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SHORT COMMUNICATION

SMALL CARNIVORES OF WAYANAD WILDLIFE SANCTUARY, THE SOUTHERN WESTERN GHATS, INDIA

E.R. Sreekumar & P.O. Nameer

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SMALL CARNIVORES OF WAYANAD WILDLIFE SANCTUARY, THE SOUTHERN WESTERN GHATS, INDIA

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Abstract: The small carnivores of Wayanad Wildlife Sanctuary were surveyed using camera traps. The study was conducted between November 2016 and February 2017 at 111 camera trap locations. Twenty-five mammal species were recorded, including nine small carnivores from the Mustelidae, Viverridae, Herpestidae and Felidae families. Species included the Asian Small-clawed Otter *Aonyx cinereus*, Brown Palm Civet *Paradoxurus jerdoni*, Common Palm Civet *Paradoxurus hermaphroditus*, Small Indian Civet *Viverricula indica*, Indian Grey Mongoose *Herpestes edwardsii*, Ruddy Mongoose *Herpestes smithii*, Stripe-necked Mongoose *Herpestes vitticollis*, Jungle Cat *Felis chaus* and Leopard Cat *Prionailurus bengalensis*. The most common small carnivore was *Viverricula indica*, followed by *Herpestes vitticollis* and *Paradoxurus hermaphroditus*. Time activity patterns revealed that the viverrids were nocturnal while the herpestids were diurnal. The sanctuary supports one endemic species of small carnivore, *Paradoxurus jerdoni*, and one threatened species, *Aonyx cinereus*, which is *Vulnerable* according to the IUCN Red List of Threatened Species. This documentation highlights the biodiversity significance of Wayanad Wildlife Sanctuary and the Nilgiri mountain range in the Western Ghats.

Keywords: Endemism, Felidae, Herpestidae, IUCN Red List, Mustelidae, Nilgiri Biosphere Reserve, protected area, threatened, Viverridae.

Small carnivores (Order Carnivora) of the Western Ghats belong to the families Mustelidae, Viverridae, Herpestidae and Felidae. Of the 194 species reported

worldwide (Wilson & Mittermeier 2009), 41 are known from India (Mudappa 2013; Menon 2014; Nameer 2015a) and 14 occur in the Western Ghats, with 13 found in the state of Kerala (Nameer 2015b).

Previous studies have reported the occurrence of small carnivores in Kalakad-Mundanthurai Tiger Reserve (Mudappa 2002), Indira Gandhi Wildlife Sanctuary (Kumar et al. 2002), Biligiri Rangaswamy Temple Tiger Reserve (Kumara et al. 2014), Parambikulam Tiger Reserve (Sreehari & Nameer 2016) and Eravikulam National Park (Nikhil & Nameer 2017) in the Western Ghats. Ecological studies have been reported for the Brown Palm Civet (Rajamani et al. 2002), Smooth-coated Otter (Anoop & Hussain 2004, 2005) and Asian Small-clawed Otter (Perinchery et al. 2011), as well as the responses of small carnivores to rainforest fragmentation (Mudappa et al. 2007).

MATERIALS AND METHODS

Study Area

The Wayanad Wildlife Sanctuary (Wayanad WS) is situated in the southern Western Ghats of Kerala

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Competing interests: The authors declare no competing interests.

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(11.58–12.00°N & 76.03–76.45°E) (Fig. 1) and has an extent of 344.44km². The sanctuary is contiguous with Nagarhole National Park and Bandipur Tiger Reserve in Karnataka to the north-east and Mudumalai Wildlife Sanctuary in Tamil Nadu to the south-east. It is also contiguous with the southern Wayanad and northern Wayanad forest divisions. The major vegetation types of the study area include southern moist mixed deciduous forest (3B/C2), southern dry mixed deciduous forest (5A/C3) and plantations of eucalypts, teak, bombax and *Gmelina arborea*. The Wayanad WS lies at a plateau, with an average altitude of 900m, with the highest peak at Karottimala (1,158m) (Sunilkumar 2012).

