systematic camera-trap sampling conducted over a five-year period, suggest the existence of populations of these species within Uttarakhand. Their distribution appears to be limited to remote and ecologically distinct high-altitude habitats.

Keywords: Bhagirathi Basin, camera trapping, distribution, Galliformes, Pterocliformes, *Syrrhaptes tibetanus, Tragopan melanocephalus, Tetraogallus tibetanus,* western Himalaya.

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Author contributions: AJ—conceived the study and wrote the manuscript. RP—collected the field data and edited the initial draft. VKD—revised the manuscript and provided technical inputs and interpretation. SS—provided overall supervision, project management, and technical guidance throughout the study and manuscript preparation.

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INTRODUCTION

Amid ongoing rapid development and climate-induced stochastic shifts in the Himalayan biodiversity hotspot, biodiversity surveys and documentation of rare and elusive species are critical (Myers et al. 2000). Such documentation enhances our understanding of extinction risks, facilitates predictions of future changes in ecological communities, and informs proactive management strategies for species of conservation concern (Yoccoz et al. 2001; Rashiba et al. 2022). We report new range extension records for three high-altitude bird species in the western Himalayan region of India: Galliformes – The Western Tragopan *Tragopan melanocephalus* (Gray, 1829) & the Tibetan Snowcock *Tetraogallus tibetanus* (Gould, 1854), and Pterocliformes – the Tibetan Sandgrouse *Syrrhaptes tibetanus* (Gould, 1850) (Image 1). These records were obtained during camera-trapping survey conducted in Bhagirathi Basin (in 2015–2019 at 500–5,500 m) as part of a long-term project titled "Assessment and Monitoring of Climate Change Effects on Wildlife Species and Ecosystems for Developing Adaptation and Mitigation Strategies in the Indian Himalayan Region" (DST NMSHE Phase I), funded by the Department of Science and Technology, Government of India. The study is part of a long-term project aimed at exploring the diversity and distribution of wild fauna and to assess the impacts of climate change in the Indian Himalayan Region. To ensure a comprehensive survey across diverse habitats, the basin was systematically divided into 38 grid cells, each measuring 256 km^2 (16 x 16 km). This dimension corresponds to the average home range of the region's largest mammal, the Himalayan Brown Bear *Ursus arctos isabellinus*. Each of these larger cells was further subdivided into smaller 4 x 4 km cells, within which camera traps were strategically deployed in 3 or 4 of these smaller cells per 16 x 16 cell grid (Pal et al. 2021a). A total of 318 locations were sampled during this period. Camera traps (Cuddeback C1, DePere, USA) were used from October 2015 to March 2019. To determine the photo-capture rates, we calculated the number of captures per 100 trap days, following the methodology outlined by Bashir et al. (2013).

These sites spanned across the elevation gradient, covering different habitat types, including subtropical broad-leaved and Chir Pine *Pinus roxburghii* forests at lower elevations (500–1,500 m), montane mixed broad-leaved forests, oak woodlands (of *Quercus semecarpifoia* & *Q. floribunda*), and subalpine mixed coniferous forests (of *Abies pindrow*, *Cedrus deodara*, & *Pinus wallichiana*) at mid-elevations (2,000–3,800 m), as well as tree line vegetation dominated by *Rhododendron* spp. (*R. arboreum*, *R. campanulatum*, & *R. anthopogon*), and *Betula utilis* high altitude alpine and subalpine vegetation (3,500–5,000 m) with *Rhododendron* spp. and alpine herb and forb species, and Trans-Himalayan landscape (3,500–5,200 m) represented in Nelong Valley with alpine desert steppe plants such as *Caragana versicolor*, *Acantholimon lycopodioides*, *Thylacospermum caespitosum*, *Rhamnus prostrata*, and *Artemisisa brevifolia*.

Camera trapping effort (78,828 trap nights) across the basin resulted in 28,257 captures of different species. Among these, a total of 11 species of Galliformes (1,332 captures) were recorded during the survey, all belonging to the family "Phasianidae" (Table 1). These records include three range extension records, including Western Tragopan (VU, Birdlife International 2025), Tibetan Snowcock (LC, Birdlife International 2024a), and Tibetan Sandgrouse (LC, Birdlife International 2024b).

