Survey and activity patterns of nocturnal mammals in a fragmented dry deciduous forest of Karnataka

Article · March 2007

DOI: 10.11609/JoTT.ZPJ.1576.2644-7

2 authors:

Chetan H.C
The Institute of Trans-Disciplinary Health Scien…
12 PUBLICATIONS **19** CITATIONS
SEE PROFILE

Ganesh Tg
Ashoka Trust for Research in Ecology and the E…
51 PUBLICATIONS **452** CITATIONS
SEE PROFILE

SURVEY AND ACTIVITY PATTERNS OF NOCTURNAL MAMMALS IN A FRAGMENTED DRY DECIDUOUS FOREST OF KARNATAKA

H.C. Chetana [1] and T. Ganesh [2]

[1,2] Ashoka Trust for Research in Ecology and the Environment, #659, 5th Main Road, Hebbal, Bengaluru, Karnataka 560024, India
Email: [1] chetan@atree.org

plus web supplement of 2 pages

Abstract

We used camera traps to record the presence and activity of nocturnal mammals in the Savandurga state forest, Karnataka during the monsoon and winter seasons. We recorded six species of mammals at the traps over the two seasons. These included among others the Sloth Bear, Leopard, Indian Gerbille and Common Palm Civet. Nocturnal activity was more in winter than in monsoon. There is a high level of human disturbance in the area that appears to influence the activity of animals.

Keywords

Activity period, anthropogenic factors, camera trap, dry deciduous forest, nocturnal mammals

Large diurnal mammals have been a focus of most ecological studies since their presence is easy to establish and their abundances can be estimated by standard protocols (Karanth & Nichols, 1998, 2002). On the other hand, small mammals are difficult to locate and their presence are hard to detect to derive any meaningful estimate of their abundance (Webbon *et al*., 2004). Camera traps are often used to get some estimates of these (Nichols & Conroy, 1996). There have however been a few studies to estimate nocturnal small mammal abundance using camera traps in India (Mudappa, 1998) and none from isolated forest patches. In southern Karnataka there are several fragmented forests that may harbour nocturnal mammal species, but they have not been documented.

Activity periods of animals in the wild reveal interesting patterns of resource used by them. Such information is important to identify the basic ecological requirements of the species such as food, habitat, breeding, territoriality and predation pressure. Feeding activity periods are also influenced by anthropogenic factors that strongly affect animal movements and can make animals switch their feeding activity patterns from the normal mode (Bentley *et al*., 2000). Much work has been done on activity periods of large diurnal mammals (Van Schaik & Griffiths, 1996; Karanth & Nichols, 1998; Yasuda, 2004; Srbek-Araujo & Chiarello, 2005), but the smaller, especially nocturnal animals are poorly known and only anecdotal information exists (Jayakar & Spurway, 1968; Yin, 1979; Singh, 1982; Acharjyo & Patnaik, 1987; Ayyadurai, *et al*., 1987; Rozhnov & Rutovskaya, 1996; Ganesh, 1997). Most of the activities of these animals have been observed under captive conditions (Acharjyo & Tripathy, 1974; Acharjyo & Mohapatra, 1978; Price, 1984; Jhala, 1997).

In this paper we focus on three objectives, namely, (i) to record the diversity of nocturnal mammals using camera traps, (ii) to compare the nocturnal activity of selected species during monsoon and winter seasons, and (iii) to determine the impact of human disturbance on animal activity.

Study Area

The study was carried out in Savandurga state forest of Karnataka (12°55'08"N-77°18'11"E), situated approximately 60km from Bengaluru (known popularly as Bangalore) near Magadi town (Fig. 1). The forest covers an area of about 27km^2. The natural vegetation of the forest is dry and moist deciduous type with scrub, grass and rocks covering a large extent of the south eastern and northern portions (Murali *et al*., 2003). Fifteen villages with a total human population of around 6600 surround the forest. One major village and a few small settlements are within the state forest totalling about 67 people (Census of India, 2001). There are a considerable number of pilgrims visiting a temple within the forest, almost on a daily basis. Common mammal species known from this place include the Sloth Bear and Leopard. Other large carnivores such as Tiger, and large herbivores like Elephants, Gaur and Sambar are now locally extinct (pers. comm. by local people).

