International Journal of Pure and Applied Zoology
Volume 9, Issue 3, pp:9-14, 2021
http://www.ijpaz.com

ISSN (Print) : 2320-9577
ISSN (Online): 2320-9585

Research Article

ROAD KILL OF ANIMALS BY HIGHWAY TRAFFIC FROM UDHAGAMANDALAM TO METTUPALAYAM, TAMILNADU

Deepan R*, Vickram B, Samson A, Dilip Clinton S and Leona Princy J

Department of Zoology and Wildlife Biology, Government Arts College, Udhagamandalam, Nilgiris, India

Article History: Received 22th April, 2021; Accepted 13th May, 2021; Published 20th May, 2021

ABSTRACT

The construction of a road, directly and indirectly, impacts on the ecosystems where the road is built. The present survey was conducted to estimate the road kills on the state highways passing through between the district Udhagamandalam and Mettupalayam (55 km). Tamil Nadu, India. The road kills were monitored three times a month between August 2017 to August 2018 and a totally of 383 road kills were founded belonging to four classes, which are mammals (7 species), birds (17 species), reptiles (12 species), and amphibians (4 species) with a total of species were recorded from a total of 1980 km of the survey within the 55 km stretch. From which the amphibian is the most affected taxa (n=155, 38.75 ± 11.79), It is followed by mammals (n=109, 15.57 ± 6.78), reptiles (n=76, 6.33 ± 2.74), and the least affected taxa is aves (n=43, 2.52 ± 0.43).

Keywords: Road, Mammals, Reptiles

INTRODUCTION

Highways across wildlife refuges are an intrusion and affect the wildlife directly by mortality through collisions with vehicles (Oldham et al.1991), (Foster et al.1995),(Das et al. 2007),(Row et al. 2007),(Shwiff et al. 2007), (Seshadri et al. 2009) and indirectly in the ecosystem (Matsue et al. 2009), which effects from habitat loss and fragmentation (Burnett et al.1992),(Richardson et al. 1997), followed by wild animal distribution pattern (Newmark et al. 1996) and movement (Desai et al.1998). The animals affected are mammals (Newmark et al.1992),(Drews et al.1995), (Newmark et al. 1996), (Richardson et al. 1997) ,birds (Reijnen et al. 1995), (Drews et al.1995), reptiles (Rosen et al.1994),(Drews et al. 1995), (Gokula et al.1997), (Das et al. 2007) and amphibians (Reh et al.1990), (Fahrig et al. 1995), (Seshadri et al. 2009). More attention has been paid in many other countries such as North America, Australia, Europe, and Africa to assess the impact of the road on the animal but Asian countries have not given the required attention to this issue. In India, many highway roads bisect reserve forests and many protected areas. In recent times the impact of highway construction among forest areas have been recognized (Gokula et al.1997), (Vijayakumar et al. 2001). For this reason, construction of new roads and widening of the existing road is opposed by the forest department and non-governmental organization. These roads have been identified as the source of disturbance to animals both directly (road kills) and indirectly (noise and disturbance) (Daniel et al. 1995), (Boominathan et al. 2008). And also, a direct or indirect impact of these roads on wild fauna has received very little attention in the country (Sunder et al.2004). Most of these observations are very subjective, though undoubtedly, these roads harm wild animals (Desai et al. 1998). The present study is exploring the road impacts on wild animals in Udhagamandalam and Mettupalayam highway from August 2017 to august 2018.

Study area

The study takes place between the district Udhagamandalam and Mettupalayam. Kotagiri is one of the town panchayats that belongs to The Nilgiris district, Tamilnadu, Which connects Mettupalayam and Udhagamandalam. Kotagiri is situated at an elevation of around 1,793 m (5,883 ft) above sea level with an average rainfall of 1300 mm. Udhagamandalam to Mettupalayam highway is about 59 km stretch, the road passes through 32 (approx) km of reserved forest and pass through seven hairpin bends mainly blind curves and bridges on the mountains. This road connects two major parts of town Udhagamandalam and the city Coimbatore through Kotagiri and Mettupalayam. Apart from these human encroachments in the name of roadside shops, settlements and plantations are considered a threat to wild animals. Especially the large mammals like elephants cross over these places (Ramakrishnan et al., 2012). The forest with dissimilar vegetation types supports a large faunal assemblage including a high abundance of threatened species like the Asian Elephant (*Elephas maximus*), etc. The result of this study would provide baseline information about the impact of highway road and vehicle traffic on an animal in a forest habitat.

