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Authors
Malo, Juan E.
Suárez, Francisco

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PREDICTIVE MODELS FOR THE LOCATION OF ANIMAL-CAR ACCIDENTS AND THEIR APPLICABILITY TO MITIGATION

Juan E. Malo (Phone: +34 91 397 8001, Email: je.malo@uam.es) and Francisco Suárez, Departamento Interuniversitario de Ecología, Facultad de Ciencias, Universidad Autónoma de Madrid, 28049 Madrid (SPAIN) Fax: +34-91-397-8001

Alberto Díaz, Actividades, Estudios y Proyectos en el Medio Ambiente S.L. C/San José 3-2º izqda. 42004 Soria (SPAIN)

Abstract

Many provinces in Spain are suffering an increasing number of animal-car collisions in the recent years so as to become one of the main issues to the official bodies with traffic and/or environmental responsibilities. In this context, the present study has been devoted to the analysis of the causes and potential solutions to the problem in the Province of Soria (Central Spain), where more than 50 percent of the reported car accidents were related in 2000 to the presence of wild animals on the road. The study was funded by the Dirección General de Medio Natural from the Consejería de Medio Ambiente of Junta de Castilla y León (the regional body in charge of game and wildlife) with a total budget of ca. $11,650.

The modelling has been carried out at two different spatial scales, a regional one focused on the definition of the areas with high accidentality, and a local one aimed at the search of factors determining the exact locations of accidents. The study was based on the database of car accidents provided by the Dirección General de Tráfico with indication of date, hour and location of the accident (approximated to the nearest 0.1km post), and species involved in the crash. This database comprised a total of 2,067 accident locations corresponding to the 1988-2001 period.

An initial analysis of the spatial contagion among accident locations lead to the definition a set of 41 “black sections” in roads, with 0.8 to 47.3km length each. These sectors embrace more than 70 percent of accident locations, though totalizing only a 7.7 percent of the road network of the province. A GIS-based analysis of the landscape features corresponding to these sectors was carried out in comparison with a set of 43 “white sections” interspersed among them. This task was based on the forest map of the province (1:50,000 scale) working with 1km radius circles centered on the midpoint of “black” and “white” sections. Nine land-use variables plus the length of ecotones and the diversity of substrata were used as input variables. The statistical analysis and the modelling showed the accident-prone areas to be characterized by their high forest cover, low presence of human structures, and a high diversity of vegetation types with some presence of crops.

The analysis at the accident-point scale was carried out within a total of 18 “black sections” of roads, through a sampling of 12 points with accidents recorded and 12 free of them in each section. In each point 28 quantitative and qualitative variables were measured. The variables covered the most relevant features believed to be potentially related to accidentality, such as the road characteristics from the driver’s point of view (distance to curve, signaling), habitat structure (land-uses, distance to trees), and local morphology (natural geomorphology plus human-made structures). The statistical analyses and modelling showed the accidents happening at points of animal corridors crossing the road, with vegetation, local morphology plus human structures forcing the animals to cross at predictable points.

The results thus show the potential to predict the points with higher probabilities to be accident-prone, thus opening the way for the efficient expenditure in mitigative and preventive measures for both the problem of animal-car collisions and for the alleviation of population fragmentation by roads. Moreover, modelling points to the possibility of mitigating the problem of animal-vehicle collisions in small roads by a combination of fencing and the ubication of alternative animal passes at certain points.

Biographical Sketch: Juan E. Malo and Francisco Suárez are researchers and lecturers at the Department of Ecology, Universidad Autónoma de Madrid (Spain). They work on applied zoology and environmental impact assessment with a specific research line focused on the effect of roads on vertebrates. Alberto Díez is biologist and works as freelance environmentalist in the Province of Soria. His main activity lies in the field of fauna studies for environmental impact assessment and landscape planning projects.