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Caracal's Comeback – First photographic record of Caracal in the Ramgarh Visdhari and Mukundara Hills Tiger Reserve, India

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Abstract

Caracals (*Caracal caracal*) were once widely distributed in India's semi-arid regions but lost more than 90% of their range due to habitat loss in the past century. Herein, we present the first photographic evidence of caracal in Rajasthan's Ramgarh Visdhari and Mukundara Hills Tiger Reserves, beyond the two known caracal populations in Kachchh (Gujarat) and Ranthambhore landscape (Ranthambhore, Kailadevi, Dholpur in Rajasthan). This finding indicates return of caracal in Ramgarh and Mukundara, and revived the hope for the species' conservation in the semi-arid western Indian landscape. The record also highlighted the importance of rigorous scientific monitoring through camera traps in order to record the presence of rare and elusive species in the landscape. Dedicated surveys for caracals, focusing on their ecology, behaviour, and conservation needs, are crucial for ensuring the long-term survival of India's most endangered cat.

Keywords: Camera trapping, distribution, new records, Rajasthan, semi-arid landscape, small cats

Carnivores, across the trophic pyramids, are experiencing widespread population declines and range contractions due to unchecked rise in anthropogenic pressures leading to habitat loss, fragmentation, poaching, and prey depletion, *etc.* (Ripple *et al.* 2014). Under these circumstances, documenting the distribution of an endangered species and understanding its ecology is crucial in making informed conservation decisions.

The caracal (*Caracal caracal* Schreber, 1776), is a medium-sized, elusive wild cat known for its distinctive black ears adorned with tufts of sensitive hair. The presence of caracal in the Indian subcontinent dates back to the Harappan civilization (Ghosh, 1982). Although widespread and relatively common in its overall range (Nowell & Jackson, 1996), it has witnessed a drastic range loss and population decline over the past few decades (Farhadinia *et al.*, 2007; Avgan *et al.*, 2016). In India, the caracal has lost more than 90% of its historical range, mostly due to habitat loss (Khandal *et al.*, 2020), and its population status is perilous. Without safeguarding the existing caracal habitat, it is likely to follow the fate of the cheetah in India (Pocock, 1939; Sharma & Sankhala, 1984; Divyabhanusinh, 1995; Ranjitsinh & Jhala, 2010). The present distribution of the caracal in India is limited to two known regions: the Kachchh landscape in Gujarat, and the Ranthambhore landscape, which includes - Ranthambhore, Kailadevi, and Dholpur in Rajasthan (Jhala *et al.* 2021). However, these two populations have plausibly been isolated for generations now, as no recent record of the species has been reported from anywhere else (Khandal *et al.* 2020). Camera trapping is a cost-effective and technically reliable method, widely used for the documentation of species presence, distribution, and monitoring their movement as well as population trends (Sanderson & Trolle 2005). Bycatch information generated from camera traps proves eventful in describing records of rare and elusive species and gaining new ecological insights (Tanwar *et al.* 2021; Burton *et al.* 2022).

Ramgarh Visdhari Tiger Reserve (hereafter RVTR, area 1501.88 Km², 25°59'N, 75°19'E to 25°53'N, 76°49'E) and Mukundara Hills Tiger Reserve (hereafter MHTR, area 1135.78 Km² ,24°38′ to 25° 7' N to 75°26' to 76°12′ E) are situated in the Hadoti plateau of Rajasthan, India (Figure 1). RVTR and MHTR form part of the 'semi-arid' biogeographic region (Rodgers & Panwar, 1988), and are characterized by Northern Tropical Dry Deciduous Forests (Champion & Seth, 1968). The terrain in these Vidhya-Aravalli Mountain ranges mainly consists of narrow valleys, hills, and

plateau top plains with narrow water drainages and rivulets crossing the landscape. Both the tiger reserves, MHTR and RVTR, are extended habitats of the greater Ranthambore landscape (Figure 1), and serves as a crucial sink habitat for tigers (Sadhu *et al.*, 2017). Despite protection under the Tiger Reserve status, these habitats are exposed to various forms of anthropogenic interferences. Considering their importance, the Wildlife Institute of India initiated the long-term ecological monitoring of these two tiger reserves, and the present survey was part of it.