Material and Methods

Camera trapping

Camera trapping can provide unbiased information on activity periods, assuming that animals are equally likely to use trails at different times of the day or night. We used two remote camera traps with built-in infrared motion sensor, a built–in flash, and a data pack that stamped each photograph with the time of the event (Sensor Camera developed at CEDT, IISc, Bengaluru). The cameras used print film; power for the sensors were supplied by 9v DC power source, while the cameras used 1.5v AA size batteries. The cameras were positioned on tree trunks 20-45cm from the forest floor, wrapped tightly with a belt and locked by a chain for safety purpose. These were placed along trails or along edges of small streams that were frequented by animals, based on pugmarks, and scats. We also used banana and dry fish as baits to lure animals already on the trails closer towards the traps. Overall 10 trapping stations were identified based on footprints and scats. These were at least 100m apart. The cameras were in operation from 1800 to 0600hr. Cameras were removed after that and no sampling was done during the day because of heavy human activity for fear of cameras being vandalized or stolen. Also, as the objective was to capture mainly nocturnal mammals, it was not considered necessary to leave the traps in position during the day. Cameras were set up in default mode with a delay of 05 seconds between pictures. Locations where cameras were installed were recorded with a Garmin GPS (global positioning system). The sampling was done for a total of 21 traps nights in August-September 2004 during the monsoons, and again for a total of 10 trap nights in January 2005 during the winter. The sampling effort could not be similar in both seasons because of logistic and project constraints. However, to compensate for any difference that may arise due to unequal sampling we did a simulation by randomly picking 10 trap nights from the monsoon sampling and comparing with winter. Fifty such simulations were done and there was no difference between

Manuscript 1576; © ZOO; Date of publication 21 March 2007
Received 09 June 2006; Revised received 08 November 2006;
Finally accepted 01 February 2007

