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ROAD KILLS OF VERTEBRATE FAUNA IN DIR LOWER, KHYBER PAKHTUNKHWA, PAKISTAN

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Abstract. Research on road kills of wild animals in the district of Dir Lower, Khyber Pakhtunkhwa, Pakistan has not been previously reported. This study was conducted to estimate the incidence of vertebrate fauna road-kills on a heavily used 22 km long stretch of the road within the study area. A total of 65 road kills of vertebrate animals were reported during a 7-month-long survey period. Overall, road kills of nine species were reported with the highest percentage being domestic cats (*Felis catus)* and the lowest percentage being goats (*Capra aegagrus hircus)* and fowl (*Gallus gallus)*.

INTRODUCTION

Roads have numerous deleterious effects on biodiversity, including oil leakage from vehicles, and stress from noise (Erritzoe et al. 2003). However, the most disastrous of them is maiming and killing animals as a result of vehicular collisions and electrocution due to the presence of high voltage powerlines along roadsides (Kolnegari et al. 2018). Road-kills are associated with a number of causative factors including driver-fatigue (Jamroz and Smolarek 2013). There is evidence that road kills can affect the sex, age and fecundity composition of animal populations (Seiler 2003). Streams of traffic, barriers and automobile speeds are closely associated with animal-vehicle collisions (Seiler 2005). Some people are careless about the risks of collisions with wild animals while driving. In addition, roads limit free movement of animals across the terrain. As contemporary development of road infrastructure is on the rise, the habitat of wild animals is becoming fragmented, which in turn affects the movement of animals. Whenever animals cross roads or highways, they face injury or death. More animal collisions are recorded in areas of dense forest cover, rich biodiversity and at higher elevation (Malo et al. 2004). Due to their lower visibility to drivers, small mammals are at high risk of being killed (Hodson 1966). It has been reported by Madsen (2002) that female roe deer (*Capreolus capreolus*) are killed more often than males. This threatens population survival because if the female mortality rate is high enough it reduces the reproductive rate of the species and thus can have negative ecological consequences. A report by Brockie et al. (2009) shows that there is a high increase in road traffic volume, which in turn enhances road mortalities.

The Government of Pakistan is planning to improve its tourism sector, especially in the northern areas of the country. This will lead to an increase in the number of tourists and, consequently, vehicular traffic, and will promote the development of additional road infrastructure thereby increasing the impact on biodiversity. As a result, habitat fragmentation, which directly impacts on the movement of wildlife, will be exacerbated. Construction of roads is the main cause of physical injuries to organisms inhabiting areas near construction sites (Trombulak and Frissell 2000). There are limited data about road kills in Pakistan, and very little attention has been given to wildlife kills due to road traffic (Akrim et al. 2019). Case studies are helpful in gathering information and developing models for road protection (Sadauskas 2006). This study reports road-kills of animals in the district of Dir Lower, Khyber Pakhtunkhwa, Pakistan and highlights the issue of road mortalities of mammals along a busy 22 km long road.

MATERIALS AND METHODS

The study area, which is a 22 km-long heavy traffic road, stretched from 34°44'51" N, 71°55'56" E (Matta, Talash) to 34°66′92″ N, 72°06′21″ E (University of Malakand), (Figure 1). We travelled along this route daily (212 days), two (196 days) or sometimes four (16 days) times a day. We drove at an average speed of 44 km/h for 212 consecutive days. Twenty additional visits were made during the study period to ensure that no casualty had been missed and that all carcasses had been reported. Thus, the total number of the visits made was 476. In addition, questionnaire surveys of vehicle drivers as a practical guide (Seiler

et al. 2004) for estimating road-kills were carried out, although, information from such sources may be biased in one or another way. We counted road mortalities while driving. Sometimes, we stopped to identify species of the animal killed. Based on vegetation density, the area can be divided into different categories i.e., densely vegetated, normally vegetated and less vegetated. In this study, only vertebrates were considered, which is partly because they are of high concern in the area, and partly because the identification of invertebrates was difficult.

