

## **Can we model wolf-vehicle collisions? Using a logistic model with corrections to identify the variables involved in the road-kills**

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The studies about large carnivore road-kills are scarce despite this being one of the main causes of mortality. This absence can be explained partly because of difficulties in obtaining sufficient sample sizes. We collected evidence from locations of 82 wolf road-kill sites in the Castile and Leon region, northwest Spain. Landscape, traffic and anthropogenic models to characterise collision localities were evaluated using logistic regressions with corrections for rare events. These corrections contribute to minimize the statistical problems derived from small sample sizes. Best models included traffic and human disturbance parameters. Landscape variables did not improve predictive power. Fencing was a decisive key predictor; road-kill was proportionally higher along fenced highways than on similar major roads that lacked fences. Wolf adaptation ability may prevent them from being killed on roads but the design failures and the lack of maintenance in fences favour that wolves reach the highways, becoming trapped on the road. In such case fencing has the opposite effect because it supposes an increase in the time of residence on the road and an increase in the number of road-kills. Moreover, speed and traffic volumes, proximity to municipal borders and distance to populated areas were significant variables. At regional scale wolf-vehicle collisions were more common on the agricultural areas, although wolf densities were lower in these zones. Both the higher density of important roads and the greater proportion of roaming wolves on the plateau may explain this pattern.