

## Distribution update

### First photographic record of Indian wolf *Canis lupus pallipes* in Valmiki Tiger Reserve, Bihar, India

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## Abstract

The Indian wolf (*Canis lupus pallipes*) is an endangered species and known to be distributed in the vast areas of the Indian subcontinent. Intensive annual camera trapping surveys started in Valmiki Tiger Reserve in 2013. The objective of these surveys was to monitor tigers and co-predators. The study area was systematically sampled by deploying a set of two camera traps per location within a 2 km<sup>2</sup> grid. The camera trap sites were determined by extensive search through sign surveys to find the ideal locations along animal trails, dirt tracks, and dry streambeds. Every year, camera traps were placed on average at 425 locations spread across 901 km<sup>2</sup>. An Indian wolf was captured only once since 2013 at two different locations in the 2016-17 survey. This is the first photographic evidence of Indian wolf from Valmiki Tiger Reserve, Bihar, and might be an extension of the known eastern distribution range of the Indian wolf population from the Chhotanagpur plateau in Jharkhand and part of the lower Gangetic plains.

## Introduction

Once the most widely distributed terrestrial mammal on the globe living throughout the northern hemisphere, wolves now face a severe reduction in their distribution and population size (Mech 1970, Feldhamer et al. 2003). In Asia, wolves are distributed across central Asia from the Trans-Himalayan region of India, Nepal, and Tibet to the northern parts of Mongolia and the Korean Peninsula (Pocock 1941). Several species and subspecies of wolves have been known and reported from different parts of the world. Around 10 subspecies of grey wolf (*Canis lupus*) are recognized, which may not be related so closely (Boitani et al. 2018). Based on recent genetic studies, there are two different subspecies of wolves living in India (Sharma et al. 2004; Aggarwal et al. 2007); Tibetan wolf or Himalayan wolf *Canis lupus chanco* and Indian wolf *Canis lupus pallipes*. These two species are also known as oldest lineages of all wolves in the world (Shrotriya et al. 2012; Sharma et al. 2019). The Himalayan wolf inhabits high altitude valley habitats ranging across Himachal Pradesh, Nepal, Tibet, and Sikkim (Jhala et al. 2013; Werhahn et al. 2020). There remains some ambiguity in the taxonomic status of *Canis lupus* in the Himalaya. Alvares et al. (2019) suggested the Himalayan wolf to be recognized as *Canis lupus chanco* based on their genetic structure. Werhahn et al. (2020) reported that the Himalayan wolf forms a distinct lineage which is adopted to high altitude and stressed further taxonomic recognition.

The wolf occurring in peninsular India is known as Indian wolf and their distribution in peninsular India is patchy and mostly found in isolated pockets in the states of Rajasthan, Gujarat, Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Bihar-Jharkhand, Uttar Pradesh, Orissa, West Bengal, and Haryana. Shahi (1982), during his visits to different parts of the country, reported about 500-800 wolves from peninsular India. Most of the

studies on Indian wolves are focused in its western and southern ranges, but not much is known from the eastern range except some sporadic surveys in Jharkhand and West Bengal (Saren et al. 2019). In 2010, a country-wide wildlife survey conducted in an occupancy framework estimate its range to be about 220,000 km<sup>2</sup>. Based on an average territory size of 150 (±15 SE) km<sup>2</sup> for breeding packs, there are likely 1200 – 1800 packs in India which seems to be a more realistic population estimate (Jhala et al. 2013).

Until the beginning of the 20th Century, wolves were once reported to occur in a wide range of Uttar Pradesh and Bihar. Though in Bihar, the population is restricted to the southern part of the state. However, there are some anecdotal evidence suggesting the presence of wolves in the floodplain grassland of the Terai, but there are no confirmed records of Indian wolf presence neither in the Terai region of India and Nepal nor in the area north to the Ganga (Jhala 2003). Later, Dey et al. (2010) confirmed the presence of the Indian wolf in the floodplains of Gandak River (Bihar) north of the Ganges.