We deployed double-sided camera traps in a systematic grid-based (2 km²) manner in RVTR (n=89) and MHTR (n=273). These cameras were deployed on forest roads and animal trails, tied to tree trunks at 30-45 cm height above the ground, to maximize captures of carnivore species. During the survey session of winter 2024-25, photographs of caracal were obtained from nine camera trap stations in RVTR between 19th December 2024 and 21st January 2025 (Figure 2a, b), spanning across a minimum area of ~60 km² (Figure 1). In MHTR, caracal photographs were obtained between 16th February 2025 and 25th February 2025 (Figure 2c, d), at two different locations (~8 km apart, straight line distance). All the caracal records in our study area were nocturnal, with captures between 18:00 hrs and 06:00 hrs. These events recorded the first photographic evidence of the caracal in RVTR and MHTR, from where it was considered locally extinct (Khandal *et al.*, 2020). The camera traps, where the caracals were captured, also had the presence of other carnivores, including tiger, leopard, hyena, golden jackal, jungle cat, Asiatic wildcat, and rusty-spotted cat. In one of the pictures, the caracal was carrying a small prey (most likely a lagomorph). However, the image was not clear enough to ascertain the prey species (Figure 2b).

In RVTR, the caracal was captured in valleys and plateau top forests, while in MHTR, the species were captured on plateau tops adjacent to riverine habitats (of Chambal and Eru rivers). These valleys are characterized by sparse to moderate vegetation and low canopy cover, dominated by *Terminalia pendula* and *Neltuma juliflora*. The forest roads in these areas are also frequently used by the villagers for fuelwood collection and travelling across the forest. The hill and plateau consist of relatively open forests, are less disturbed, and are dominated by patches of *Terminalia pendula*, *Acacia catechu* and *Boswellia serrata*. Including Caracal (*Caracal caracal schmitzi*), the area now is inhabited by six different wildcat species, *i.e.*, tiger (*Panthera tigris*), leopard (*Panthera pardus*), jungle cat (*Felis chaus*), Asiatic wildcat or desert cat (*Felis lybica*), and rusty-spotted cat (*Prionailurus rubiginosus*).

Caracal sightings were in fair numbers in the Bundi district (RVTR) in the last century (Pocock, 1939; Prakash, 1960) as reported in recorded gazettes from the royal states of imperial India, while no confirmed capture or sighting was reported in and around MHTR apart from displayed taxidermy hunted specimens in museums, given the rare status of the species in the region (Khandal & Dhar 2024). The last confirmed evidence of the species was in 1987 in RVTR (then Ramgarh Visdhari Wildlife Sanctuary), when a road kill specimen of a caracal was recorded in forest department catalogs (Khandal *et al.*, 2020). Although the habitats of both MHTR and RVTR are found suitable for caracal, no photographic evidence was recorded of the species during the past surveys (Jhala *et al.* 2015, Jhala et al, 2021; Latafat *et al.* 2023, Qureshi *et al.* 2023). The nearest known sighting of a caracal was near the Phalodi region (aerial distance 64 km) of Ranthambhore Tiger Reserve (Jhala