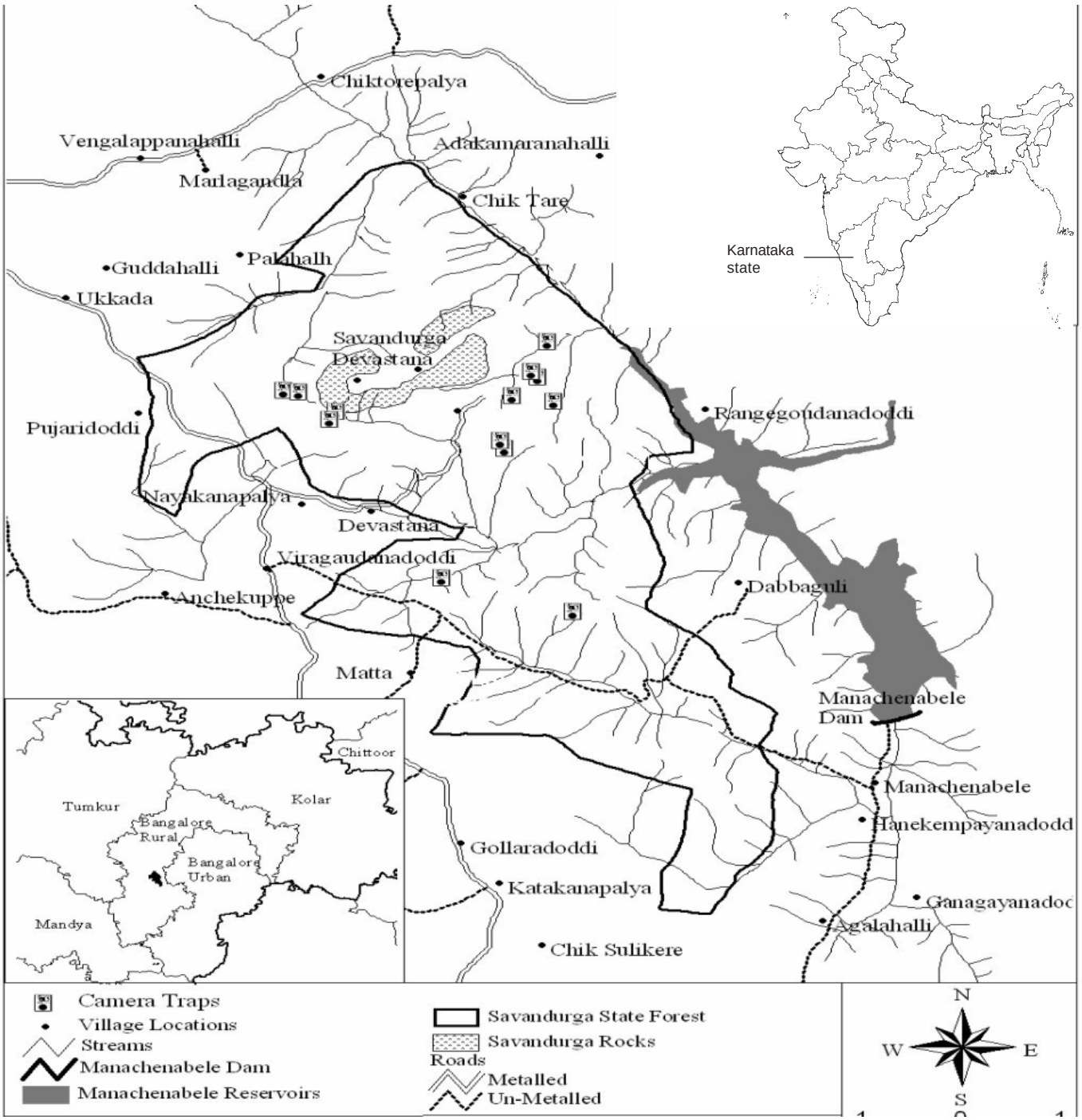

Figure 1. Camera trap sites in Savanadurga state forest

using 21 trap nights and 10 trap nights data, when compared with the winter sampling.

We also visually estimated canopy cover, ground cover and tree height in 10x10m plot laid at each of the camera trapping stations. Disturbance effects was recognised by direct observation of cattle, fire, lopping and poaching activity by humans and also by indirect evidence of cut stems, burnt wood, livestock dung, baits set to trap animals etc.

Questionnaire survey

We conducted a survey in the villages within and around the forest to determine their use of the forest and in particular their reasons for venturing into the forest. We sampled 41 individuals from 10 villages (Appendix 1[w]).

Species identification

After the film was developed, the photographs were examined for

[w] See Appendix 1 on the web at www.zoosprint.org

images of animals. Species were identified with the help of Prater (1971) and Menon (2003) and the time and date of every photograph was recorded.

Data Analysis

Capture rate

Capture rate per hour was calculated as follows:

$$C = T / (D \times H)$$

where: C = Capture rate per hour.
T = Total number of captured individuals of a species.
D = Total number of trap nights.
H = No of hours of trapping.

The species were identified from the photos in which time and date were also printed. We also categorized the data into one-hour intervals to plot activity of the species across the sampling time.

Results and Discussion

The camera trap sampling was done for a total of 372hr, of which 252hr were during the monsoon and 120hr in winter. Six species of mammals were recorded during the sampling including one record of Leopard and two records of Sloth Bears. The most common species recorded were the Indian Gerbil and the Common Palm Civet.