MATERIALS AND METHODS

Roadkill was recorded in the highway which connects Udhagamandalam and Mettupalayam. The Observation is specially made for the taxa amphibians, reptiles, aves, and mammals. From the period of August 2017 to August 2018, the stretch of state highway between Udhagamandalam and

*Corresponding author e-mail: wildlifedeepan1999@gmail.com

Mettupalayam was driven three times a month, totaling 36 sampling days. Each sampling trip totaled 55 km. The route was driven (Driver and an observer using a motorbike at the constant speed of 20 to 30 km/h) during the day between 09:00 and 11:30 and during the evening between 14:00 and 16:30, the survey is alternatively conducted to acquire the finest result. On each sighting of roadkill, location, types of road, state of roadkill, and the climatic condition are recorded. The dead animals were identified up to its species level, and removed from the road to avoid recounting and if unidentified, it was preserved in 10% of formalin solution for later identification based on field guides (Whitaker et al.2004), (Daniels et al.2005),(Grimmett et al. 2011),(Menon et al.2014). Additional to this, Food waste material across roads thrown by tourists is also accounted for the estimation of food material in the stretch (Samson et al., 2016) and we count vehicular traffic to study the pressure of vehicles on animals.

RESULTS

Totally 383 road kills were founded belonging to four classes, which are mammals (7 species), birds (17 species), reptiles (12 species), and amphibians (4 species) with a total of species were recorded from a total of 1980 km of the survey within the 55 km stretch. From which the amphibian is the most affected taxa (n=155, 38.75 ± 11.79), It is followed by mammals (n=109, 15.57 ± 6.78), reptiles (n=76, 6.33 ± 2.74), and the least affected taxa is aves (n=43, 2.52 ± 0.43) (Table 1).

During the survey, we crossed over an average of 652 vehicles, from two-wheelers to trucks. Hence, the entire stretch consists of an average of 10.54 vehicles crossing per minute during the survey period of 1 hour. This count peaks during April as 1044, because of tourist passage to udhagamandalam. and 2356 food waste material is observed in 1980 km with an encounter rate of 1.19 food waste per kilometer (Table 2).

From the above table and chart, the roadkill is seen from another perspective. That, in amphibian there is more roadkill is happened during the winter season, followed by the monsoon, pre-monsoon, and ends in post-monsoon. Then the taxa Reptile is mostly affected during the season pre-monsoon, it is followed by winter and in post-monsoon, the roadkill count is at its foot. Birds are the least affected taxa in roadkill, but most affected in the winter season, it is followed by both monsoon and pre-monsoon and least in post-monsoon. And Most of the mammalian roadkill is found in pre-monsoon, it is followed by the season winter, it is followed by monsoon and least in post-monsoon (Figure 1).

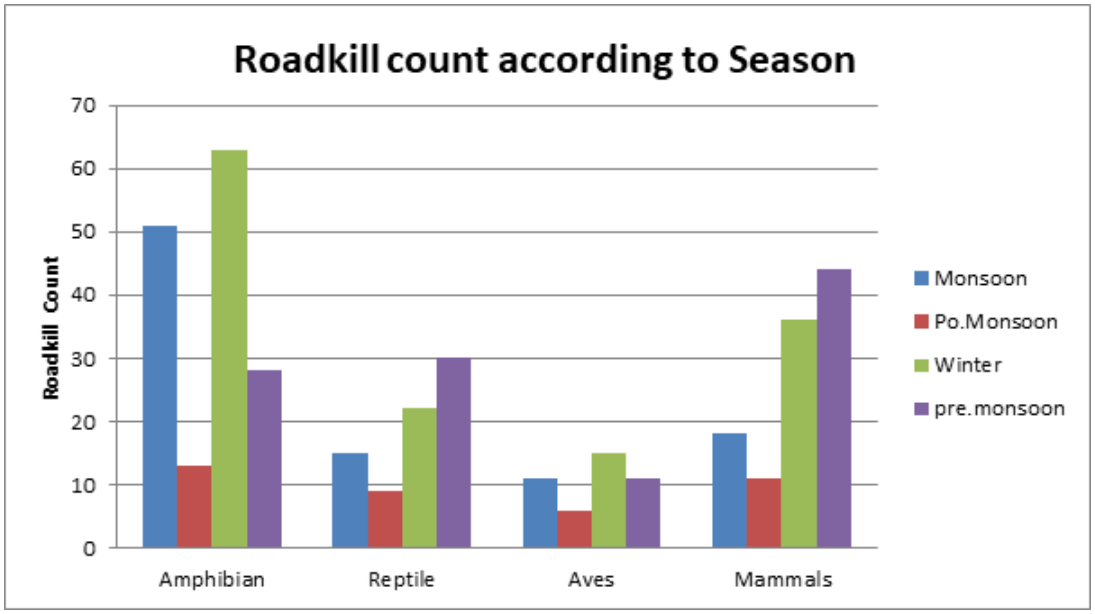
Table 1: *Summary of vertebral fauna killed by vehicular traffic.*

