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## SMALL WILD CATS SPECIAL ISSUE

### SHORT COMMUNICATION

#### FIRST PHOTOGRAPHIC EVIDENCE OF FISHING CAT *PRIONAILURUS VIVERRINUS* BENNETT, 1833 AND CLOUDED LEOPARD *NEOFELIS NEBULOSA* GRIFFITH, 1821 (CARNIVORA: FELIDAE) IN PARSA NATIONAL PARK, NEPAL

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## FIRST PHOTOGRAPHIC EVIDENCE OF FISHING CAT *PRIONAILURUS VIVERRINUS* BENNETT, 1833 AND CLOUDED LEOPARD *NEOFELIS NEBULOSA* GRIFFITH, 1821 (CARNIVORA: FELIDAE) IN PARSA NATIONAL PARK, NEPAL

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**Abstract:** Twelve cat species were recorded in Nepal including the largest, Tiger *Panthera tigris*, and the smallest, Rusty-spotted Cat *Prionailurus rubiginosus*. There is more research on the *Panthera* species than on small wild cats; consequently, the conservation status, distribution, and ecology of small cat species are poorly known. In this article, we report on the first photographic evidence of Clouded Leopard *Neofelis nebulosa* and Fishing Cat *Prionailurus viverrinus* in Parsa National Park in southern central Nepal during a camera trap survey targeted at the tiger between 2014 and 2016. There were only single detections of each species; this does not give enough information to establish distribution or conservation status of either of the species in Parsa National Park. Further targeted surveys are needed to establish the significance of this protected area for the conservation of these two species.

**Keywords:** Camera trapping survey, small wild cats, southern central Nepal, Terai.

Nepal is home to 12 cat species including both the largest, Tiger *Panthera tigris*, and the smallest, Rusty-spotted Cat *Prionailurus rubiginosus*, of the world (Lamichhane et al. 2016; Lama et al. 2019). Distribution and ecology of large charismatic cats like Tiger, Snow Leopard *Panthera uncia*, and Leopard *Panthera pardus* are researched considerably in Nepal (see Jackson 1996; Smith et al. 1998; Thapa et al. 2014; Karki et al. 2015) in comparison to small felids. There are huge information gaps on the distribution and status of smaller felids in Nepal. Most of the existing information on small cat species are based on historic references and specimens, anecdotal

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records, and sign surveys carried out in protected areas for large felids (Lamichhane et al. 2016; Taylor et al. 2016). These efforts detected common and large felids but may have missed rare and elusive smaller felids (Tempa et al. 2013). Increased use of camera trapping in recent years aided in the discovery of rare species like Clouded Leopard *Neofelis nebulosa* and Fishing Cat *Prionailurus viverrinus* in new areas and provided verifiable records (see Appel et al. 2012; Lamichhane et al. 2016; Taylor et al. 2016; Ghimirey & Acharya 2018; Yadav et al. 2018; Lama et al. 2019). The latest addition is the discovery of Marbled Cat *Pardofelis marmorata* in the eastern Himalayas of Nepal (Lama et al. 2019).

Among the cat species, Clouded Leopard receives less attention from the conservation community in Nepal and is threatened by illegal wildlife trade and degrading habitat (Ghimirey & Acharya 2018). Though Hodgson (1853) reported its presence in Nepal already in the mid-18<sup>th</sup> Century, it was recorded in different parts of the country only since the late 1980s (Dinerstein & Mehta 1989), such as in Dhanusa, Nawalparasi, and Kaski districts (Dinerstein & Mehta 1989), Annapurna Conservation Area (Appel et al. 2012; Ghimire et al. 2019), Shivapuri Nagarjun NP (Pandey 2012), and Chitwan NP (Ghimirey et al. 2014; Lamichhane et al. 2014). In recent years, Fishing Cat was recorded in Chitwan NP (Dahal & Dahal 2011; Mishra et al. 2018), Koshi Tappu Wildlife Reserve (Taylor et al. 2016), Bardia NP (Yadav et al. 2018), Shuklaphanta NP (NTNC survey records, unpublished), and Jagadishpur Reservoir in Kapilvastu area of southwestern Nepal (Dahal 2016).