RESULTS

During the surveys, we recorded nine animal species, i.e. four species of domestic mammals, two wild mammal species, two species of wild birds and one of domestic birds. Domestic animals included domestic cat (*Felis catus*), domestic goat (*Capra aegagrus hircus*), domestic dog (*Canis lupus familiaris*), domestic sheep (*Ovis aries*), domestic fowl (*Gallus gallus*) and wild animals were golden Jackal (*Canis aureus*), black rat (*Rattus rattus*), House crow (*Corvus splendens*) and common myna (*Acridotheres tristis*).

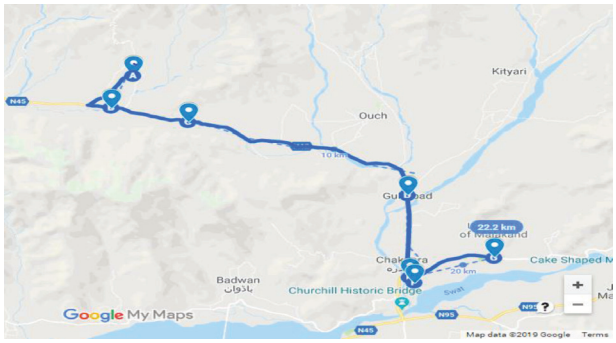

Figure 1. Road surveyed during the study.

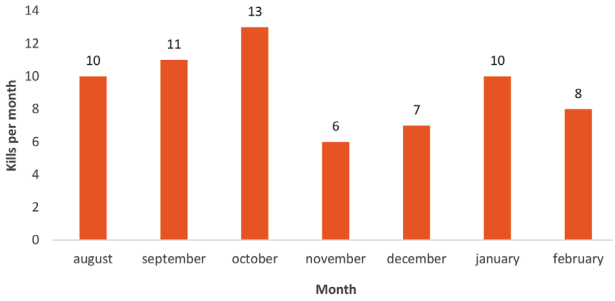

Figure 2. Number of animals killed per month in the study area.

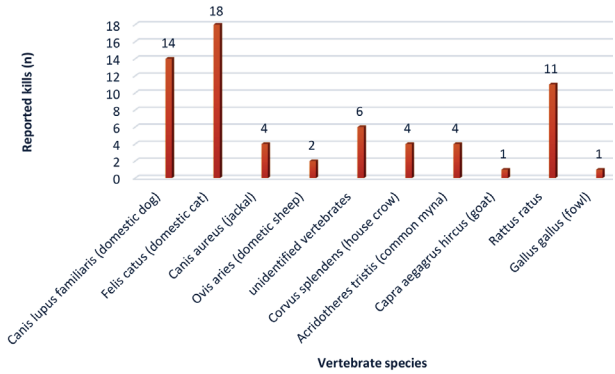

Figure 3. Species-wise distribution of reported road kills of vertebrate animals.

Figure 2 shows the month-wise number of road kills of wild animals in the study area. The number of road kills per month was the highest in October (n = 13) and the lowest in November (n = 6) with an average of 9.28.

Figure 3 shows a comparison of different species killed in road collisions.

DISCUSSION

This research study documented the incidence of road kills of vertebrate animals in the Dir Lower district of Khyber Pakhtunkhwa province of Pakistan. At this rate, a total of 108 wild animals were recorded killed per year on a road segment of 22 km. If this figure was extrapolated for the 329 km long road of the National Highway from Peshawar to Chitral, passing through Timergara, it would reach 1615 road collisions per year, which is a considerably high number, indicating that animals in the vicinity must be protected along their route. The highest number of road-kills was recorded for domestic cats (n = 18), and the lowest for domestic fowl (n = 1), and domestic goats (n = 1). Jackal (n = 4) killings were observed only during January because during the winter season they migrate out of the study area.

