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SHORT COMMUNICATION

A THREAT ASSESSMENT OF THREE-STRIPED PALM SQUIRREL *FUNAMBULUS PALMARUM* (MAMMALIA: RODENTIA: SCIURIDAE) FROM ROADKILLS IN SIGUR PLATEAU, MUDUMALAI TIGER RESERVE, TAMIL NADU, INDIA

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Jabamalainathan Leonaprinacy

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A threat assessment of Three-striped Palm Squirrel *Funambulus palmarum* (Mammalia: Rodentia: Sciuridae) from roadkills in Sigur Plateau, Mudumalai Tiger Reserve, Tamil Nadu, India

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Abstract: This study was undertaken to assess the threat from road kills for three-striped palm squirrels in the tropical forest of Sigur plateau, Mudumalai Tiger Reserve, Tamil Nadu, and Southern India from January 2014 to December 2016. Road kills were recorded along the Udhagamandalam to Masinagudi state highway passing through Mudumalai Tiger Reserve (40 km). Four visits per month were carried out mostly on weekends (Saturday or Sunday). A total of 497 three-striped palm squirrel kills were recorded, with an overall rate of 0.09/km of the roadway. Habitat wise 387 kills were observed in the thorn forest and 110 in dry deciduous forest habitats. Season wise 176 kills were recorded in winter, 156 in summer, 83 post-monsoon, and 82 during the monsoon. The study distinguished the ongoing major threat on the three-striped palm squirrel in the present scenario.

Keywords: Deciduous forest, ecology, habitat loss, mortality, vehicle movements.

The Three-striped Palm Squirrel *Funambulus palmarum* is a small rodent of the Sciuridae family, with four subspecies native to India and Sri Lanka. *F. palmarum* is endemic to southern India and Sri Lanka (Thorington & Hoffmann 2005; Nameer & Molur 2008), where it is widely distributed from sea level to 2,000m (Nameer & Molur 2014). Squirrels can reach head-body length of 12–15 cm and tail length of 14–15 cm (Menon 2014), and they have short fur that is yellowish-brown or brown on the back and creamy white on the belly (Menon 2014). Three white stripes on the back stretch from the head to tail. *F. palmarum* has dark round eyes, small triangular ears, long front teeth, and a bushy tail (Figure 1a; Prater 1971; Menon 2014; Pradhan & Talmale 2012). It is an omnivore with a diet based largely on fruit and nuts that also includes

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eggs, small birds, larvae, and insects (Prasad et al. 1966; Malhi & Kaur 1994; Malhi & Khushrupinder 1995). Squirrels mate throughout the year and build nests in treetops using grass and branches. Pregnancy lasts 34 to 45 days and produces 1–5 offspring; young are fully weaned at 10 weeks and reach sexual maturity at nine months. Animals can survive up to four years in the wild and >5 years in captivity (Weigl 2005). This study was undertaken to assess the threat to Three-striped Palm Squirrels from roadkills in the tropical forest of Sigur Plateau, Tamil Nadu in southern India.

STUDY AREA

Sigur Plateau is located in Mudumalai Tiger Reserve. It is a connective junction of Western and Eastern Ghats and harbors a diverse range of wildlife that includes Asian Elephant *Elephas maximus*, Tiger *Panthera tigris*, Leopard *Panthera pardus*, Gaur *Bos gaurus*, Chital *Axis axis*, Sambar *Rusa unicolor*, and other mammals (Ramakrishnan & Saravanamuthu 2012), as well as birds such as Endangered and Critically Endangered vultures including the Long-billed Vulture *Gyps indicus*, White-rumped Vulture *Gyps bengalensis*, Red-headed Vulture *Sacrogyaps calvus*, and Egyptian Vulture *Neophran percnopterus* (Ramakrishnan et al. 2014; Samson et al. 2014, 2015). The corridor between the Western and Eastern Ghats is used by elephants, tiger, gaur, and

other herbivores for seasonal migrations influenced by the southwest and northeast monsoons. The major streams of Sigur Plateau are the Moyar River, the Sigur River, the Avarahalla River, the Kedarhalla River, and the Gundattihalla River, which crisscross the Moyar Valley and drain into the Bhavanisagar Reservoir. Villages located within the Sigur Plateau are home to local communities and more recently to several tourist facilities that subsist mainly on the attractions of the diverse wildlife in the area surrounding Mudumalai Tiger Reserve.

