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Caption: Large Indian Civet *Viverra zibetha*, Tricoloured Munia *Lonchura malacca* and *Hoya wightii* (Medium—pencil crayon on watercolour paper) © Supriya Samanta.



Latrine site and its use pattern by Large Indian Civet *Viverra zibetha* Linnaeus, 1758: record from camera trap

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Abstract: Latrine sites are the places used for urination and defecation, which mostly act as a signaling agent for multiple purposes like territorial marking, confrontation with extruders or potential predators, delivering different inter and intra-communication messages. To understand latrine site visit pattern, a single camera trap was deployed for 91 trap nights at the latrine site of Large Indian Civet during the months of December 2016 and February & March 2017. Latrine site was found under the tree with abundant crown cover and bushes. At least two individuals were found to be using a single latrine site in an irregular manner between 1800 h and 0600 h with higher activity between 1800 h and 2300 h. Our results indicated an irregular latrine site visit pattern, hence similar studies with a robust research design in larger areas are required to understand specific latrine use patterns.

Keywords: Activity pattern, behavior, camera trap, clock chart, seasonal, scent marking, territorial marking, territory, urination.

The repeated use of specific latrine sites has been described for several mammals, including omnivores, ungulates, and primates (Dröscher & Kappeler 2014). Such sites vary in location (arboreal, terrestrial, or subterranean), in volume of faeces, spatial distribution, and behaviours associated with defecation and seem to vary in the functions they serve (Irwin et al. 2004).

Understanding the use of latrine sites is one of the most effective and fundamental tools that provides future directions and insights into the ecological and behavioural relationships among conspecifics. Time stamped camera trap data have been very useful for understanding the presence, ecology and behaviour of the species (Ridout & Linkie 2009; Rowcliffe et al. 2014).

The Large Indian Civet *Viverra zibetha* is a widespread species and has been recorded up to 2,420 m in Nepal (Appel et al. 2013), and up to 3,080 m in India (Khatiwara & Srivastava 2014). Its presence was documented in the riverine and Sal *Shorea robusta* forests, near human settlements (Ghimirey & Acharya 2014), grasslands and in thick bushes (Jnawali et al. 2011) as well as in the primary, secondary, degraded forest, scrubland and plantations areas (Duckworth 1997; Azlan 2003; Jennings & Veron 2011; Choudhury 2013; Chutipong et al. 2014). Due to its wide distribution across a variety of habitats, it is listed as Least Concern (LC) in IUCN Red List (Timmins et al. 2016). It is a ground dwelling (Lekagul & McNeely 1977; Duckworth 1997) solitary, nocturnal animal; with occasional records at daytime (Than et al.

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2008; Gray et al. 2014). In this note, we documented its latrine site and its use pattern in the premises of the Institute of Forestry, Pokhara, using camera trap records.

Study area

The Institute of Forestry (IOF), Pokhara campus is situated in Pokhara, Kaski district, Gandaki province of Nepal. We identified the latrine site of the Large Indian Civet during mammalian profile survey within Banpale forest, a legal asset of IOF, which mainly includes the natural *Schima-Castanopsis* forest; having species of *Dalbergia*, *Albezia*, *Michelia*, and *Alnus*. The Seti river is a perennial that flows within a close vicinity of the forest. The recorded latrine site was very close to the Marshyangdi hostel. Agricultural crops, vegetables, and banana gardens were found around the study site.

MATERIAL AND METHODS

A single piece of Bushnell camera trap was deployed without any lure for 91 days from 1–30 December 2016 and 01 February to 30 March 2017. The camera trap, having active motion inbuilt function with non-motion sensor, was deployed at the base of a *D. sissoo* tree at a height of 25–30cm above the ground in such a way that the entire latrine site was visible. It was set to both photo and video mode option so as to record two photos

per second followed by a video of 10 seconds from 1800–0600 h for each trap night.

Data analysis

Both photo and video from the camera trap were imported, collated, and cleaned for further analysis. Only those photos and videos with the evidence of the record of a Large Indian Civet in the latrine site were considered for the interpretation. The obtained data were analyzed in R software using the package ggplot2, dplyr, lubridate (R core team 2019) to create the clock chart.

RESULTS

The geographic location of the latrine site was at an elevation of 808 m. Monitoring of the latrine site for three months yielded a total of 215 videos and 1,017 camera trap images during the effort of 91 camera trap nights.