METHODS

The study was carried out between November 2016 and February 2017. Camera trapping was performed with digital cameras with infra-red sensors for heat and motion detection (Model: Cuddeback Attack C1). The camera traps were deployed at 111 stations (Fig. 2) in the sanctuary at locations chosen from evidence of animal activity such as scats and pug marks (Mudappa et al. 2007). The camera traps were set 30–40 cm above ground and situated at least 150m apart. The cameras were set in default mode with the time-delay as fast as possible between pictures during day hours, and five seconds between pictures during night. Camera trap locations were marked using a Garmin GPS etrex30. The cameras were activated 24 hours a day for 10–20 days at

each station, for a total of 46,368 trapping hours (Table 1).

RESULTS AND DISCUSSION

A total of 3,790 images of 25 species of mammals were obtained during the study period. Of these, carnivores accounted for 350 images, with approximately a third being of small carnivores (Fig. 3). The nine species recorded (Table 2), in order of frequency detected, were: Small Indian Civet (34.6%), Stripe-necked Mongoose (29.3%), Common Palm Civet (11.3%), Ruddy Mongoose (8.3%), Brown Palm Civet (7.6%), Indian Grey Mongoose (3.8%), Leopard Cat (2.3%), Asian Small-clawed Otter (2.3%) and Jungle Cat (0.8%) (Fig. 4).

Table 1. Camera trap effort in the study locations of Wayanad Wildlife Sanctuary

Study Location	Camera-trap Effort	
	Days	Hours
Kurichiat	294	7056
Muthanga – I	440	10560
Muthanga – II	462	11088
Sulthan Bathery	460	11040
Tholpetty	276	6624
Total	1932	46368