S. no	Animal group	Total no. of. species	Total no. of. kills (Mean and S.D)	Percentage (%)	E.R/K.M
1	Mammals	7	109 (15.57 ± 6.78)	28.45	0.05
2	Aves	17	43 (2.52 ± 0.43)	11.22	0.02
3	Reptile	12	76 (6.33 ± 2.74)	19.84	0.01
4	Amphibian	4	155 (38.75 ± 11.79)	40.46	0.07

Table 2: *Table representing road kill based on season-wise.*

S.No	Common name	Scientific name	Total	Total Number of Roadkills			
				Monsoon	Po.Monsoon	Winter	Pre.Monsoon
I	Amphibian	4	4	4	4	4	4
1	Common Toad	*Duttaphrynus melanostictus*	69	21	12	27	9
2	Niligiri bush frog	*Raorchestes signatus*	41	19	0	15	7
3	Narrow mouthed frog	*Uperodon triangularis*	33	10	1	14	8
4	Southern hill frog	*Duttaphrynus microtympanum*	12	1	0	7	4
II	**Reptile**						
1	Garden Lizard	*Calotes versicolor*	36	6	3	8	19
2	Indian Trinket snake	*Coelognathus helena*	2	0	0	1	1
3	Indian Sand Boa	*Eryx johnii*	3	1	1	1	0
4	Common Krait	*Bungarus caeruleus*	5	1	2	1	1
5	Russell's Viper	*Daboia russelli*	3	0	1	1	1
6	Spectacled cobra	*Naja naja*	1	1	0	0	0

7	Striped narrow headed snake	*Xylophis perroteti*	2	1	0	1	0
8	Green vine snake	*Ahaetulla nasuta*	7	1	0	2	4
9	Common wolf snake	*Lycodon aulicus,*	6	2	1	2	1
10	Keeled Grass Skink	*Eutropis carinata*	2	0	1	0	1
11	Bengal Monitor	*Varanus bengalensis*	5	1	0	3	1
12	Chameleon	*Chamaeleo zeylanicus*	4	1	0	2	1
III	**Aves**						
1	Indian Roller	*Coracias benghalensis*	2	2	0	0	0
2	House Crow	*Corvus splendens*	6	0	0	4	2
3	Red Whiskered Bulbul	*Pycnonotus jocosus*	3	1	0	2	0
4	House Sparrow	*passer demesticus*	7	1	3	1	2
5	Greater Coucal	*Centropus sinensis*	1	1	0	0	0
6	Red Vented Bulbul	*Pycnonotus cafer*	2	1	0	0	1
7	Flame Backed Woodpecker	*Dinopium benghalense*	1	0	0	1	0
8	Shikra	*Accipiter badius*	1	0	1	0	0
9	Spotted Dove	*Spilopelia chinensis*	1	1	0	0	0
10	Indian Robin	*Copsychus fulicatus*	2	0	1	1	0
11	Jungle Myna	*Acridotheres fuscus*	4	2	1	1	0
12	Pied Bushchat	*Saxicola caprata*	2	0	0	1	1
13	Jungle babbler	*Turdoides striata*	3	0	0	1	2
14	Jungle crow	*Corvus macrorhynchos*	4	1	0	1	2
15	Common myna	*Acridotheres tristis*	2	0	0	1	1
16	Asian koel	*Eudynamys scolopaceus*	1	1	0	0	0
17	Nilgiri Laughing thrush	*Trochalopteron cachinnans*	1	0	0	1	0
IV	**Mammal**						
1	Bonnet Macaque	*Macaca radiata*	1	0	0	0	1
2	Bandicoot Rat	*Bandicota indica*	32	4	4	8	16
3	Field Rat	*Rattus Rattus*	46	9	4	19	14
4	Indian Palm Squirrel	*Funambulus palmarum*	21	3	2	6	10
5	Slender Loris	*Loris lydekkerianus*	1	1	0	0	0
6	Malabar Giant Squirrel	*Ratufa indica*	7	1	0	3	3
7	Indian Palm Civet	*Paradoxurus hermaphroditus*	1	0	1	0	0



