



SOUTH AFRICA DISSERTATION/THESIS PROJECT

SA86 Road ecology in Dinokeng Game Reserve

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Introduction

Roads have both a direct effect on wildlife through high mortality, and an indirect effect through habitat fragmentation and altering animal behaviour. Road traffic incidents lead directly to increased animal mortality rates, human fatalities and property damage, making road ecology of key importance across the world. This importance increases where people have less, wildlife is under threat and human-wildlife conflict is prevalent. South Africa is a densely populated developing African country where endangered animal species are under pressure from habitat degradation and urbanization, poaching and, sometimes, poor wildlife management strategies. Effectively, South Africa provides the perfect opportunity to study road ecology; which is an understudied area of human-wildlife conflict in proportion to how regularly wildlife interacts with roads across the world and the magnitude of the associated consequences. Therefore, this project is perfect for students looking to work on conservation management in an area that informs on road ecology policy in South African reserves. This work is also highly publishable due to the topical nature and the unique circumstances in Dinokeng Game Reserve.

Dinokeng has many of the features of an expected hotspot for road traffic collisions with wildlife. This is primarily because it is a fenced reserve dissected by two large public roads (one tar and one gravel) and a network of many smaller roads (mainly sand and dirt). Dinokeng also has populations of at-risk species; notably, the black-backed jackal, scrub hare and crested francolin. This unusual and pioneering reserve was created by multiple land-owners combining portions of their land into one reserve. Some of the landowners within Dinokeng opted to stay within the reserve, only donating a portion of their land and many of them still live within the reserve or own commercial property within it. This creates a busy reserve with a complex mosaic of human activity and disturbance. The wildlife within Dinokeng is therefore under pressure from this human disturbance, especially the relatively busy network of roads used by many road-users that have little experience in driving around high densities of wildlife. It could therefore be argued that this may increase the likelihood of roadkill.

To monitor how the roads and road usage in Dinokeng are affecting species in the reserve, we collect three types of data: roadkill, camera trap and driver behaviour (see methods). Generally, your expedition will be divided between field and camp activities, with the majority of the time spent in the field. During time in camp, students will be expected to attend lectures and practicals on African conservation and complete project data entry. The data collected by students is part of a long-term population monitoring and land management project and thus all students joining the Opwall expedition to Dinokeng Game Reserve will assist with all types of data collection rather than focussing only on the data required for their project. In exchange for assisting the reserve management, students will have access to historical data sets from the reserve and may use them for their research projects.

Methods

Roadkill data

Over the last two years, together with our in-country partners we have been collecting data on roadkill along main arterial roads across the reserve, on dedicated surveys and opportunistically collecting information on incidences of roadkill.. Our surveys follow established methodology that has been employed in other national parks and reserves in South Africa, enabling fascinating comparisons. On finding a roadkill incident the team records features of the road; including, verge width, vegetation cover, speed limit and road type. We also record what species was killed and mark a GPS location. In addition to this empirical mortality data, we also collect other types of data to gain a deeper understanding of road-use by humans and animals.

Camera trap data

To identify both which animal species are present around the roads and traffic volume on the roads, we set up a network of camera traps along the key roads in the reserve that have resulted in a massive photo dataset. To process and analyse this data Wildlife Ecological Investments (WEI), our South African partners, have developed a powerful and intuitive bespoke software program, which will be available to students during their fieldwork season. By discovering which species are near roads from analysing camera trap data and their respective estimated mortality rates from roadkill data collected in the field, it could be possible to understand which species are most at-risk, and where and when the chances of mortality are different. This can help us inform applied management solutions to minimize the effects of roadkill. We can also use the camera traps positioned on roads to investigate how animals interact with roads and traffic in both beneficial and negative ways. The public tar road in Dinokeng has a wide mowed verge which is used preferentially by grazing herbivores such as impala and wildebeest, and this is one example of how roads can change animal behaviour. Predators may also use the road network to traverse the reserve.

Driver behaviour data

The other aspect of road-effects on wildlife is the human element that can lead to road collisions. We directly study driver behaviour in Dinokeng, measuring driver response to a dummy rubber snake positioned in the road, recording how often the snake is driven over, and how the humans are behaving at this time. This informs on people's general attitude to wildlife, their ability to spot cryptic species on roads and whether different situations or vehicle types vary in their response. Furthermore, as we carry this survey out at multiple sites, it allows us to analyse if responses vary depending on surroundings and features of the road itself. This is a great opportunity to carry out experimental research that can effectively inform wildlife conservation.

Summary of Data Available

- Roadkill data from 2018 to present – species and road attributes
- Driver behaviour data from 2018 to present – driver response and road features
- Camera trap data from June 2018 until August 2020 – animal and vehicle photographic data
- Key study species (although any species present in Dinokeng could theoretically be studied using camera trap data) – Black-backed Jackal, Scrub hare and various ground birds

You have the opportunity to decide exactly how you wish to utilize this data, combining what is available to produce an interesting and relevant research question.

Recommended Reading

- Beale, Colin M, et al. (2013), 'Ten lessons for the conservation of African savannah ecosystems', *Biol. Conserv.*, 167 224-32.
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- Pretorius, Mariette E, Nimmi Seoraj-Pillai, and Neville Pillay (2019), 'Landscape correlates of space use in the critically endangered African wild dog *Lycaon pictus*', *PLoS One*, 14 (3).
- Rich, Lindsey N, et al. (2017), 'Assessing global patterns in mammalian carnivore occupancy and richness by integrating local camera trap surveys', *Glob. Ecol. Biogeogr.*, 26 (8), 918-29.
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- Williams, Samuel T, et al. (2019), 'Using road patrol data to identify factors associated with carnivore roadkill counts', *PeerJ*, 7.