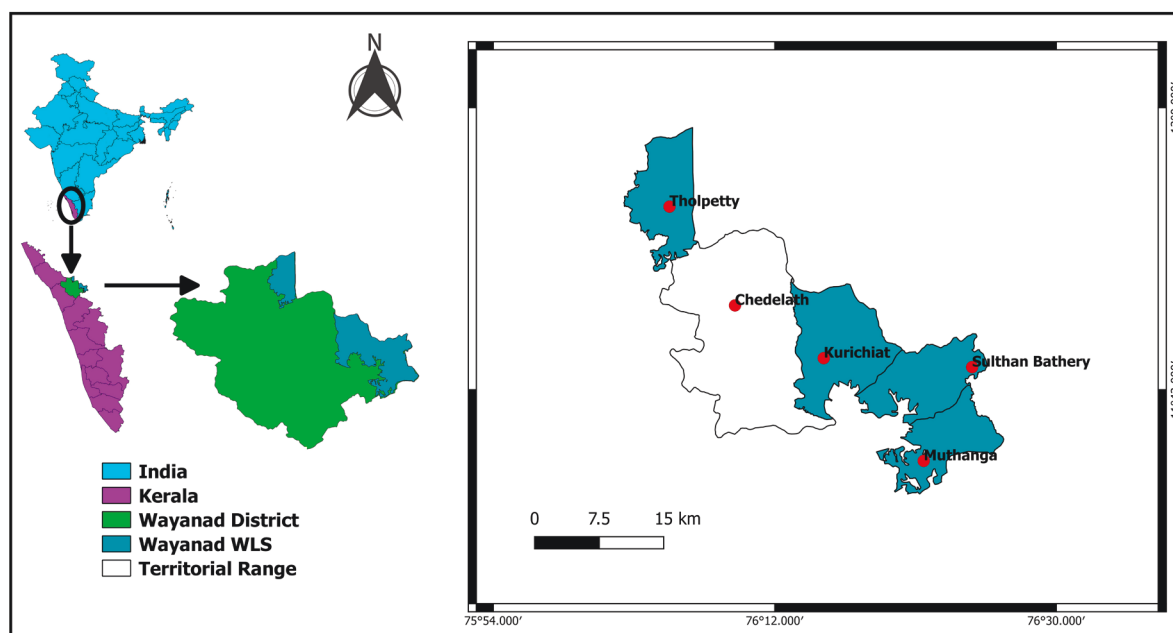


Figure 1. Location map of Wayanad Wildlife Sanctuary

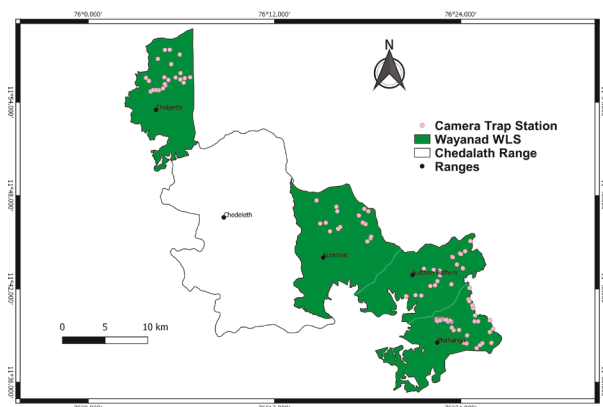


Figure 2. Camera trap stations in different study locations of Wayanad Wildlife Sanctuary

Species Account of Small Carnivores in Wayanad Wildlife Sanctuary

Asian Small-clawed Otter *Aonyx cinereus*: Of the 13 extant species of otters distributed worldwide, the Asian Small-clawed Otter is the smallest (Hussain et al. 2011), rarely weighing more than 5kg. In India the Asian Small-clawed Otter is reported to occur in the north in the Himalayan foothills of Himachal Pradesh, West Bengal and Assam, and in the south in the higher ranges of the hills in Coorg (Karnataka), Ashambu, Nilgiri and Palani hills (Tamil Nadu) and Kerala (Pocock 1941; Prater 1971; Hussain 1999; Menon 2014). The only earlier confirmed record of Asian Small-clawed Otter from Kerala was from Eravikulam National Park (Nikhil & Nameer 2017; Perincheri et al. 2011). Thus the present sighting from Wayanad Wildlife Sanctuary is an additional sight record of this species from Kerala. Three individuals of *Aonyx cinereus* were spotted in the camera traps at 11.77°N & 76.25°E longitude (Image 1). Recently, this species was also reported from Maharashtra and Goa in the northern Western Ghats (Punjabi et al. 2014).

Brown Palm Civet *Paradoxurus jerdoni*: Brown Palm Civet is endemic to the Western Ghats and it is common at high altitudes (Mudappa 1998). The species has been recorded from Nilgiris, Anamalais, Coorg (Schreiber 1989), Silent Valley National Park (Ramachandran 1990), Kakachi-Upper Kodayar (Ganesh 1997), Kalakkad-Mundanthurai Tiger reserve (Ganesh 1997; Mudappa 1998, 2002), Parambikulam Tiger Reserve (Sreehari & Nameer 2016), and Eravikulam National Park (Nikhil & Nameer 2017). Rajamani et al. (2002) recorded the Brown Palm Civet from 12 different locations from the southern Western Ghats, including three locations in Kerala—Achankovil Reserve Forests, Chalakudy Reserve Forests and Vazhachal Reserve (Malakkappara) Forests.