Seasonal activity

Of the six species encountered using camera traps three were common to both seasons (Table 1). The capture rates of species were higher in winter than in monsoon for the civet, gerbil and wild boar. This may be due to food shortages in the forest in winter and it is natural for frugivores to frequent any available resources especially easily available fruit baits. During monsoon, Sloth Bear scats were observed regularly along forest trails. This mostly contained *Lantana camara* seeds, but in winter bear scats were completely absent and no event was recorded by camera traps. Interviews with people showed higher incidence of bear sightings outside the forest in farmlands during post monsoon time, usually in search of groundnuts. Similarly the Leopard probably subsists on Wild Boar and other smaller prey but also prefers domestic dogs and livestock in the surrounding villages, as the prey base is low within the forest.

There was a distinct difference in activity patterns between the two seasons. In the monsoons activity was restricted between 18.00 & 22.00hr and again between 0300 and 0500hr (Fig. 2). In winter the activity was noticed throughout the night (Fig. 3). Most of these activities pertain to the Indian Gerbil and the Common Palm Civet. The gerbil and civet were active early in the night during the monsoons, but in winter the gerbil was active all through the night and the civet only in the mornings. It is possible that dearth of food in the forest could attract greater activity at a bait and may be a reason for this continuous activity in winter (Bullock *et al.*, 1995).

Table 1. Camera trapping record species captured per day in different seasons

Common name	Scientific name	Monsoon Capture rate / Hour	Winter Capture rate / Hour
Indian Hare	*Lepus nigricollis* F. Cuvier	0	0.00064
Common Palm Civet	*Paradoxurus hermaphroditus* (Pallas)	0.00096	0.00512
Wild Boar	*Sus scrofa* Linnaeus	0.00064	0.00064
Indian Gerbil	*Tatera indica* (Hardwicke)	0.00256	0.01859
Sloth Bear	*Melursus ursinus* (Shaw)	0.00032	0
Leopard	*Panthera pardus* (Linnaeus)	0.00032	0

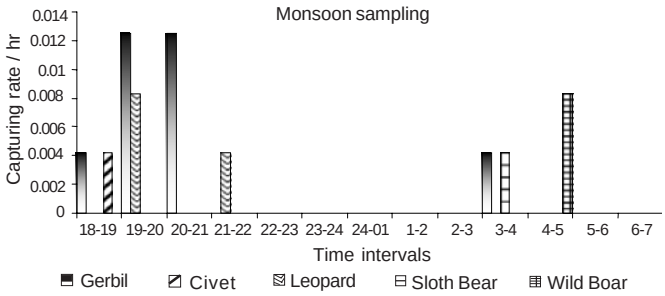

Figure 2. Monsoon capturing rate per hour by using camera trap methods

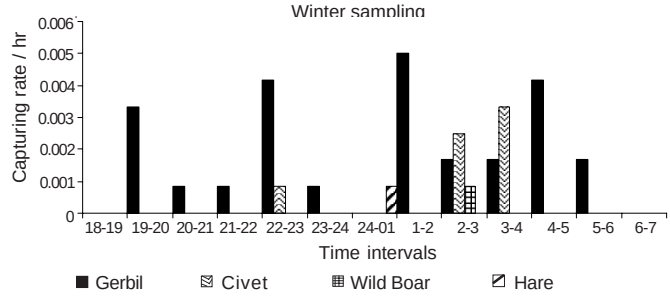

Figure 3. Winter capturing rate per hour by using camera trap methods

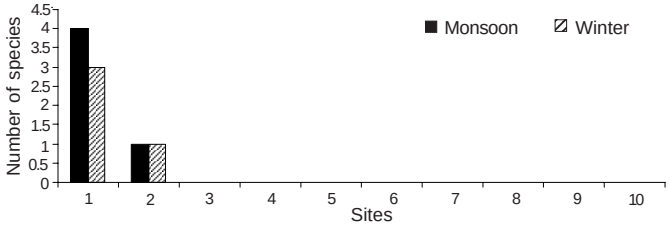

Figure 4. Occurrence of species across the different sites

Spatial distribution

A total of 10 different sites were sampled in this study both during monsoon and winter. These were individually sampled over the seasons. Most of the species and individuals were recorded in one site only and rarely in two locations. This was true for both the seasons (Fig. 4). Scat and pugmark data also indicate most animal occurrences close to these two sites in both seasons. One of the reasons for concentration of animal populations at these sites could be the availability of good forest cover and water availability in one site, while the other site had, in addition to cover and water, caves and other shelters among the rock outcrops which were used as diurnal resting places by the animals, which usually remained undisturbed. Other factors such as grazing, fire and human activity, which were lower in these two sites, could also have restricted animal presence to these sites (Table 2).