The Indian wolf lives in smaller packs, usually four to seven individuals. They prey mainly on small to medium sized ungulates like blackbuck *Antelope cervicapra*, Indian gazelle *Gazella bennetti*, nilgai *Boselaphus tragocamelus*, Indian hare *Lepus nigricolis* and livestock (mainly goat & sheep) and prefer to live in scrublands, grassland, and semi-arid habitats (Jethva and Jhala 2004, Habib 2007). The eastern population of the Indian wolf found in Odisha, Jharkhand, Bihar, and parts of West Bengal is reported to occur also in forested habitats (Shahi 1982). Much of its habitat has been taken over by intensive agriculture. Thus, landscape fragmentation adversely affects its natural prey. The species is listed as Endangered under IUCN Red Data List (2016) and protected as Schedule I animal in the Indian Wildlife (Protection) Act, 1972.

The following is the established format for referencing this article:

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## Methods

Spread across 901 km<sup>2</sup>, Valmiki Tiger Reserve (VTR) is situated along Himalayan foothills in the north-western corner of West Champaran district of Bihar state. The northern boundary of VTR is bordering with Chitwan National Park in Nepal while Sohagbarwa Wildlife Sanctuary of Uttar Pradesh lies on its western side. The habitat of VTR is a mosaic of moist and dry deciduous forests types merged with tall and small grassland. The Gandak, Pandai, Masan, Sonha, and several other small rivers and rivulets provide all year water supply to animals. The major fauna is represented by tigers *Panthera tigris*, leopards *P. pardus*, sloth bears *Melursus ursinus*, wild dogs or dholes *Cuon alpinus*, gaur *Bos gaurus* and several species of ungulates (Maurya & Borah 2013, WWF-India unpublished reports). WWF-India has conducted intensive camera trapping and sign surveys as a part of tiger and other species monitoring programs since 2013. Camera traps sites were selected based on signs such as scats, scrapes, scent markings, claw marks, pugmarks etc. that indicated use of the sites by predators. The study area was divided into blocks based on resource availability and 2 km<sup>2</sup> grid was overlaid on a map of the study area. A pair of camera traps was systematically placed in most of the grids. At each location, cameras were operated for 30 – 35 days. A mean distance between camera trap locations of 1-2 km was maintained. Every year, camera traps were placed at an average of 425 locations spread across VTR (Table 1). In the 2016-17 survey, a total of 463 camera stations were deployed systematically and camera trap placement and height were optimized for the study's target species: tigers. Cameras were checked regularly to ensure their functionality and to download data.

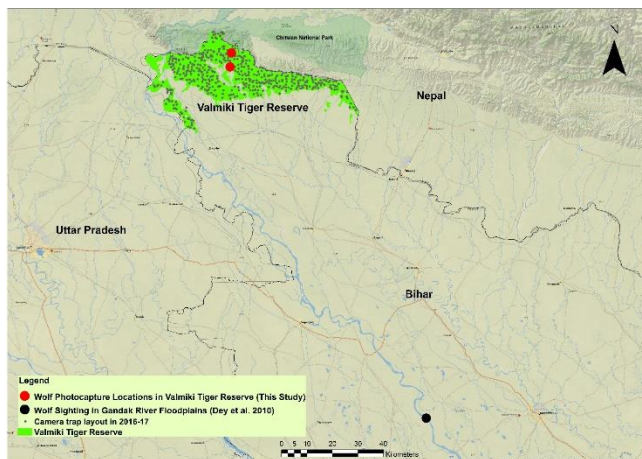


Figure 1: Occurrence of Indian wolf in and around Valmiki Tiger Reserve in Bihar.