The latrine site was under the bush coverage of a *D. sissoo* tree, with 80% canopy intertwined with bushes and climbers, making the site enclosed with openings at two ends. The defecating site was excavated 5-cm deep at the center of the pit (a cavity or hole in the ground usually made by digging). The individuals deposited the feces along with spraying of urine in the latrine site, and rubbing their anus in soil right after defecation. Two



Image 1. Map of the study area (camera trap recorded locations of Large Indian Civet in the Banpale forest and latrine site at backside of Marsyangdi hostel at Institute of Forestry, Pokhara Campus, Nepal).

Large Indian Civets were seen together in the recorded video of March 2017 in the latrine site, however, their sexes could not be distinguished.

Large Indian Civets visited the latrine site from 1800–0500 h (Figure 1). It was active for most of the night time with the highest record during the hour between (2100–2200 h) followed by (1800–1900 h), with the lowest at the start of the day (0500–0600 h). It visited the site for eight days in December, seven days in February and six days in March. After the first eight days of frequent visits, the animal was not observed for the next 22 days in December.

Of the total video duration (1,423 seconds), the presence of the Large Indian Civet was recorded for 1,046 seconds, the major activity during this was sniffing (782 seconds, 78%) and defecating & urinating (224 seconds, 22%). It initially sniffed the site, afterwards urinated and defecated.

DISCUSSION

The recorded latrine site was outside the forest area and in close proximity to the settlement area. A tree surrounded by tall bushes with a small outlet in both sides was used by the Large Indian Civet as latrine site.

Irregular visits to the monitored latrine site suggest that the animals have maintained other latrine sites too. A species maintaining more than one latrine site can be attributed to territory marking such as in otters (Torgerson 2014) and could be an interesting aspect of study. It could be a special vigilance behavior of the small carnivores to avoid any risk or conflict around the habitat.

The Malay Civets *Viverra zibellina* were predominantly active from 1800 h to 0700 h (Colon 2006), and reported frequent walking and sniffing as a physiological olfactory sense use of carnivores to check the potential predator and conspecifics before the use of the latrine site for defecation and urination. This could be attributed as a special form of scent marking serving as a commonly invoked chemical communication function (Irwin et al. 2004; Wronski et al. 2013; Dröscher & Kappeler 2014; King et al. 2017) for avoidance of parasite transmission (Gilbert 1997), avoidance of detection by predators (Boonstra et al. 1996), and territoriality (Gorman & Trowbridge 1989). The nocturnal and crepuscular activity would help in increasing the encounters with prey (Colon 2006), a similar behavior was observed in our current study.



Image 2. Camera trapped photographs taken from the video recorded during the latrine site monitoring of Large Indian Civet: 1—the latrine trench of the species marked by yellow circle | 2—species urinating on its latrine site | 3—species defecating on its latrine site.

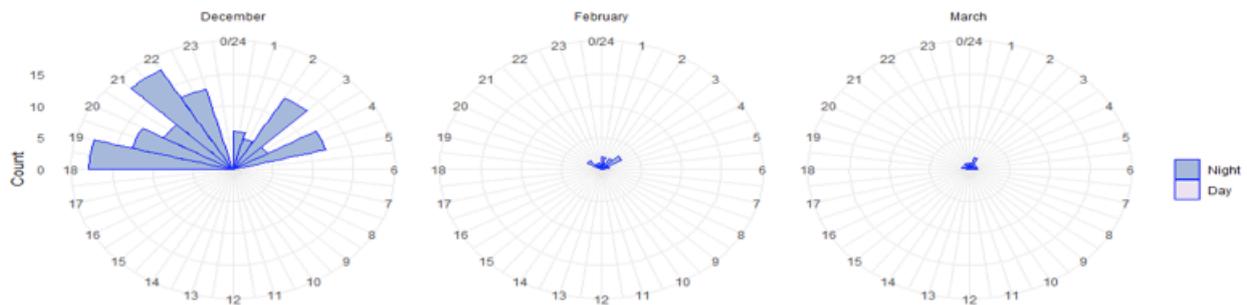


Figure 1. Frequency of camera-trap photographs and videographs of Large Indian Civet during survey period (1800–0500 h has been treated as night while the rest is day).

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