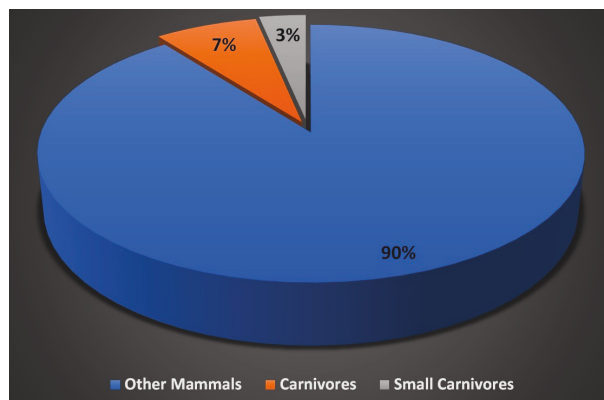


Figure 3. Relative abundance of mammals in Wayanad Wildlife Sanctuary

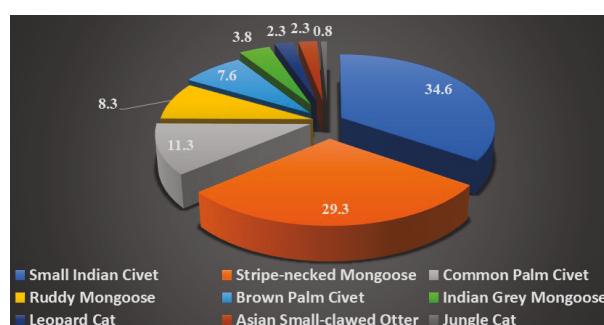


Figure 4. Relative abundance of small carnivores in Wayanad Wildlife Sanctuary

Ten individuals of *Paradoxurus jerdoni* (Image 4) were recorded during the present study from Wayanad WS (Fig. 7).

Ruddy Mongoose *Herpestes smithii*: Ruddy Mongoose is a widespread species distributed in peninsular India, from the state of Rajasthan in the west to Bihar in the east, and in Sri Lanka (Phillips 1984; Gilchrist et al. 2009; Dookia 2013; Mudappa 2013). It is, however, an uncommon species in Kerala, and is known only from Parambikulam Tiger Reserve and Chinnar Wildlife Sanctuary (Sreehari et al. 2013; Sreehari & Nameer 2016). During the present study 10 images were recorded (Image 6) and all were from the natural forest in Wayanad WS (Fig. 8).

Leopard Cat *Prionailurus bengalensis*: Leopard Cat is, perhaps, the most widespread species of small Asian felids, that is distributed from southern India to the Russian Far East. They are also found in a variety of habitats from rainforests to coastal islands to dry coniferous forests in the Himalayas up to an altitude of 3,000m (Sunkist & Sunkist 2009). In southern India, however, it is known primarily from forested habitats, mostly away from human habitations. *Prionailurus*

Table 2. Small carnivores recorded from Wayanad Wildlife Sanctuary

Species	Scientific name	Family	Image number	Distribution map (Figure number)
Asian Small-clawed Otter	<i>Aonyx cinereus</i>	Mustelidae	1	
Small Indian Civet	<i>Viverricula indica</i>	Viverridae	2	5
Common Palm Civet	<i>Paradoxurus hermaphroditus</i>	Viverridae	3	6
Brown Palm Civet	<i>Paradoxurus jerdoni</i>	Viverridae	4	7
Indian Grey Mongoose	<i>Herpestes edwardsii</i>	Herpestidae	5	
Ruddy Mongoose	<i>Herpestes smithii</i>	Herpestidae	6	8
Stripe-necked Mongoose	<i>Herpestes vitticollis</i>	Herpestidae	7	9
Jungle Cat	<i>Felis chaus</i>	Felidae	8	
Leopard Cat	<i>Prionailurus bengalensis</i>	Felidae	9	10



Image 1. Asian Small-clawed Otter *Aonyx cinereus*.
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Image 2. Small Indian Civet *Viverricula Indica*.
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Image 3. Common Palm Civet *Paradoxurus hermaphroditus*.
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Image 4. Brown Palm Civet *Paradoxurus jerdoni*.
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bengalensis has been reported from Peppara WS (Jayson & Christopher 1996), Kalakad-Mundanthurai Tiger Reserve (Mudappa 2002), Biligiri Rangaswamy Tiger Reserve (Kumara et al. 2014), Parambikulam Tiger Reserve (Sreehari & Nameer 2016) and Eravikulam National Park (Nikhil & Nameer 2017). During the current study, three images of *P. bengalensis* (Image 9)

were recorded from the Wayanad WS (Fig. 10).