Table 1: Summary of camera trap sampling in Valmiki Tiger Reserve, Bihar from 2013 to 2020.

| Year      | Sampling Period       | No. of Camera stations | Trap nights (effort) |
|-----------|-----------------------|------------------------|----------------------|
| 2012-2013 | Feb 2013 - June 2013  | 270                    | 6688                 |
| 2015-2016 | Nov 2015 - Jan 2016   | 476                    | 17736                |
| 2016-2017 | Nov 2016 - Feb 2017   | 463                    | 15059                |
| 2018-2019 | Jan 2018 - April 2018 | 492                    | 18170                |
| 2019-2020 | Nov 2019 - Feb 2020   | 446                    | 18566                |

## Results & Discussion

The entire VTR has been monitored annually through intensive camera trapping surveys since 2013 (Table 1). More than 30 mammalian species were photographed during these camera trap surveys but have not yielded any picture of Indian wolves. While tigers, leopards, and sloth bears were the most frequently captured species among large carnivores across the tiger reserve. During the survey in 2016-17, five pictures of Indian wolves on three different occasions were captured at two different camera locations (Table 2 & Fig 2) on 17th and 25th day of sampling in Raghia range of VTR. The first capture was made on the 9th Jan 2017 at 18:04 h while both the second and third were made on the 17th Jan 2017 at 06:41h and 06:50h, respectively. The aerial distance between the two capture locations was ~6 km. It is likely that the same individual was captured on these three camera trap occasions at two locations. The first camera site was dominated by tropical moist deciduous sal *Shorea robusta* forest with high to moderate canopy cover. The second capture site is characterized by a perennial stream. Along with the wolf, several other members of Canidae and Hyaenidae family such as golden jackal *Canis aureus*, wild dog or dhole, Indian fox *Vulpes bengalensis* and striped hyena *Hyaena hyaena* were also photo captured in VTR. According to the local people and forest officials, the Indian wolf was not reported earlier in VTR (pers. comm. with S. Sinha of Wildlife Trust of India). These pictures confirm the presence of wolf in VTR and therefore present an addition to the mammalian fauna of the reserve. The first capture took place in the vicinity of the villages and interestingly, there have been no reported cases of human wildlife conflict with wolves, such as livestock depredation. This could be either a transient or resident individual(s), which future monitoring can reveal. Apart from this study, records of Indian wolves from the Terai region were also reported in 2010 downstream of Gandak River (26° 6. 945' N; 84° 56. 469' E) during a survey for aquatic fauna (Dey et al. 2010 and Fig 1).

Table 2: Summary of captures details of Indian wolf in Valmiki Tiger Reserve, Bihar.

| S# | Range  | Date & Time of Capture | GPS Coordinates                      | Remarks                                                                                                 |
|----|--------|------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1  | Raghia | 09 Jan 2017, 06:04 PM  | 27° 23' 35.84" N<br>84° 10' 41.70" E | Photo captured on single occasion near fringe area, degraded land with patchy distribution of sal trees |
| 2  | Raghia | 17 Jan 2017, 06:41 AM  | 27° 26' 36.50" N<br>84° 11' 5.50" E  | Photo captured on single occasion in a water stream with moderate canopy cover                          |
| 3  | Raghia | 17 Jan 2017, 06:50 AM  | 27° 26' 36.50" N<br>84° 11' 5.50" E  | Photo captured on single occasion in a water stream with moderate canopy cover                          |