Figures 1. *Representing roadkill of fauna according to season.*

DISCUSSION

In the present study, a total record of 383 roadkill incidents is found, In which the most affected taxa is Amphibian followed by Mammals, Reptile and Aves. During the survey period, the most affected taxa are Amphibian. Among which, the present survey recorded that the Common Indian Toad (*Duttaphrynus melanostictus*) was the most affected species by roadkill. This finding got corroborates with in Mudumalai Tiger Reserve as well as (Vijayakumar et al. 2001) in Anamalai Hills. These frogs are reliably found under street lamps and vehicle headlights to feast on insects (Daniels 2005) coupled with their highly eurytopic and human commensal traits (Daniel et al. 2002), (Daniels et al. 2005) could also be the possible reasons for their higher susceptibility of becoming roadkill victims. The speed of the traffic, the size of the species, and its dispersal behavior are also cited as important factors when assessing the barrier effect of a road (van Langevelde et al., 1995). Wide roads with high traffic densities restrict animal movement most effectively.

During the study, mammals were affected second more in number. Here most of the mammalian road kills recorded in the present study are nocturnal (Fieldmouse, Bandicoot, and Slender loris) species that could have been killed while crossing the roads, as they get blinded by the vehicle's headlights. Even though a lot of nocturnal species are present in this landscape these two species Field rat and Bandicoot rat have become the victim of roadkill because by considering their size it is less noticed on the road by drivers. Apart from this species, the Three-striped Palm squirrel was observed in a considerable number of kills. Mendez-Carvajal et al. 2016 stated that Three-striped Palm squirrel having a habit that they sunbath regularly during early morning and late evening times. They used the road surface for sunbathing which seemed to be the reason for the high death rate of Three-striped Palm Squirrel by roadkill.

In Reptile, The most affected species were Commonly Lizard which is cold-blooded species and thermoregulation is a unique character for reptiles. We note that many reptile and amphibian species were found only after unreliable rainfall and on sections of the highway near water sources, such as the river. The number of reptiles and amphibians killed on the highway was higher in the rainy season than the dry season, perhaps due to their generally higher activity during this period when temperatures are higher and food availability is greater. Moreover, abundant rainfall may flood reptile's burrows, compromising their thermal regulation and forcing them to seek new, more reliable places to bask, such as the hot asphalt on highways Among Snake species, The Roadkill includes the Indian Trinket snake, Indian Sand Boa, Olive keelback, and Russell's viper is recorded. In Snake common wolf snake is affected more in number. At Mudumalai Tiger Reserve, different kind of finding has been made by founded that the Russells viper is the major victim.

Birds comprised the least fauna hit on this highway with a count of 17 species. This may be related to the abundance of landing sites and shelter provided by the shrubs and trees along the highway, as suggested by (Vestjens et al., 1972), (Brown et al., 1986). And in nature, they feed on insects and graminivorous in the habit (Ali et al., 1987). (Seibert et al.1991), (Potvin et al.2010) reported that low altitude flying made them the victim of road kills.

In some other cases the scavenging birds such as crows are attracted by the carcasses on the roadside also leads to road kills (Chhangani et al. 2004). Birds are attracted to roads as a location of concentrated resources, especially food is key for more victims of road kills in birds (Erritzoe et al. 2003), (Rytwinski et al. 2012). The House sparrow was found to be the most affected species rather than others. The road kills of House sparrows were collected mostly on the road passing through human settlement areas because in general, the House sparrows depend on human habitations to fulfill their

basic needs (Balmori et al. 2002). Similarly, (Samson et al. 2016) stated that house sparrow is the major victim of roadkill in Mudumalai Tiger Reserve other than a house sparrow, the birds such as House crow, Red Whiskered Bulbul, and Jungle Myna has a considerable impact.