The Western Tragopan has a historically restricted distribution limited to the northwestern Himalaya, spanning northern Pakistan, Kashmir, and Himachal Pradesh (Hume & Marshall 1881). The presence of the species in Uttarakhand was previously considered speculative, based on unverified anecdotal reports from the Bhilangana region in Tehri District (Gaston et al. 1983), with a single confirmed sighting of a female individual in the Tons River drainage, west of Kedarkantha peak, at an elevation of 2,550 m (Bland 1987). Our study provides the first photographic confirmation of the species in this region. Among the four surveyed locations, one site documented a male individual followed by a female during May, which coincides with the known breeding season of the species (Madge et al. 2002) (Image 2C). Camera traps recorded male, female, and juvenile individuals across all the locations, in subalpine and temperate forests at elevations ranging 2,500–3,500 m during the winters (2018–2019). The species is known to breed at elevations above 2,400 m, typically up to the treeline, and to descend to lower elevations between 1,350–1,735 m during the winter (Islam & Crawford 1987). The mixed coniferous forests in these high-elevation zones may represent suitable breeding habitats for the species. Additional Galliformes detected at these sites included the Koklass Pheasant *Pucrasia macrolopha* (0.0286 ± 0.1667 SE) and Himalayan Monal *Lophophorus impejanus* (0.782 ± 0.363 SE). Potential predators documented in these areas comprised the Common Leopard *Panthera pardus* (0.024 ± 0.1337 SE), Leopard Cat *Prionailurus bengalensis* (0.01 ± 0.024 SE),