Time activity pattern of small carnivores of Wayanad Wildlife Sanctuary

Time activity patterns were analysed for the few species of viverrids as well as herpestids including *Viverricula indica*, *Paradoxurus jerdoni*, *P.*

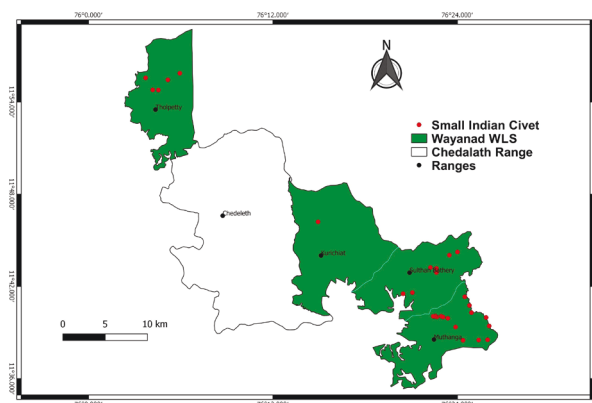


Figure 5. Distribution of Small Indian Civet in Wayanad Wildlife Sanctuary

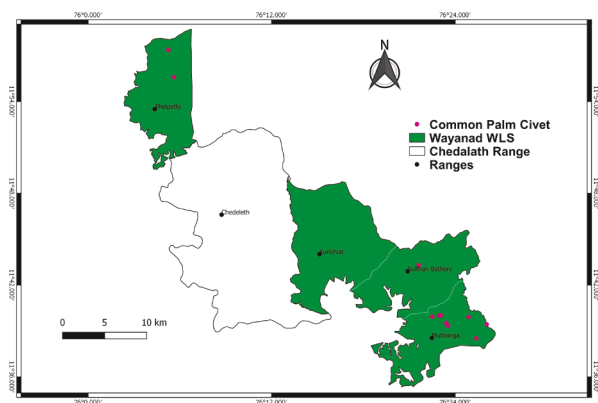


Figure 6. Distribution of Common Palm Civet in Wayanad Wildlife Sanctuary

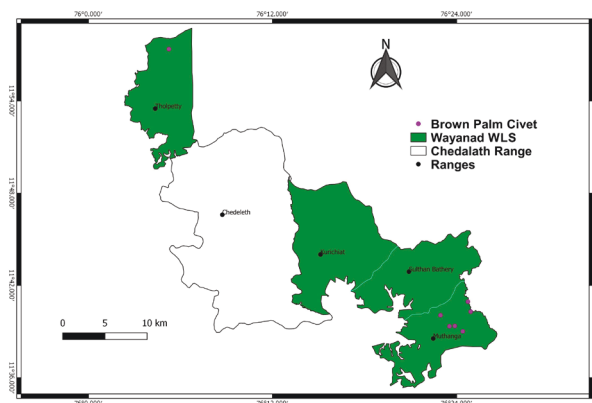


Figure 7. Distribution of Brown Palm Civet in Wayanad Wildlife Sanctuary

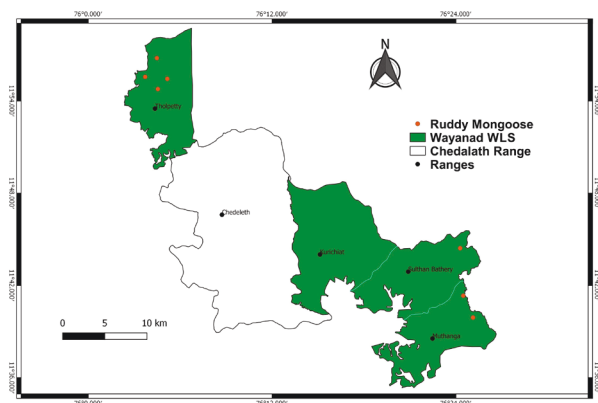


Figure 8. Distribution of Ruddy Mongoose in Wayanad Wildlife Sanctuary

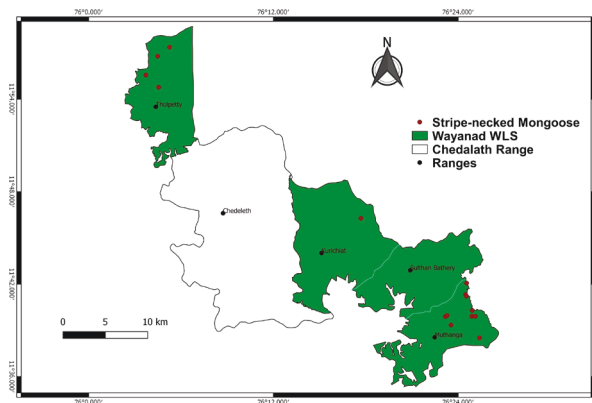


Figure 9. Distribution of Stripe-necked Mongoose in Wayanad Wildlife Sanctuary

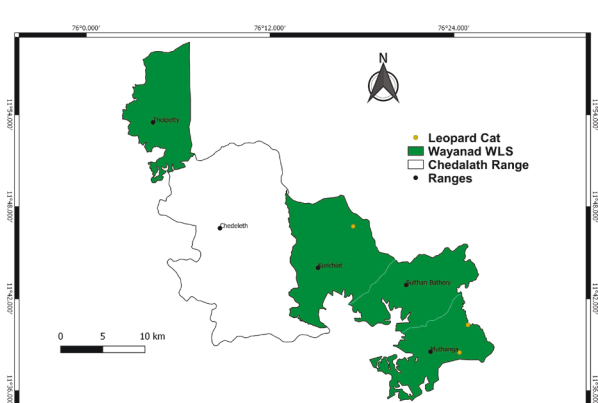


Figure 10. Distribution of Leopard Cat in Wayanad Wildlife Sanctuary.