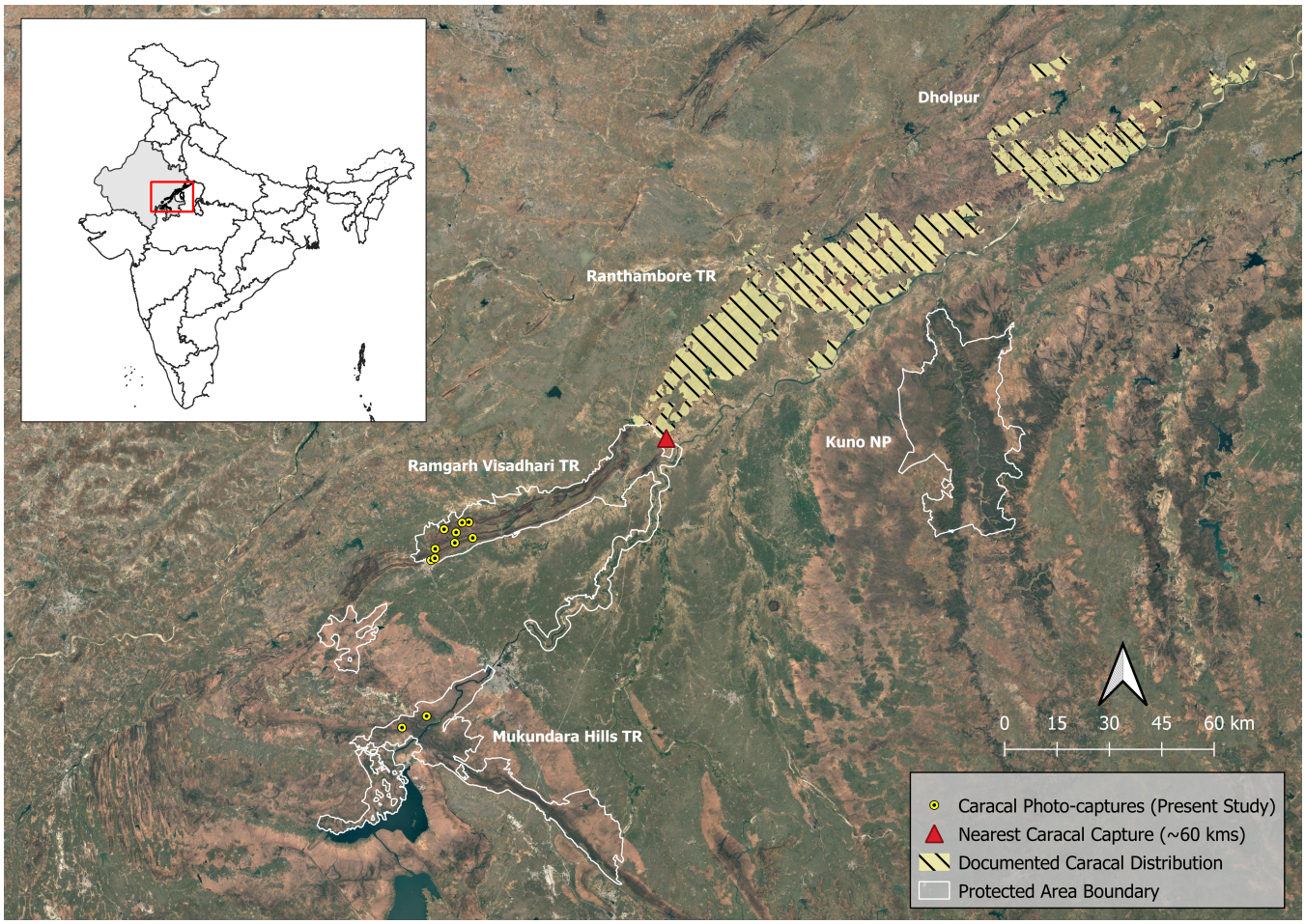

Figure 1. Map showing documented caracal distribution (Jhala *et al.*, 2021, Khandal & Dhar, 2024) with camera trap capture locations from the present study.