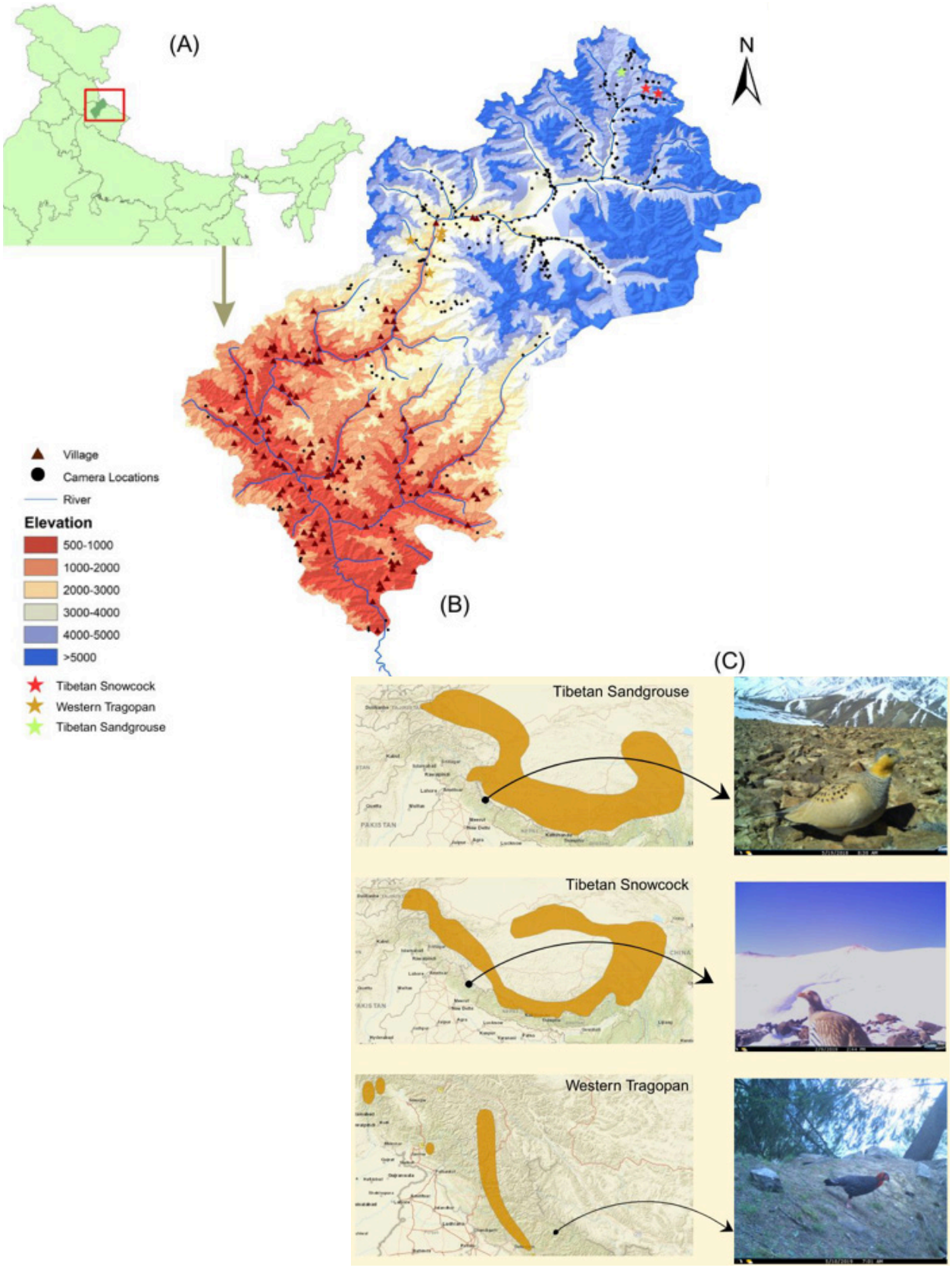

Image 1. A—Location of Bhagirathi basin in Uttarakhand, India | B—Bhagirathi basin with camera trap locations (black circles), villages (brown triangles), coloured stars depicting locations where the above-mentioned species were captured | C—IUCN range maps of the recorded species with camera trap pictures.

Table 1. All galliform species detected in the study area, along with their capture rates. For species with very low detection frequencies, the total number of captures has been provided to supplement interpretation of capture rates.

	Species	Elevation range (m)	Capture rate (Mean+-SD) / No. of captures	IUCN status	IWPA status
1	Cheer Pheasant *Catreus wallichii*	1,445–3,050	n=1	VU	Schedule I
2	Chukar *Alectoris chukar*	200–4,500	0.0707 ± 0.1554	LC	Schedule I
3	Hill Partridge *Arborophila torqueola*	1,500–2,700	n=21	LC	Schedule I
4	Himalayan Monal *Lophophorus impejanus*	400–5,240	0.1066 ± 0.1473	LC	Schedule I
5	Himalayan Snowcock *Tetraogallus himalayensis*	3,600–4,570	0.0929 ± 0.1864	LC	Schedule I
6	Kalij Pheasant *Lophura leucomelanos*	Up to 3,700	0.0641 ± 0.0671	LC	Schedule I
7	Koklass Pheasant *Pucrasia macrolopha*	370–4,000	0.0288 ± 0.0290	LC	Schedule I
8	Red Junglefowl *Gallus gallus*	0–3,050	n = 1	LC	Schedule I
9	Snow Partridge *Lerwa lerwa*	3,000–5,500	n = 10	LC	Schedule I
10	Tibetan Snowcock *Tetraogallus tibetanus*	3,700–5,800	n = 7	LC	Schedule I
11	Western Tragopan *Tragopan melanocephalus*	1,750–3,600	n = 11	VU	Schedule I

LC—Least Concern | VU—Vulnerable.

Red Fox *Vulpes vulpes* (0.01±0.14 SE), and Asiatic Black Bear *Ursus thibetanus* (0.005 ± 0.012 SE). The area also experiences human presence (0.011 ± 0.045 SE), particularly during the summer months.

Both Tibetan Snowcock (n = 7) and Tibetan Sandgrouse (n = 3) were recorded in the Nelong Valley, which is a trans Himalaya (3,500–5,200 m) habitat where they were observed alongside the Himalayan Snowcock *Tetraogallus himalayensis*. These species are known to undertake altitudinal migration during the winter months in response to snow accumulation (Madge & McGowan 2002). Potential predators documented in the area included Himalayan Wolf *Canis lupus chanco* (0.059 ± 0.014 SE), Red Fox *Vulpes vulpes* (0.049 ± 0.025 SE), and Snow Leopard *Panthera uncia* (Capture Rate = 0.035 ± 0.017 SE). The area also shows the presence of free-ranging dogs (0.017 ± 0.0081 SE) that can predate and be a potential threat to these species.