Methods

Roadkills were recorded along the Udhagamandalam–Masinagudi state highway passing through Mudumalai Tiger Reserve (40km) (Figure 1). The local habitats are classified as dry thorn forest and dry deciduous forest (Gokula & Vijayan 1996; Ramakrishnan & Saravanamuthu 2012). Four visits per month were carried out between January 2014 and December 2016, mostly on weekends (Saturday or Sunday) by an observer and driver on a motorbike traveling at 10–15 km/h; observation times alternated between morning (06.00–08.00 h) and evening (16.00–18.00 h). Intermittent roadkills were also observed by forest officials and drivers, which when verified were included in the totals. For each kill the information recorded included the location, surrounding area (forest, human habitation, plantation), habitat type,

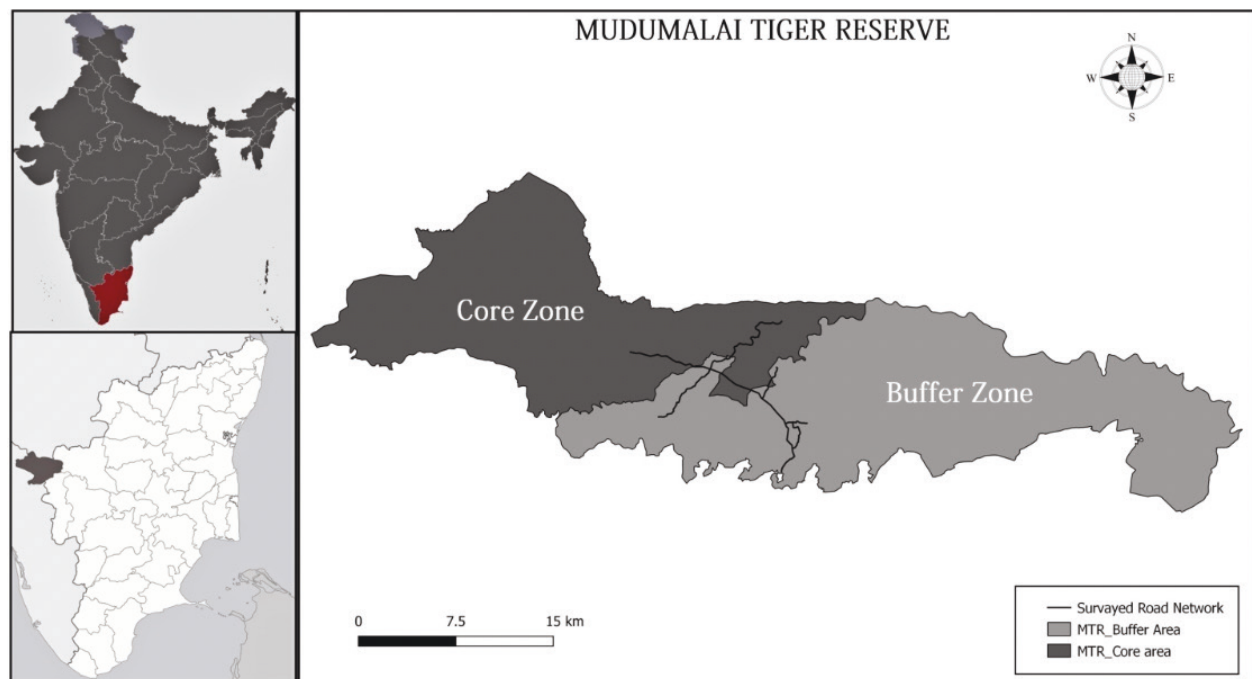


Figure 1. The location of the road networks in the Sigur plateau in Mudumalai Tiger Reserve.

and state & sex of dead animals, which when possible were removed from the road to avoid recounting.