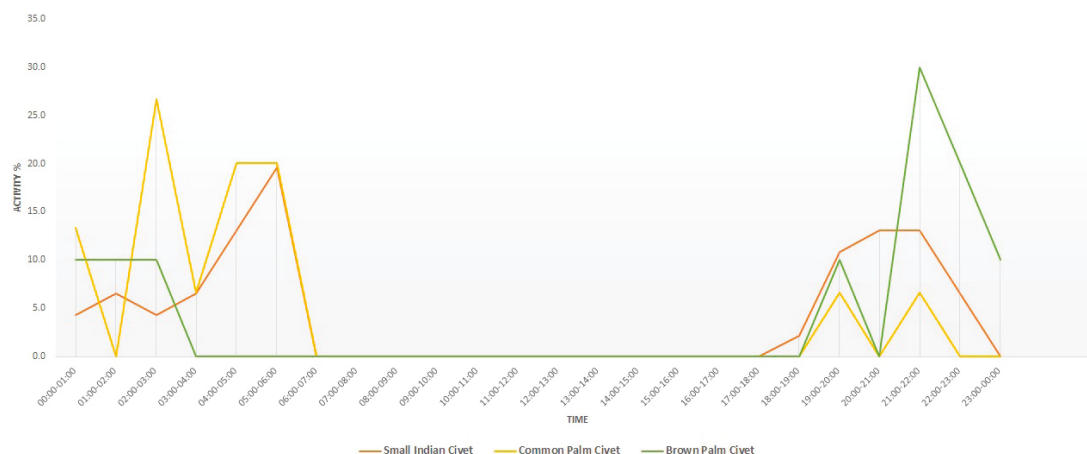


Figure 11. Time activity pattern of viverrids in Wayanad Wildlife Sanctuary

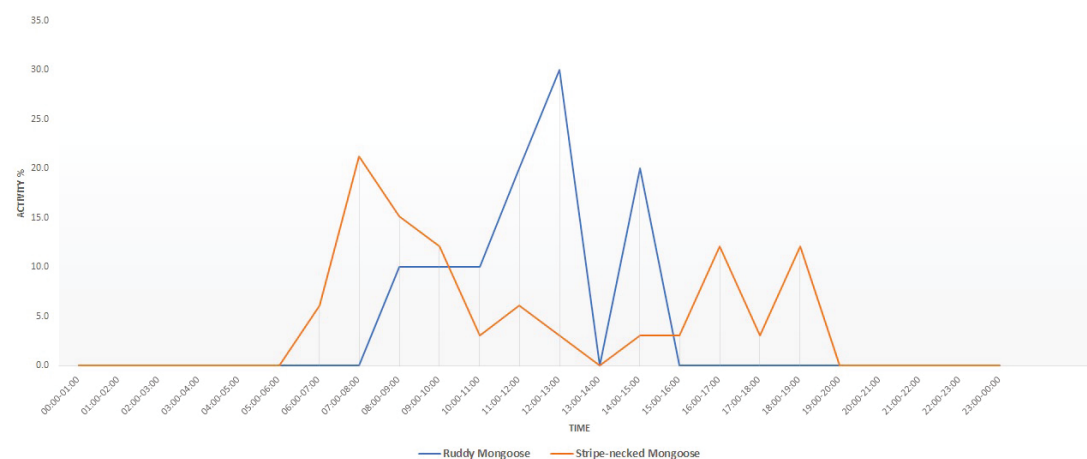


Figure 12. Time activity pattern of herpestids in Wayanad Wildlife Sanctuary

hermaphroditus, *Herpestes smithii* and *H. vitticollis*. A total of 114 images were used for this analysis.

The activity pattern of viverrids are given in Fig. 11. All three viverrids were active only during night hours between 18:00–06:00 hr. *Viverricula indica* showed a bimodal activity pattern, with greater activity during early morning hours (05:00–06:00 hr). *P. hermaphroditus* showed multiple peak activities, with at least three peaks in the post mid-night periods (01:00hr, 03:00hr and 05:00hr) and its activity was lower in the pre-midnight hours. *P. jerdoni* however, has peak activity during the pre-midnight hours (21:00hr). Another interesting pattern that was observed was the mutual exclusion of the activity timing between the two *Paradoxurus* species (Fig. 11).

Time activity pattern of *Herpestes smithii* and *H. vitticollis* are shown in Fig. 12. Unlike the viverrids, the herpestids showed a diurnal activity pattern. Of

two species of mongoose, the Ruddy Mongoose can be considered a strictly diurnal species that is active between 07:00hr and 16:00hr, with the peak activity at mid-day. For Stripe-necked Mongoose activity commenced by 06:00hr and extended up to 20:00hr, peaking from 07:00–08:00 hr. Thus competition between these species appears to be limited by different temporal modes of activity.

CONCLUSION

