PATTERNS OF WILDLIFE-VEHICLE COLLISION IN MONTANE ENVIRONMENTS

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ABSTRACT

As the human population and its associated infrastructure expand, road networks also increase in mountainous, previously inaccessible terrains. Increased vehicular traffic and better-paved roads in montane environments heighten risks to wildlife inhabiting these regions, including the potential for more wildlife-vehicle collisions, leading to higher mortality rates. Unpredictable weather patterns and sudden topographical changes all contribute to these roads potentially being more hazardous to both drivers and any surrounding wildlife: the ruggedness of these terrains and tortuosity of roads may make it harder for drivers and wild animals to detect one another on mountain roads, increasing the likelihood of collisions. Conversely, it is also possible that driver behaviour in rugged mountainous terrain becomes sufficiently cautious, precisely because of these environmental features, to reduce roadkill rates, compared to incidences in low-lying areas with flatter, more open terrain. Here, we investigate patterns of roadkill in Africa based on a dataset of 26 studies of vertebrate roadkill in African countries. We estimated the roadkill rates for each observed species and then analysed the correlation with topographical aspects of the study sites. We used the 90m Digital Elevation Model downloaded from the geospatial cloud-computing platform Google Earth Engine. We classified “high” elevation mountains as regions lying above 2000 meters above sea level (masl), “moderate” elevation mountains as lying between 1500 and 2000 masl, and “low” regions as areas below 1500 masl. We also extracted slope and the topographic ruggedness index. Roadkill rates were estimated for 15 different amphibian species, 98 reptilian, 261 avian, and 273 mammalian species, comprising 5,549 individual roadkill records. We found that the highest ruggedness was, unsurprisingly, in the high-elevation mountains, with much lower ruggedness indices in the moderate and low elevation areas. Roadkill rates peaked in the mid-elevation mountains (21.1 individuals/km/survey day), with the lowest roadkill rates found at high elevations (0.32 individuals/km/survey day). Roadkill rates were also markedly lower at low elevations than in mid-elevation mountains (1.82 individuals/km/survey day). Crucially, however, the highest proportion of species classified as Near Threatened or more vulnerable to extinction on the IUCN Red List was killed in the high-elevation mountains (10.1% of species killed in these areas), with the lowest proportions found in low-elevation regions (5.1% of species). In the mountainous regions, we found that amphibians were killed at the highest rates (peaking at moderate elevations), while mammals were killed most frequently in the low-lying regions. These findings indicate that roads in mountainous African regions pose a high risk to our indigenous wildlife. We discuss the potential mitigation measures and pitfalls of continued development on the biodiverse African continent, considering the demands for improved infrastructure, stable ecosystems, and the key ecosystem services they provide.

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