We report Clouded Leopard and Fishing Cat recorded for the first time in Parsa NP in southern central Nepal during a monitoring survey targeting tiger. These are the first confirmed records for the presence of both species in Parsa NP.

#### STUDY AREA

Parsa NP is located in southern central Nepal (27.306°N & 84.781°E) (Fig. 1), covering an area of 627km<sup>2</sup> (Thapa et al. 2014; Lamichhane et al. 2018). It is contiguous with Chitwan NP in the west and is a critical region in the Chitwan-Parsa-Valmiki trans-boundary forest complex in the Terai Arc landscape (Chanchani et al 2014). The park is dominated by subtropical dry deciduous forest with colonizing *Saccharum spontaneum* and *Imperata cylindrica* on the dry riverbeds and floodplains to a climax Sal *Shorea robusta* forest on Bhabhar and hillsides (Thapa et al. 2014). The streams running off the Churia Hills permeates the porous sediment and flows underground, reappearing south of the park and restricting water availability in more than 70% of its area throughout the

dry months (Lamichhane et al. 2017). The protected area supports diverse mammalian fauna including Tiger, Leopard, Dhole *Cuon alpinus*, Striped Hyena *Hyaena hyaena*, Golden Jackal *Canis aureus*, Bengal Fox *Vulpes bengalensis*, and Honey Badger *Mellivora capensis* (Thapa et al. 2014). The major prey species are Spotted Deer *Axis axis*, Barking Deer *Muntiacus muntjak*, Gaur *Bos gaurus*, Nilgai *Bosephalus tragocamelus*, Wild Boar *Sus scrofa*, and Sambar *Rusa unicolor*. The combined ungulate density was estimated to be 25.33 (SE±3.9) ungulates/km<sup>2</sup> in 2013 (Dhakal et al. 2014).

#### MATERIALS AND METHODS

The study was primarily designed for tiger monitoring, deploying camera traps in continuous cells of 2kmx2km during the cool and dry seasons of November 2014 to January 2015 and February to April 2016, covering the core area of Parsa NP during the first survey period and the new extension area during the 2016 survey period (Fig. 1). A pair of camera traps (model: Panthera V5) was placed in each cell. All the camera traps were active for 24 hours for a minimum of 21 days during both survey periods. Following completion of the field survey, images were checked manually for the species recorded.

#### RESULTS

Camera traps were deployed in 130 and 167 locations during the first and second survey period, with a total survey effort of 7,230 trap nights, including 3,549 and 3,681 trap nights, respectively. We obtained a single image of Clouded Leopard and four images of a Fishing Cat.

#### Clouded Leopard

A single Clouded Leopard was photographed on 30 November 2014 at 00.26h at 27.312°N & 84.961°E (Fig. 1) on the eastern edge of Parsa NP. The species was identified by comparing the pelt pattern with the image of a Clouded Leopard provided in the IUCN Red List (Grassman et al. 2016). The age and sex of the individual, however, could not be determined. The Clouded Leopard was camera trapped in Sal-dominated mixed forests (Image 1).

#### Fishing Cat

Four images of Fishing Cat were obtained from three camera trap stations (27.235°N & 84.892°E; 27.234°N & 84.914°E; 27.246°N & 84.946°E) on the southeastern edge of Parsa NP during the 2016 survey (Fig. 1). Comparison of the pelage on both flanks from the paired cameras confirmed that all three stations recorded the same individual. We could not confirm its sex from the images. These three camera trap stations were in a Sal-dominated