RESULTS

A total of 497 individual Three-striped Palm Squirrels (Figure 1; Image 1) were recorded as roadkill victims in 144 visits covering 5,760km, for an encounter rate (ER) of 0.09 individuals/km/month. Most kills were recorded as fresh ($n=307$). Males ($n=220$) were more frequently observed than females ($n=145$), although many were unidentified ($n=132$; Figure 1). Three-hundred-and-eighty-seven kills were observed over 33km of road in thorn forest habitats ($ER=0.08$ individuals/km/month), and 110 in dry deciduous forest (7km; $ER=0.11$ individuals/km/month) (Table 2). More roadkills were recorded in forest habitats ($n=354$; $ER=0.078$ individuals/km/month) followed by human habitation ($n=89$; $ER=0.08$ individuals/km/month), and plantations ($n=54$; $ER=0.57$ individuals/km/month). The roadkill results show significant variation $R^2=0.995$ year by year 2014 ($n=148$; 12.33 ± 1.25 ; $ER=0.08$ individuals /km/month), 2015 ($n=165$; 13.75 ± 1.55 ; $ER=0.08$ individuals/km/month), and 2016 ($n=184$; 15.33 ± 1.58 ; $ER=0.10$ individuals/km/month) (Figure 2). Month-wise analyses of the roadkills show that May ($n=75$; 25 ± 1.15) had more number of roadkills followed by December ($n=61$; 20.33 ± 1.76), April ($n=48$; 16 ± 1.15), November ($n=47$; 15.66 ± 1.45) March ($n=42$; 14 ± 1.15), and January ($n=41$; 13.66 ± 1.45) (Figure 2); and significant variations were observed between month-wise data and the year-wise data ($F=11.12$ $p=0.005$). The season-wise data revealed



Image 1. Male and female roadkill of Three-Striped Palm Squirrel.

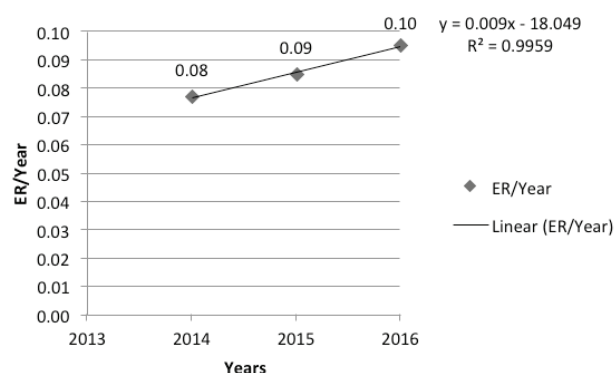


Figure 2. Year-wise encounter rate of roadkills of Three-striped Palm Squirrel in Sigur Plateau, Mudumalai Tiger Reserve.

Table 1. Season-wise roadkills of Three-striped Palm Squirrel in Sigur Plateau in Mudumalai Tiger Reserve.

Seasons	Totals	M±SE	ER
Winter (December–March)	176	14.66±1.19	0.10
Summer (April–June)	156	17.33±2.12	0.11
Monsoon (July–September)	82	9.11±0.78	0.06
Post Monsoon (October–November)	83	13.83±1.07	0.09

Table 2. Habitat-wise roadkills of Three-striped Palm Squirrel in Sigur Plateau in Mudumalai Tiger Reserve.