In Reptile, the most affected species were Garden lizard which is a cold-blooded species and thermoregulation is a unique character for reptiles (Das et al. 2007). We note that many reptile and amphibian species were found only after unreliable rainfall and on sections of the highway near water sources, such as the river. The number of reptiles and amphibians killed on the highway was higher in the rainy season than the dry season, perhaps due to their generally higher activity during this period when temperatures are higher and food availability is greater. Moreover, abundant rainfall may flood reptile's burrows, compromising their thermal regulation and forcing them to seek new, more reliable places to bask, such as the hot asphalt on highways (Rosen et al. 1994), (Vijayakumar et al. 2001). Among Snake species, The Roadkill includes the Indian Trinket snake, Indian Sand Boa, Olive keelback, and Russell's viper is recorded. In this Snake Russell's viper is affected more in number. At Mudumalai Tiger Reserve, the same kind of finding has been made by (Baskaran et al. 2010).

Among the amphibian species, the present survey recorded that the Common Indian Toad (*Duttaphrynus melanostictus*) was the most affected species by roadkill. This finding got corroborates with (Baskaran et al. 2010), (Samson et al.2016) in Mudumalai Tiger Reserve, and (Vijayakumar et al. 2001) in Anamalai Hills. These frogs are reliably found under street lamps and vehicle headlights to feast on insects (Daniels 2005) coupled with their highly eurytopic and human commensal traits (Daniel et al. 2002); (Daniels et al. 2005) could also be the possible reasons for their higher susceptibility of becoming roadkill victims. The speed of the traffic, the size of the species, and its dispersal behavior are also cited as important factors when assessing the barrier effect of a road (van Langevelde et al., 1995). Wide roads with high traffic densities restrict animal movement most effectively.

CONCLUSION

The present study shows that highways have a severe impact on wildlife including very rare species. This survey is a short-term study, it is recommended that long-term studies are important to suggest various impacts highways have on wild animals. Earlier records indicate that Tiger, Leopard, Sloth Bear, Leopard Cat, Small Indian Civet, and Gaur have been killed by vehicular traffic. We make the following recommendations like building speed breakers for every single kilometer is not recommended in the hilly road but laying speed breaks across the straight road and flat terrain is optional, cautioning the driver by the implementation of signboards across flat terrain, the road should not be upgraded and the bushes near the roadside should be cleared to get clear vision through this the impact of vehicular traffic on the animal is decreased.

References

1. Ali, S., Ripley, S.D. (1987). Handbook of Birds of India and Pakistan. Oxford University Press, Bombay.
2. Balmori, A. (2002). Evidence of a connection between sparrow decline and the introduced of phone mast GSM. Available at http://www. hese project.de/de/ emf/ Wissenschaft For schung/show Author.php?1 ang=p1&target=Balmori_Dr_Alfo so/, (Accessed: 02 November 2006).
3. Baskaran, N., Boominathan, D. (2010). Road kills of animals by highway traffic in the tropical forest of Mudumalai Tiger Reserve, southern India. J. Threat. Taxa., 2: 753–759.
4. Brown, R.J., Brown, M.N., Pesotto, S. (1986). Birds killed on some secondary roads in western Austraila. Corella., 10: 118–122.
5. Burnett, S. (1992). Effects of a rainforest road on movements of small mammals: mechanisms and implications. Wildl. Res.,19: 95-104.
6. Chhangani, A.K. (2004). Frequency of avian road-kills in Kumbhalgarh Wildlife Sanctuary, Rajasthan, India. Forktai 20: 110–111.
7. Daniel, J.C. (2002). The Book of Indian Reptiles and Amphibians (Bombay Natural History Society Bombay). Oxford University Press, India.
8. Daniel, J.C., Desai, A.A., Sivaganesan, N., Datye, H.S., Rameshkumar, S., Baskaran, N., Balasubramanian, M., Swaminathan, S. (1995). Ecology of the Asian Elephant. Bombay Natural History Society, Bombay.
9. Daniels, R.J.R. (2005). Amphibians of Peninsular India. University Press, India.
10. Das, A., Ahmed, M.F., Lahkar, B.P., Sharma, P. (2007). A preliminary report of reptilian mortality on road due to vehicular movement near Kaziranga National Park, Assam, India. Zoos Print J., 22: 2742–2744.
11. Desai, A.A., Baskaran, N. (1996). Impact of human activities on the ranging behaviour of elephants in the Nilgiri Biosphere Reserve, South India. J. Bombay Nat. Hist. Soc., 93: 559-569
12. Drews, C. (1995). Road kill of animals by public traffic in Mikumi National Park, Tanzania with notes on baboon mortality. Afr. J. Ecol.,33: 89-100.
13. Erritzoe, J., Mazgajski, T., Rejt, L. (2003). Bird casualties on European roads–a review.
14. Acta Ornithol., 38: 77–93.
15. Fahrig, L., Pedlar, J.H., Pope, S.E., Taylor, P.D., Wegner, J.F. (1995). Effect of road traffic on amphibian density. Biol. Conserv., 73: 177-182.
16. Foster, M.L., Humphrey, S.R. (1995). Use of highway underpasses by Florida Panthers and other Wildlife. Wildl. Soc. Bull. 23: 95-100.