Few systematic studies have examined high-altitude Galliformes in Uttarakhand. In Ali-bedni region of Nanda Devi Biosphere Reserve, seasonally replicated surveys across 3,000–5,000 m revealed that alpine species like the Himalayan Snowcock and Snow Partridge occurred above 3,500 m, with densities strongly influenced by grazing pressure and human disturbance, highlighting the ecological sensitivity of alpine habitats and offering valuable context to understand other high-elevation avifauna in Garhwal Himalaya (Bhattacharya et al. 2009). The Tibetan Snowcock typically inhabits alpine and subalpine scrublands, as well as exposed rocky cliffs at elevations ranging 3,700–6,000 m (McGowan 2020). While the Tibetan Sandgrouse prefers arid upland habitats, such as stony plateaus, rocky hillsides, and sparsely vegetated gravel valleys, often in proximity to snowfields (Madge & McGowan 2002). The species is primarily distributed across the Tibetan Plateau, with significant populations in northern and inner Tibet. In India, the species is confined to eastern Ladakh, where it is considered locally common (Pfister 2001). In Nepal, it has been documented in the Upper Mustang region, where it was first recorded in 2002 (Chetri et al. 2007). In the Nelong Valley, the species was recorded during the summer months of April and May in both 2017 and 2018 (Image 2B). Only a single individual was captured during the sampling period. The species exhibits limited sexual dimorphism, with males and females appearing morphologically similar.

With three range extension records in the Bhagirathi Basin, our findings highlight the landscape as a critical habitat for many wildlife species (Ramesh et al. 2011; Pal et al. 2021). Recent surveys have also documented several new distribution records of mammals, such as the Woolly flying Squirrel *Eupetaurus cinereus* (Pal et al. 2019a); Pallas's Cat *Otocolobus manul* (Pal et al. 2019b); Dhole *Cuon alpinus* (Pal et al. 2018a); Tibetan Sandfox *Vulpes ferrilata*, Eurasian Lynx *Lynx lynx*, & Wolly Hare *Lepus oisostolus* (Pal et al. 2021); and Tibetan Argali *Ovis ammon* (Pal et al. 2018b), demonstrating that these high-altitude ecosystems harbour many cryptic fauna. Therefore, long-term intensive monitoring is required to confirm range extensions and new species distributions in high altitude regions of the Himalaya. Our confirmed detections of both males and females of Western Tragopan at several sites in the Bhagirathi

Image 2. A—Tibetan Sandgrouse | B—Tibetan Snowcock | C—Western Tragopan (male-left) and female-right).

Basin suggest that the area may support a potential resident breeding population rather than a transient occurrence. Although we could not find any presence of Western Tragopan in the Bhilangana region, which was earlier reported by Gaston et al. (1983), intensive long-term monitoring could help confirm its presence in that area. Similarly, records of Tibetan Snowcock and Tibetan Sandgrouse imply that these high-altitude species use the region as wintering grounds or possibly as previously undocumented year-round habitat. The records were documented beyond the established IUCN boundaries, indicating a possible extension of their range (Image 1c). These observations highlight the importance of the Bhagirathi Basin as a key refuge for many alpine birds. The topographic diversity, low human presence in winter, and complex habitat structure are likely to enhance its suitability.

High-altitude Galliformes in Uttarakhand are

threatened by intensive grazing, *Cordyceps* collection, and tourism, which overlap with their breeding areas and markedly reduce densities and habitat use (Bhattacharya et al. 2009). In addition, free-ranging domestic dogs and illegal hunting already reported from the region (Pal et al. 2021, 2022), continue to exacerbate these pressures. Many Himalayan Galliformes are suspected to have declined significantly, but the extent and current status of some species remain uncertain (Dunn 2015). Despite extensive effort, the low encounter rates for all three species point to their extreme rarity or isolated populations. Given the low encounter rates and cryptic nature of these species, we recommend long-term monitoring using targeted camera-trapping protocols focused on known breeding habitats, seasonal movements, and potential predator–prey interaction zones. This would help clarify species status, habitat associations, and prevailing conservation threats, thereby providing a baseline for evidence-based management and long-term protection.

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