Vegetation	Km	Total km	Totals	M±SE	ER
Thorn Forest	33	4752	387	32.25±3.28	0.08
Dry Deciduous Forest	7	1008	110	9.16±1.09	0.11

that winter (December–March) ($n=176$; 14.66 ± 1.19 ; $ER=0.09$ individuals/km/month) and summer (pre-monsoon) (April–June) ($n=156$; 17.33 ± 2.12 ; $ER=0.11$ individuals/km/month) seasons recorded more kills compared to post-monsoon (October–November) ($n=83$; 9.11 ± 0.78 ; $ER=0.09$ individuals/km/month) and monsoon seasons (July–September) ($n=82$; 13.83 ± 1.07 ; $ER=0.06$ individuals/km/month) (Figure 3; Table 1).

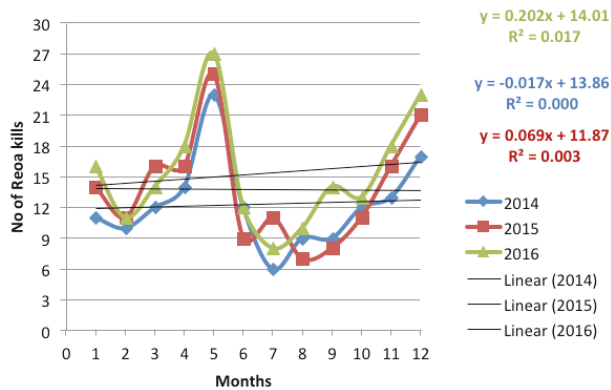


Figure 3. Year-wise and month-wise number roadkills of Three-striped Palm Squirrel in Sigur Plateau, Mudumalai Tiger Reserve.

DISCUSSION

This study targeted a single species affected by linear construction like road networks. In fragmented habitats, linking route ways enhance the movements of small mammals (Coffman et al. 2001). Medium and large-sized mammals are particularly at risk, especially when the emergence of young coincides with high traffic volumes (Oxley et al. 1974). The present study shows that males are frequently killed rather than females. Linear construction appears to affect the movement of males and females (Davis-Born & Wolff 2000). Various species show seasonal peaks in accident rates often with a higher percentage of males being killed (Davies et al. 1987; Rotar & Adamic 19975; van Langevelde & Jaarsma 1997; Mead 1997; Reeve & Huijser 1999). This suggests that breeding or dispersal behavior may be partly responsible (Moshe & Mayer 1998). Three-striped Palm Squirrel live in diverse habitats but mainly occur in tropical forests and around human habitation (Molur et al. 2005). The present study was carried out in two different vegetation structures in Sigur Plateau. Thorn forest had more roadkills compared to dry deciduous forest which indicated that Three-striped Palm Squirrels utilized thorn forest vegetation more. A considerable amount of roadkills was observed in human habitation as well as plantations. Three-striped Palm Squirrels are easily tamed by humans and easily adapt to human habitation, plantations, and gardens (Molur et al. 2005).

Sunbathing is one of the key activities for striped squirrel at dawn and dusk (Mendez-Carvajal et al. 2016). Samson et al. (2016) recorded that most fresh roadkills of Three-striped Palm Squirrel are observed at dawn and dusk in the present study also corroborate the previous study indicating that Three-striped Palm Squirrel use the road surface for sunbathing, it seemed to be the reason

for the high death rate. Some incidences may have occurred related to eating the insect on the roads. The road and road allowances attract prey populations, in particular, small mammals and carrion, but also insects and worms that are washed out of the soil onto roads (Tabor 1974). According to the literature, individuals from this genus prefer insects as protein sources more than fruits and nuts when fruits and vegetation are in the same proportions (Prater 1971; Barnett & Prakash 1975; Tiwari 1990; Balasubramanian 1995; Parasara et al. 1997).