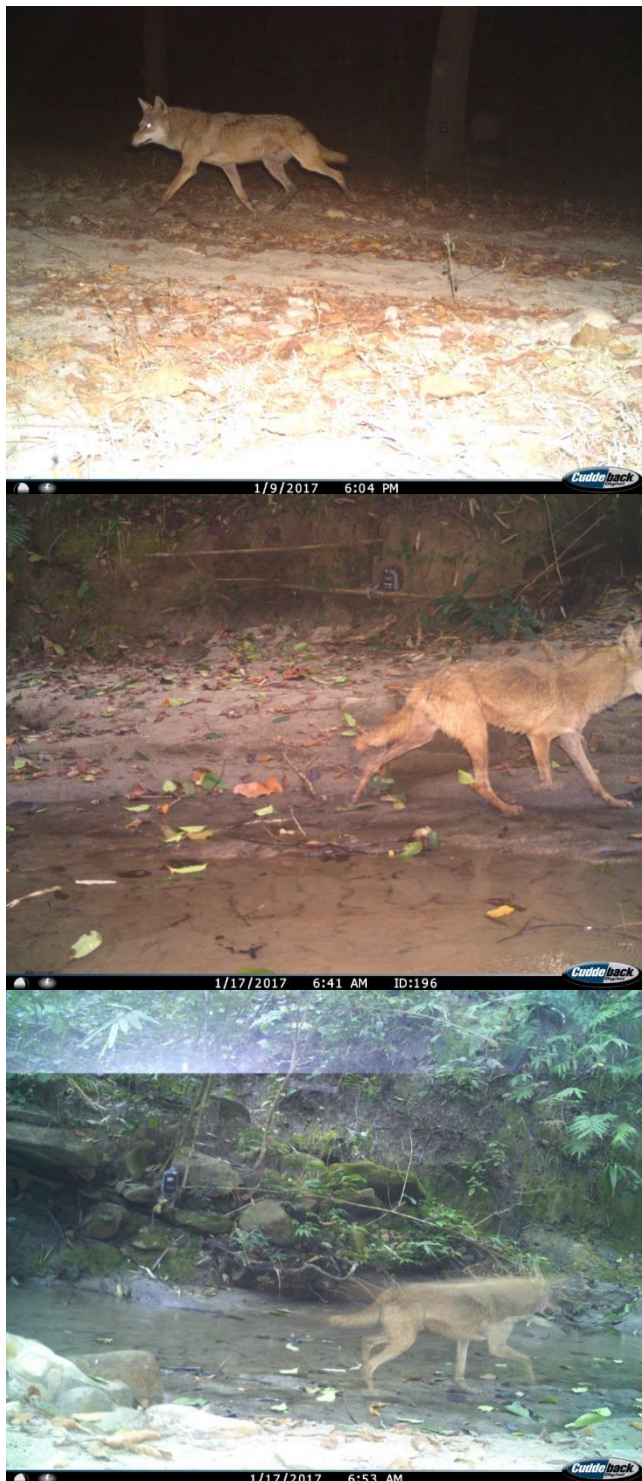


Figure 2: Indian wolf photo captured thrice at two different camera locations in Raghia Range of Valmiki Tiger Reserve, Bihar.

Our capture locations are 164 km away from those of Dey et al. (2010). All along the Gandak River there are some floodplains grassland patches interspersed with agricultural fields which might have been used by an Indian wolf population as the area supported a fair population of nilgai, Indian wild pig *Sus scrofa*, hog deer *Axis porcinus*, and Indian hare (Dey et al 2010; Maurya & Borah 2013). Wolves were once widely distributed in some parts of Bihar-Jharkhand (West Champaran, Bhagalpur, Gaya, Darbhanga, Munger, Purnea, Saran, Saharsa, Plamau and Hazaribagh districts) (Jhala

2003; Fauna of Bihar including Jharkhand Part-1, 2004) but were exterminated in the 1990s from many areas due to high human wolf conflict (Jhala and Sharma 1997). Its habitat in this state has been taken over by intensive agriculture and landscape fragmentation which adversely affected all carnivore species including wolves. Recently, wolves are also reported in West Bengal and Bangladesh (Saren et al 2019, Akash et al. 2020). Wolves are great dispersers and known to travel long distances for which they negotiate human dominated landscapes (Mech and Boitani 2004; Jethva and Jhala 2004; Habib, 2007).

The occurrence of wolves in VTR might be extension of the known eastern distribution range of the Indian wolf from the Chhotanagpur plateau in Jharkhand and part of the lower Gangetic plain (Saren et al 2019, Sharma et al. 2019, Akash et al. 2020). Further research on the species' distribution and population status is required to develop strategies for conservation of the species in a human dominated landscape.

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## Biographical sketch

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