There is heavy pressure on the Wayanad Wildlife Sanctuary from several factors, including people with domestic animals residing within and near the sanctuary that depend on its natural resources. This often leads to human-wildlife conflicts. Another major problem is habitat fragmentation and degradation, which is further intensified due to the infestation of exotic weeds such as *Lantana camara*, *Chromolaena odorata*



Image 5. Indian Grey Mongoose *Herpestes edwardsii*.
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Image 6. Ruddy Mongoose *Herpestes smithii*.
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Image 7. Stripe-necked Mongoose *Herpestes vitticollis*.
© E.R. Sreekumar & P.O. Nameer



Image 8. Jungle Cat *Felis chaus*. © E.R. Sreekumar & P.O. Nameer



Image 9. Leopard Cat *Prionailurus bengalensis*.
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and *Senna spectabilis*. Considerable areas (24.4%) of the natural forest have also been converted to teak and eucalyptus plantations. In spite of these conservation challenges, the Wayanad WS supports nine species of small carnivore, including the Western Ghats endemic *Paradoxurus jerdoni*, and the Vulnerable species *Aonyx cinereus*. The present study highlights the significance

of the Wayanad WS as a prime habitat for conservation of small carnivores.

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Articles

On the reproductive ecology of *Premna latifolia* L. and *Premna tomentosa* Willd. (Lamiaceae)

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Stream macro-invertebrate diversity of the Phobjikha Valley, Bhutan

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