Winter and summer seasons recorded Three-striped Palm Squirrel roadkills because of very high traffic on the state highway passing through the Nilgiri North Forest Division at one end connected to the Interstate highway NH 67 at Theppakadu and Ooty on other end. Generally, winter and summer are the best seasons to visit Udhagamandalam and that is a reason for high vehicular traffic intensity resulting in the high number of roadkills. Similarly, significant number of roadkills were also found in Mudumalai Tiger Reserve due to local vehicular movement as well as wildlife safaris (Samson et al. 2016)

According to the literature, habitat loss and degradation due to agro-industry farming, small-scale logging, human encroachments, invasive alien species, and hunting for local consumption purposes are minor threats to the Three-striped Palm Squirrel population (IUCN Red List Data 2016). The present study explored the current major threat in the present scenario. An urgent long-term study is needed to better understand the impact of roads on the ecology of the Three-striped Palm Squirrel.

REFERENCES

- Balasubramanian, P. (1995). Some notes on the fruits, seeds and nectar consumed by Three-striped palm squirrel *Funambulus palmarum* at Point Calimere Wildlife Sanctuary, Tamil Nadu. *Journal of the Bombay Natural History Society* 95: 256–258.
- Barnett, S.A. & I. Prakash (1975). *Rodents of Economic Importance in India*. Arnold Heinemann, New Delhi, 175pp.
- Coffman, C.J., J.D. Nichols & K.H. Pollock (2001). Population dynamics of *Microtus pennsylvanicus* in corridor-linked patches. *Okios* 93: 3–21. <https://doi.org/10.1034/j.1600-0706.2001.930101.x>
- Davies, J.M., T.J. Roper & D.J. Shepherdson (1987). Seasonal distribution of road kills in the European Badger (*Meles meles*). *Journal of Zoology* 211: 525–529. <https://doi.org/10.1111/j.1469-7998.1987.tb01550.x>
- Davis-Born, R. & J.O. Wolff (2000). Age- and sex-specific responses of the Gray-tailed Vole (*Microtus canicaudus*), to connected and unconnected habitat patches. *Canadian Journal of Zoology* 78: 864–870. <https://doi.org/10.1139/z00-017>
- Gokula, V. & L. Vijayan (1996). Birds of Mudumalai Wildlife Sanctuary. *Forktail* 12: 107–117.
- Malhi, C.S. & K. Kaur (1994). Responses of *Funambulus pennantii*