Anthropogenic disturbance

The forests are heavily used to collect non-timber forest produce (NTFPs), fuel wood and for grazing. These activities start early in the

Table 2. Overall characteristics of different camera trap sites in the Savandurga state forest (based on questionnaire and visual observation)

Sites	1	2	3	4	5	6	7	8	9	10
Canopy cover (>70%)	+	+	+	-	-	-	+	-	-	+
Rocky	+	+	+	+		+		+	+	
Tree height (>5m)	+	+	+	+		+	-	-	-	+
Ground cover	+	+	+	+	+	+	+	+	+	+
Presence of stream	+	+	+			+			+	+
Disturbance										
Grazing	-	-	+	+	+	-	+	+	+	+
Fire			+	+	+					
Human activity (tree cutting, poaching)	-	-	+	-	+	+	+	+	+	+
Wild animal scats	+	+	+	-	-	-	-	-	-	-

+ Presence; - Absent

morning and last up to 1900hr. Grazing by cattle and goats is intense. Our questionnaire and personal encounters also revealed that poaching is a major activity of a select group of people. Guns and indigenous traps are used to catch animals. Wild Boar and Jungle Fowl are regularly poached apart form other species that can be caught opportunistically such as mongoose, hare, civet etc. both during the day and night. During monsoon most people hunt during the day (85%), and few at night (32%) but during winter poaching occurs both by day and early night. Once abundant diurnal mammals such as Sambar and Chital are now locally extinct (pers. comm. by local people). Wild boar numbers have decreased and will likely be extinct soon due to incessant hunting. The fate of other nocturnal mammals is not known as there is little in terms of baseline data on animal populations from this area. The village population has increased and they still depend on the forest for grazing, fuel wood, NTFP collection and poaching. To facilitate this almost all parts of the forests are burnt leading to canopy opening and extensive spread of exotic species.

The Savandurga forest is a major catchments for the Manchenbelle dam on the Arkavathi river and conserving this forest is important for sustenance of local livelihoods in the region. Temple and rock climbing tourism are gaining popularity here which brings in additional pressure on the forest. These need to be regulated and local people should benefit from these activities.

References

Acharjyo, L.N. and A.P. Tripathy (1974). A note on body colourband breeding habits in captivity of Common Palm Civet (*Paradoxurus hermaphroditus*) of Orissa. *Journal of the Bombay Natural History Society* 71: 601-603.

Acharjyo, L.N. and S. Mohapatra (1978). Birth and growth of Common Palm Civet (*Paradoxurus hermaphroditus*) in captivity. *Journal of the Bombay Natural History Society* 75: 204-206.

Acharjyo, L.N. and S.K. Patnaik (1987). Occurrence of Large Indian Civet (*Viverra zibetha*) in Orissa. *Journal of the Bombay Natural History Society* 201-202.

Ayyadurai, M., V. Natarajan, P. Balasubramanian & S.A. Rajan (1987). A note on the food of the Small Indian Civet (*Viverricula indica*) at Point Calimere Wildlife Sanctuary, Tamil Nadu. *Journal of the Bombay Natural History Society* 84(1): 203.

Bentley, J.M., C.P. Catterali & C.S. Geoffrey (2000). Effects of fragmentation of Araucarian vine forest on small mammal communities. *Conservation Biology* 14: 1075-1087.

Bullock, S.H., H.A. Mooney & E. Medina (1995). *Seasonally Dry Tropical Forest.* Cambridge University Press, 450pp.