A well-designed management plan is needed to protect wild animals. In the current era of economic development and industrialization, consideration should be given to the conservation of wild animals. Results of the present study show that domestic cats constituted 28% of the reported road-kills and were at high risk of becoming casualties followed by domestic dogs (Figure 4), which accounted for 22% of the reported killings. As stated by Jamroz and Smolarek (2013), attention should be given to the causes of road kills of wild animals. This study shows that road kills of vertebrate fauna at the current rates are high enough to be regularly monitored. One important goal here is to ensure that wildlife conservation is included as an important consideration in conjunction with economic development. Construction of infrastructure, especially that of roads, needs to be highly planned with wildlife conservation in mind. Computer-based simulations and modelling may be helpful in identifying accident hot spots and their remediation (Seiler 2001).

The following steps should be taken to protect wild animals from road accidents:

Figure 4. A dog killed by a vehicle while crossing the road.

1. Construction of underground corridors or overhead bridges on roads for wild animals in hilly areas in order to cross the road without facing vehicles.
2. Placement of awareness signboards at specific sites on roadsides to alert drivers to take care and to slow down their speed.
3. Arrangement of seminars and workshops for the general public to raise awareness about the importance of wild animals.

CONFLICT OF INTEREST

The authors have no financial or other conflicts regarding the publication of this manuscript.

REFERENCES

Akrim, F., T. Mahmood, S. Andleeb, R. Hussain, and J. Collinson Wendy. 2019. Spatiotemporal patterns of wildlife road mortality in the Pothwar Plateau, Pakistan. *Mammalia* 83 (5): 487–495. doi: 10.1515/mammalia-2017-0101.

Brockie, R. E., R. M. F. S. Sadleir, and W. L. Linklater. 2009. Long-term wildlife road-kill counts in New Zealand. *New Zealand Journal of Zoology* 36 (2): 123–134. doi: 10.1080/03014220909510147.

Erritzoe, J., T. D. Mazgajski, and Ł. Rejt. 2003. Bird casualties on European roads – A Review. *Acta Ornithologica* 38 (2): 77–93. doi: 10.3161/068.038.0204.

Hodson, N. L. 1966. A survey of road mortality in mammals (and including data for the Grass snake and Common frog). *Journal of Zoology* 148 (4): 576–579. doi: 10.1111/j.1469-7998.1966.tb02972.x.

Jamroz, K., and L. Smolarek. 2013. Driver fatigue and road safety on Poland's national roads. *International Journal of Occupational Safety and Ergonomics* 19 (2): 297–309. doi: 10.1080/10803548.2013.11076987.

Kolnegari, M., A. T. Qashqaei, M. Hazrati, A. A. Basiri, M. M. Tork Abad, and M. Ferrer. 2018. Rare cases of carnivore mortality due to electric power distribution lines in Iran. *Zoology and Ecology* 28 (4): 418–420. doi: 10.1080/21658005.2018.1520019.

Madsen, A. B., H. Strandgaard, and A. Prang. 2002. Factors causing traffic killings of roe deer *Capreolus capreolus* in Denmark. *Wildlife Biology* 8 (1): 55–61. doi: 10.2981/wlb.2002.008.

Malo, J. E., F. Suárez, and A. Díez. 2004. Can we mitigate animal–vehicle accidents using predictive models? *Journal of Applied Ecology* 41 (4): 701–710. doi: 10.1111/j.0021-8901.2004.00929.x.

Sadauskas, V. 2006. Investigation of road accidents on Lithuanian state roads. *Transport* 21 (4): 289–292. doi: 10.1080/16484142.2006.9638082.

Seiler, A. 2001. *Ecological effects of roads: a review*: Swedish University of Agricultural Sciences Uppsala.

Seiler, A. 2003. *The toll of the automobile: Wildlife and roads in Sweden*. Swedish University of Agricultural Sciences Uppsala.

Seiler, A. 2005. Predicting locations of moose–vehicle collisions in Sweden. *Journal of Applied Ecology* 42 (2): 371–382. doi: 10.1111/j.1365-2664.2005.01013.x.

Seiler, A., J.-O. Helldin, and C. Seiler. 2004. Road mortality in Swedish mammals: results of a drivers' questionnaire. *Wildlife Biology* 10 (1): 225–233. doi: 10.2981/wlb.2004.028.

Trombulak, S. C., and C. A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology* 14 (1): 18–30. doi: 10.1046/j.1523-1739.2000.99084.x.