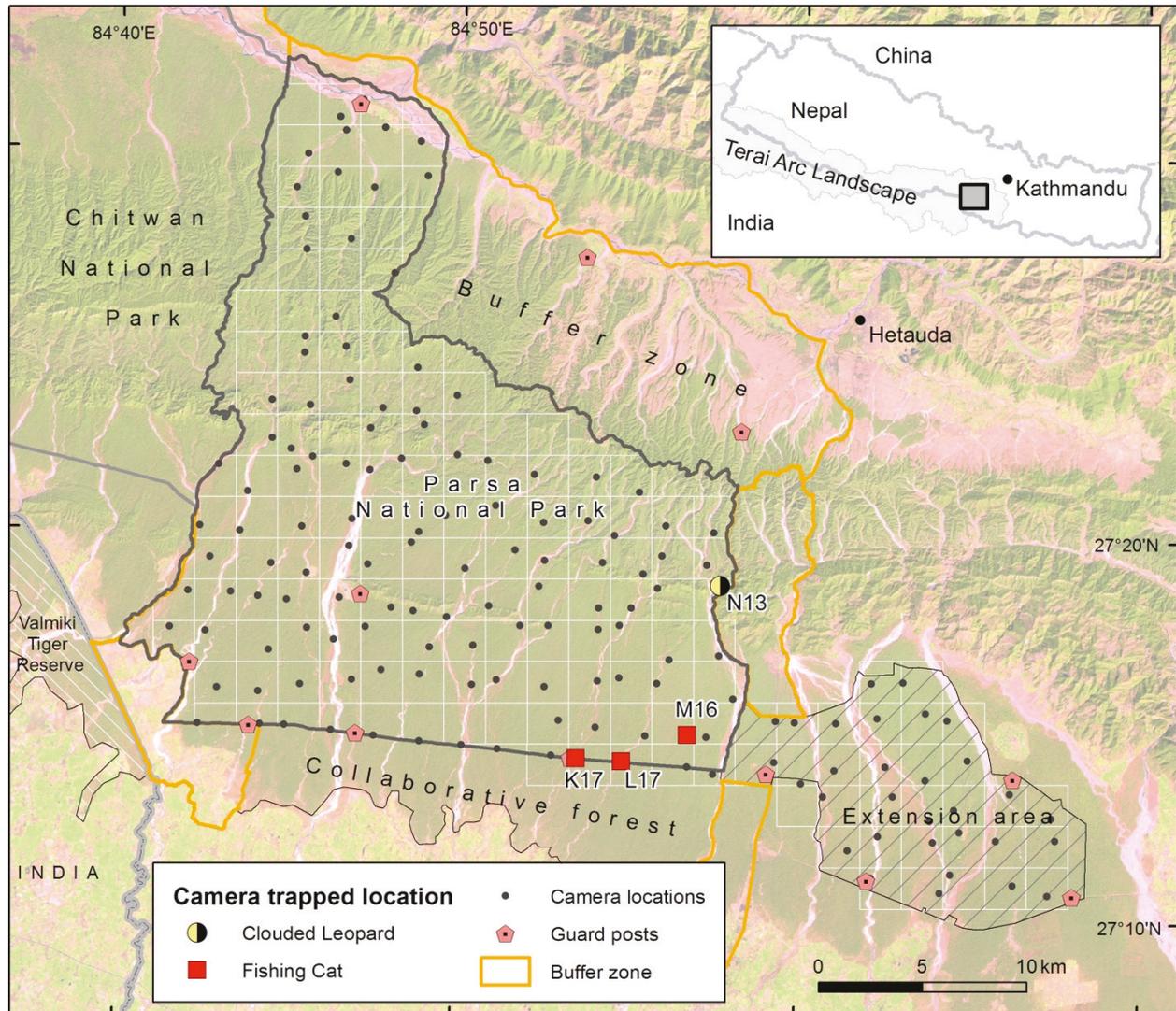


Figure 1. Study area with camera trap locations in Parsa National Park, Nepal.

forest (Image 2).

## DISCUSSION

Our records confirm that both Clouded Leopard and Fishing Cat occur in Parsa NP. Thus, both species were documented in all three protected areas within the Chitwan-Parsa-Valmiki trans-boundary forest complex (Clouded Leopard: Ghimirey et al. 2014; Lamichhane et al. 2014; Kamlesh Maurya pers. comm. 2017; Fishing Cat: Dahal & Dahal 2011; Mishra 2016; Mukherjee et al. 2016).

Borah et al. (2014) reported frequent captures of the Clouded Leopard by camera traps set up on paths and animal trails in Manas NP. Also, Lamichhane et al. (2014) reported records of the species on the forest floor in Chitwan NP. The camera locations in Parsa NP were selected after an intensive search for signs such as scratch marks to maximize the probability of capturing the tiger.