Census Info India (2001). Version 1, CD *document-Karnataka* Villages and Town wise CD Office of the Registrar General, India.

Ganesh, T. (1997). Occurrence of the Brown Palm Civet in the wet forest Kalakad-Mundanthurai Tiger Reserve, Tamil Nadu. *Journal of the Bombay Natural History Society* 94: 556.

Jayakar, S.D. & H. Spurway (1968). Notes on the Common Palm Civet or Toddy Cat *Paradoxurus hermaphroditus* (Pallas), with special reference to the age at shedding of the milk teeth. *Journal of the Bombay Natural History Society* 65: 211-213.

Jhala, Y.V. (1997). Seasonal effects on the nutritional ecology of Black Buck *Antelope cervicapra*. *Journal of Applied Ecology* 34: 1348-1358.

Karanth, K.U. & J.D. Nichols (1998). Estimation of tiger densities in India using photographic captures and recaptures. *Ecology* 79: 2852-2862.

Karanth, K.U. & J.D. Nichols (2002). *Monitoring Tigers and their Prey: A Manual for Researchers, Managers, and Conservationists in Tropical Asia.* Centre for Wildlife Studies, Bangalore, India, 193pp.

Mudappa, D. (1998). Use of camera-traps to survey small carnivores in the tropical rainforest of Kalakad-Mundanthurai Tiger Reserve, India. *Small Carnivore Conservation* 18: 9-11.

Menon, V. (2003). *A Field Guide to Indian Mammals.* Dorling Kindersley (India) Pvt. Limited, India, 200pp.

Murali, K.S., A. Kavitha & R.P. Harish (2003). Spatial patterns of tree and shrub species diversity in Savandurga state forest, Karnataka, *Current Science* 84: 808-813.

Nichols, J.D. & M.J. Conroy (1996). Techniques for estimating abundance and species richness. pp.177-234. In: Wilson, D.E., F.R. Cole, J.D. Nichols, R. Rudran and M.S. Foster (eds.). *Measuring and Monitoring Biological Diversity: Standard Methods for Mammals.* Smithsonian Institution Press, Washington, D.C.

Prater, S.H. (1971). *The Book of Indian Animals.* Bombay Natural History Society & Oxford University Press, Bombay, 324pp.

Price, E.O. (1984). Behavioral aspects of animal domestication. *The Quarterly Review of Biology* 59:1-32

Rozhnov, V.V. & M.V. Rutovskaya (1996). Vocalizations of the Common Palm Civet (*Paradoxurus hermaphroditus*) during mating. *Lutreola* 6: 6-9.

Singh, L.A.K. (1982). Stomach contents of a Common Palm Civet, *Paradoxurus hermaphroditus* (pallas). *Journal of the Bombay Natural History Society* 79: 403-404.

Srbek-Araujo, A.C. & A.G Chiarello (2005). Is camera-trapping an efficient method for surveying mammals in Neotropical forests?. A case study in southeastern Brazil. *Journal of Tropical Ecology* 21: 1-5.

Van Schaik, C.P. & M. Griffiths (1996). Activity periods of Indonesian rain forest mammals. *Biotropica* 28(1): 105-112.

Webbon, C.C., J.P. Baker & S. Harris (2004). Faecal density counts for monitoring changes in Red Fox numbers in rural Britain. *Ecology* 41: 768-779.

Yasuda, M. (2004). Monitoring diversity and abundance of mammals with camera traps: a case study on Mount Tsukuba, central Japan. *Mammal Study* 29: 37-46.

Yin, T. (1979). Occurrence of civets in the city of Rangoon (Burma). *Journal of the Bombay Natural History Society* 76: 359-360.

Acknowledgements

We thank the Karnataka Forest Department for giving permission to the work in Savandurga as part of the JBIC project. We would like to thanks CEDT, IISc, Bangalore for letting us hire their camera traps and two anonymous reviewers and their valuable comments. We are also grateful to the staff of the forest department, field assistants and local people for their cooperation.