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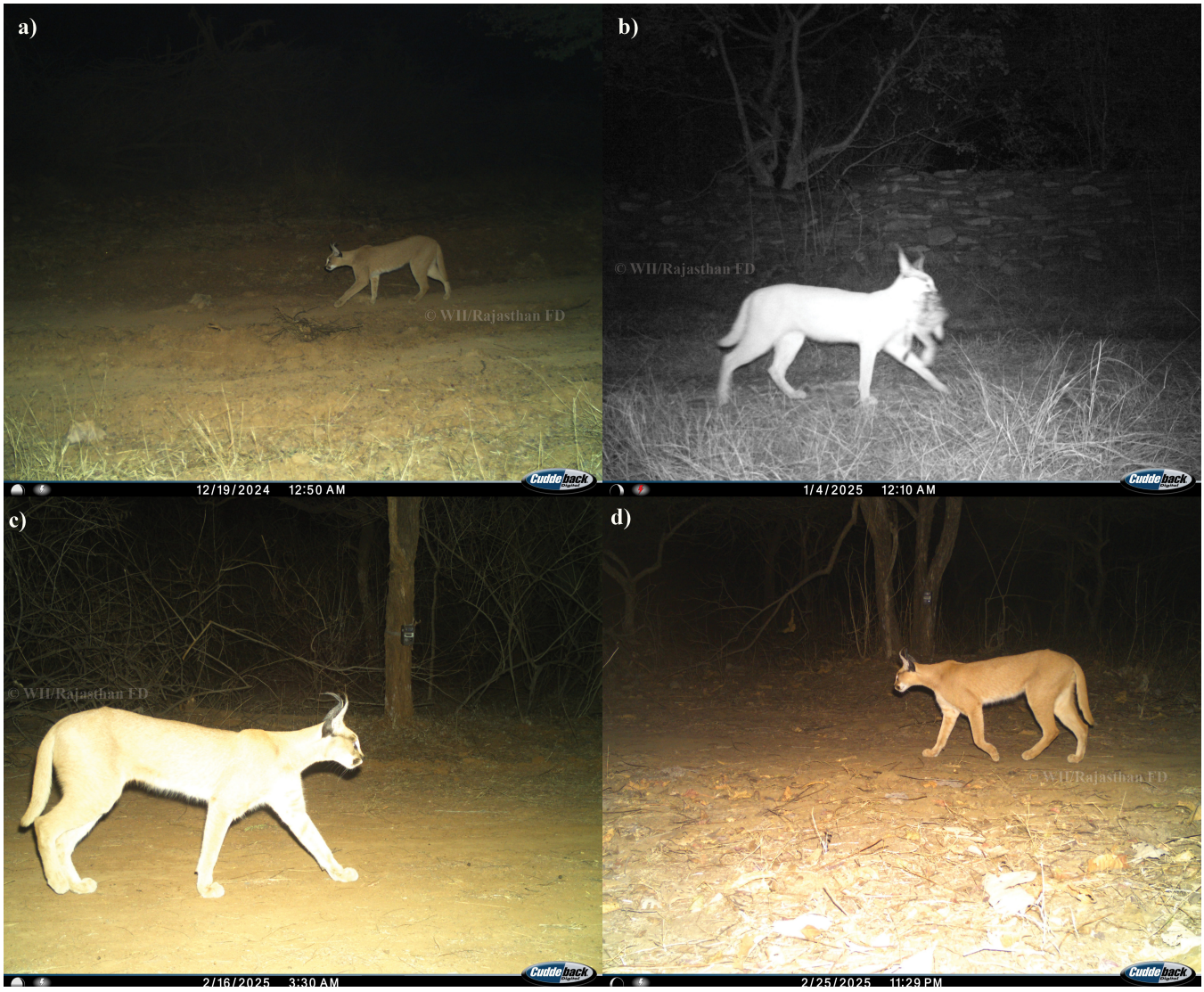

Figure 2. Photo-captures of the caracal from the present study. a) First photo-capture in RVTR. b) Caracal carrying a lagomorph in RVTR. c) First photo-capture of caracal in MHTR. d) Last Photo-capture of caracal in MHTR during current study.

et al., 2021). It is possible that the individual photo-captured in the present study might be dispersing from Ranthambhore (Phalodi region). Caracals are large ranging species, and are known to cover larger distances in resource sparse areas (Norton & Lawson, 1985; Bothma & Riche, 1994; Avenant & Nel, 1998; van Heezik & Saddon, 1998; Marker & Dickman, 2005). The probability of RVTR and MHTR harboring sizable caracal populations currently is low (given no photographic captures in the recent surveys). These recent photo-captures of caracal have revived the hope for caracal conservation in the semi-arid western Indian landscape and highlighted the importance of rigorous scientific monitoring to record rare and elusive species, such as caracal. Dedicated species-specific studies focused on population status, habitat use, ranging pattern, and genetic assessment are required for developing effective conservation strategies to safeguard the species' long-term viability (Jhala *et al.* 2021; Khandal & Dhar 2024).

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CONFLICT OF INTEREST

Qamar Qureshi, Vishnupriya Kolipakam and Bilal Habib hold editorial positions at the Journal of Wildlife Science. However, they did not participate in the peer review process of this article except as authors. The authors declare no other conflict of interest.

DATA AVAILABILITY

All data are presented in the paper.

AUTHORS' CONTRIBUTION

RT, MP, and AS conceived and designed the study. RT, MP, and DS carried out the field study. QQ, BH, VK, AS, SS, MS, RK and SJ secured necessary permission and resources to carry out the study. AS, VK, BH and QQ supervised the research work. RT, MP and AS wrote the original draft. All the authors contributed for the final version of the manuscript.

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