- Wroughton (Rodentia, Sciuridae) towards different food additives. *Mammalia* 59(3): 373–383. <https://doi.org/10.1515/mamm.1995.59.3.373>
- Malhi, C.S. & K. Khushrupinder (1995). Food preference behavior of the five striped squirrel, *Funambulus pennanti* Wroughton. *Behavioural Processes* 34: 55–66. [https://doi.org/10.1016/0376-6357\(94\)0052-i](https://doi.org/10.1016/0376-6357(94)0052-i)
- Mead, C. (1997). Apathetic bundle of feathers. *British Wildlife* 8: 229–231.
- Mendez-Carvajal, P.G., P.K.D. Mallikarjun, S. K. Pagadala, I. Martín, D. Marsilio-Apostoli & I. Ruiz-Bernard (2016). Brief observations of natural behaviour for Indian Five-striped Squirrel *Funambulus pennantii*, Telangana, India. *Small Mammal Mail* 15(1): 15–19.
- Menon, V. (2014). Indian Mammals: A Field Guide. Hachette Book Publishing India Pvt. Ltd., 530pp.
- Moshe, I. & R. Mayer (1998). Spatio-temporal trends in armadillo diurnal activity and road kills in central Florida.
- Nameer, P.O. & S. Molur (2008). *Funambulus palmarum* In: IUCN 2008. IUCN Red List of Threatened Species. Accessed 6 January 2009.
- Oxley, D.J., M.B. Fenton & G.R. Carmody (1974). The effect of roads on populations of small mammals. *Journal of Ecology* 11:51–59.
- Parasara, U.A., B.M. Parasharya & K.L. Mathew (1997). Five-striped squirrel *Funambulus pennantii* of the *Helicoverpa armigera* H.B. (Lepidoptera: Noctuidae). *Journal of the Bombay Natural History Society* 94: 562–564
- Prasad, M.R.N., G.K. Dhaliwal, P. Seth, A.H. Reddi, A.K. Sivashankar & N.K. Uberoi (1966). Biology of reproduction in the Indian Palm Squirrel, *Funambulus pennanti* (Wroughton). *Symposia of the Zoological Society of London* 15: 353.
- Prater, S.H. (1971). *The Book of Indian Animals*. Bombay Natural History Society, Mumbai, India, 324pp.
- Ramakrishnan, B. & R. Saravanamuthu (2012). Conservation and Management of Elephant Corridors. Lap Lambert Academic Publishing, GmbH & Co. KG Heinrich-Böcking-Str. 6-8 66121, Saarbrücken, Germany, 193pp.
- Ramakrishnan, B., G. Kannan, A. Samason, K. Ramkumar & S. Ramasubramanian (2014). Nesting of White-rumped Vulture (*Gyps bengalensis*) in the Segur Plateau of The Nilgiri North Forest Division. *Indian Forester* 140(10): 1014–1018.
- Reeve, N.J. & M.P. Huijser (1999). Mortality factors affecting wild hedgehogs: a study of records from wildlife rescue centers. *Lutra* 42: 7–24.
- Rotar, J.T. & M. Adamic (1997). Wildlife traffic relations in Slovenia. Problems arising with the construction of motorway network and possibilities of their mitigation, pp. 86–92. In: Canters, K. & A. Piepers (eds.). Proceedings of the International Conference on Habitat Fragmentation, Infrastructure and the Role of Ecological Engineering. Ministry of Transport, Public Works and Water Management, Road and Hydraulics Engineering Division, Delft, Netherlands.
- Samson, A., B. Ramakrishnan, A. Veeramani & P. Ravi (2015). Occupation of Indian Giant Squirrel nests by White-rumped Vultures (*Gyps bengalensis*) in India. *Podoces* 10(2): 35–36.
- Samson, A., B. Ramakrishnan, S. Renuka P. Ravi & S. Ramasubramanian (2014). Bathing behavior and waterhole importance of White-rumped Vulture conservation in the Segur Plateau, Tamil Nadu, southern India. *Journal of Applied Science and Research* 2(5): 92–99.
- Samson, A., B. Ramakrishnan, A. Veeramani, P.S. Kumar, S. Karthick, G. Sivasubramanian, M. Ilakkia, A. Chitheena, J.L. Princy & P. Ravi (2016). Effect of vehicular traffic on wild animals in Sigur Plateau, Tamil Nadu, India. *Journal of Threatened Taxa* 8(9): 9182–9189. <https://doi.org/10.11609/jott.1962.8.9.9182-9189>
- Tabor, R. (1974). Earthworms, crows, vibrations and motorways. *New Scientist* 62: 482–483.
- Thorington, R.W. & R.S. Hoffmann (2005). Family Sciuridae, pp. 754–818. In: Wilson, D.E. & D.M. Reeder (2005). *Mammal Species of the World: a taxonomic and geographic reference* (3rd Edition). The Johns Hopkins University Press.
- Tiwari, J. (1990). Five striped squirrel *Funambulus pennantii* (Wroughton) killing birds. *Journal of the Bombay Natural History Society* 87: 137.
- van Langevelde, F. & C.F. Jaarsma (1997). Habitat fragmentation, the role of minor rural roads (MRRs) and their traversability pp. 171–182. In: Canters, K.J., A. Piepers & D. Hendriks-Heersma (eds.). Proceedings of the International Conference on Habitat Fragmentation, Infrastructure and the Role of Ecological Engineering. Ministry of Transport, Public Works and Water Management, Road and Hydraulics Engineering Division, Delft, Netherlands.
- Weigl, R. (2005). Longevity of mammals in captivity; from the Living Collections of the world A list of mammalian longevity in captivity. Schweizerbart and Borntraeger science publishers, Germany, 214pp.



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