Predicting the effects of road paving on vehicle-animal collisions: a case study in a Brazilian protected area considering carcass removal and detection

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While the presence of roads in protected areas allows and stimulates the access of tourists, it is a source of environmental impacts requiring qualified intervention. Although mortality by vehicle-animal collisions can substantially affect population persistence of wildlife, the Brazilian government has been investing resources in road paving without much concern about environmental impacts. The National Parks Aparados da Serra and Serra Geral are two contiguous federal protected areas in a grassland-forest mosaic in southern Brazil. These parks are crossed by four roads, totaling 66 km, of which 14.4km are paved and 51.6 are unpaved. Our goal was to estimate the magnitude of road mortality in these four roads in order to predict the impact of road paving and traffic increase, which is due to happen. To predict the effect of paving based on the number of road-kills recorded in paved and unpaved segments of those roads it is necessary to correct the mortality estimates considering the differences in carcass removal and detection between paved and unpaved roads.

Since September 2012 we have been surveying the mortality of native vertebrates fortnightly on the four roads by two observers in a vehicle at 30-40 km/h. Experiments for evaluating our method’s detection capacity and removal time of carcass were carried out both on paved and unpaved segments. We conducted 75 surveys during two years and nine months of monitoring. A total of 284 carcasses of native vertebrates were recorded, of which 195 were amphibians (four species), 50 reptiles (20 species), 21 mammals (seven species) and 18 birds (nine species). We recorded 213 road-kills on paved segments and 71 on unpaved segments. Taking into account mean values for detection and removal time of all carcass used in experiments, the detection capacity was 54% for paved and 24% for unpaved segments; characteristic removal time was 1.95 days for paved and 1.27 for unpaved segments. Road mortality rate considering detectability and removal was 0.18 road-kills/km/day on paved segments and 0.06 road-kills/km/day on unpaved segments. We estimated 65.7 road-kills per year for each kilometer of paved road and 21.9 road-kills per year for each
kilometer of unpaved road. These results point out that the corrected road-kill mortality rate on paved segments is three times higher than on unpaved segments. Corrected road-kill mortality rates considering the differences in carcass detectability and removal between paved and unpaved roads suggest that paving must increase the number of road-killed animals, raising the total road mortality within these protected areas. The government investments on road paving within protected areas must be accompanied by serious planning of mitigation measures to avoid that wildlife populations protected by these parks are compromised by the probable increase in mortality rates.