17. Gokula, V. (1997). Impact of vehicular traffic on snakes in Mudumalai Wildlife Sanctuary. Cobra., 27: 26.

18. Gruisen, J.V. (1998). Rajasthan. Tiger Link 4: 10-11.

19. Newmark, W.D. (1992). In: Managing protected areas in Africa. (Ed. W.J. Lusigi). UNESCO, Paris.

20. Newmark, W.D., Boshe, J.I. Sariko, H.I., Makumbule, G.K. (1996). Effects of highway on large mammals in Mikumi National Park, Tanzania. Afr. J. Ecol., 34: 15-31.

21. Oldham, R.S., Swan, M.J.S. (1991). In: Conservation of amphibian populations in Britain, pp. 141-157. (Ed. Seitz, A., V. Lowschcke). Birkhauser Verlag, Basel.

22. Potvin,A.J., Bishop, C.A. (2010).An endangered population and roadside mortality: three western Yellow-breasted Chat fatalities in the south Okanagan valley, British Columbia. BC Birds., 20: 45–48.

23. Reh, W., Seitz, A. (1990). The influence of land use on the genetic structure of populations of the common frog Rana temporaria. Biol. Conserv., 54: 239-49.

24. Reijnen, R., Foppen, R., Braak, C.T., Thissen, J. (1995). The effects of car traffic on breeding bird populations in woodland III: Reduction of density in relation to the proximity of main roads. J Appl Ecol., 32: 187-202.

25. Richardson, J.H., Shore, R.F., Treweek, J.R. (1997). Are major roads a barrier to small mammals? J. Zool., 243: 840-846.

26. Rosen, C., Lowe, C.H. (1994). Highway mortality of snakes in the Sonoran desert of Southern Arizona. Biol. Conserv., 68: 143-8.

27. Row, J.R., Blouin-Demers, G., Wheatherhead, P.J. (2007). Demographic effect of road mortality in black rat snakes (Elaphe obsolete). Biol. Conserv., 137: 117-124.

28. Rytwinski, T., Fahrig, L. (2012). Do species life history traits explain population responses to roads? A meta-analysis. Biol. Conserv., 147: 87–98.

29. Samson, A., Ramakrishnan, B., Veeramani, A., Santhoshkumar, P., Karthick, S., Sivasubramanian, G., Ilakkia, M., Chitheena, A., Princy, J.L., Ravi, P. (2016). Effect of vehicular traffic on wild animals in Sigur Plateau, Tamil Nadu, India. J. Threat. Taxa., 8(9):9182–9189.

30. Seibert, H. C., Conover, J. H. (1991). Mortality of vertebrates and invertebrates on an Athens County, Ohio, Highway. OJS., 91: 163–166.

31. Seshadri, K.S., Yadev, A., Gururaja, K.V (2009). Road kills of amphibians in different land use areas from Sharavathi river basin, central Western Ghats India. J. Threat. Taxa.,1: 549-552.

32. Shwiff, S.A., Smith, H.T., engeman, R.M., Barry, R.M., Rossmanith, R.J., Nelson, M. (2007). Bioeconomic analysis of herpetofauna raod-kills in a Florida State Park. Ecol Econ., 64: 181-85.

33. Van Langevelde, F., Jaarsma, C.F. (1995). In: Habitat fragmentation, the role of minor rural roads (MRRs) and their traversability. (Ed. Canters, K., A. Piepers). Ministry of Transport, Public Works and Water Management, Road and Hydraulics Engineering Division, Delft, Netherlands.

34. Vestjens, W.J. (1972). Wildlife mortalities on a road in NSW. Emu., 73: 107–112

35. Vijayakumar, S.P., Vasudevan, K., Ishwar, N.M. (2001). Hepetofaunal mortality on the roads in the Anamalai Hills, southern Western Ghats. Hamadryad., 26: 265-272.