Our protocol of checking camera traps every alternate day may have impacted encounter rates of shy and elusive small wild cats.

Large intact and interconnected forest patches of this complex (ca. 3,000km<sup>2</sup>) might have provided an opportunity for the dispersal of the Clouded Leopard. Such interconnected forest habitats are important for sustaining viable populations of large carnivores such as Tiger, Leopard, and Clouded Leopard, which in turn also protect the functionality of the ecosystem (Borah et al. 2014; Chanchani et al. 2014). To maintain its ecological integrity, the Chitwan-Parsa-Valmiki protected area complex should also be kept intact by avoiding the construction of linear infrastructure such as roads and railways that fragment the forests, or by establishing wildlife-friendly corridors.

Across its range, the Fishing Cat is associated with wetlands such as coastal and inland wetlands, rivers



**Image 1.** Clouded Leopard *Neofelis nebulosa* in a dry riverbed in Parsa National Park, Nepal. © Department of National Parks and Wildlife Conservation, National Trust for Nature Conservation, Zoological Society of London, 16 November 2014.



**Image 2.** Fishing Cat *Prionailurus viverrinus* on a forest road in Parsa National Park, Nepal. © Department of National Parks and Wildlife Conservation, National Trust for Nature Conservation, Zoological Society of London, 08 March 2016.

**Table 1.** Details of Clouded Leopard and Fishing Cat capture events in Parsa National Park, Nepal.

Particulars	Fishing Cat	Clouded Leopard
Grid ID (GPS Locations)	K17 (27.235°N & 84.892°E), L17 (27.234°N & 84.914°E), M16 (27.246°N & 84.946°E)	N13 (27.312°N & 84.961°E)
Elevation	201–255 m	458m
Number of detections	3	1
Date of capture	8.iii.2016	30.xi.2014
Time of capture	04.48h (K17), 05.37h (L17) & 19.43h (M16)	00.26h
Flank image	Both	Right
	Forest road	Riverbed
Habitat surrounding the location	Sal forest	Sal forest
Distance to nearest settlement	4.5–5.6 km	5.7km
Distance to nearest perennial water source	4.2–5.7 km	0.5km

and streams, marsh areas, reed beds, tidal creeks, and mangrove forests (Mukherjee et al. 2016). Parsa NP is a relatively dry area with limited water sources, especially during the dry rainless season between October and April. Perennial water sources here are confined to small streams coming from the Churia Hills and flowing partly underneath the surface, which limits the availability of water in the park (Israil et al. 2006; Thapa et al. 2014).

The location where the Fishing Cat was recorded is a dry forest road in Bhabar Forest, which contrasts with records in wetlands across southern and southeastern Asia (e.g., Cutter & Cutter 2009 in Thailand; Mukherjee et al. 2012 in West Bengal, India; Islam et al 2015 in Pakistan; Taylor et al. 2016 in eastern Nepal; Palei et al. 2018 in Odisha, India; Thaug et al. 2018 in coastal Cambodia). A targeted survey for Fishing Cat by Sharma (2016) did not record the species in Parsa NP. This survey covered only a small area (~20km<sup>2</sup>), targeting two sites close to rivers and streams. Our record is at a distance of ~20km from the survey area of Sharma (2016) and well away from wetland sites or water sources (>5km). Looking at the linear movement and the single record of the species, we assume that the individual might have arrived incidentally at the location or been passing through it while migrating to another habitat.

While the global ranges of Fishing Cat and Clouded Leopard are declining due to various anthropogenic factors (Grassman et al. 2016; Mukherjee et al. 2016), the current records in an additional protected area would help in their conservation.

These records, however, also indicate that more in-depth surveys on their distribution, abundance, and habitat use are necessary and warranted. In addition, such targeted surveys will also contribute to understanding the dynamics between larger carnivores, like tiger and leopard, and small wild cats. Hence, we recommend a targeted survey covering the current capture locations to ascertain whether these individuals were transiting or are resident.

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