

Fine-scale analysis of ungulate-vehicle collisions in Southern Belgium

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Context

Ungulate-vehicle collisions (UVC) are an increasing phenomenon in many European countries. These road accidents are a threat to wildlife populations but also to human safety and generate high economic costs. Wallonia, the Southern part of Belgium, is also affected by the UVC problem and offers an interesting study area because of its very dense road network and increasing big game populations.

Objectives

The aim of our study was to determine where and when UVC hotspots occurred along highways in Wallonia, in order to provide recommendations regarding the location and design of mitigation measures.

Results

Concerning traffic accidents, the most involved game species are wild boar (37% of all casualties ; figure 1). That's why the amount of data on wild boar was higher than for the other species. The results of the spatial and temporal analysis of wild boar-vehicle collisions (WVC) are therefore more accurate than for the other species. Consequently we decided to focus on the wild boar in the present poster.

Temporal analysis showed strong variations in the WVC frequency over time, on the daily and seasonal scale. These critical periods correspond to the activity periods of the species (more UVC at night and during autumn and winter ; figure 2).

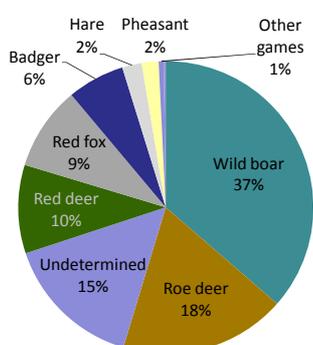


Figure 1. Proportion of the different game species in Wildlife vehicle collisions.

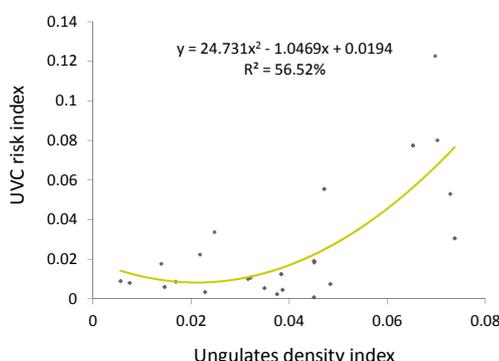


Figure 3. Correlation between accident frequency and size of the ungulate population.

Table 1. Multiple regression results for trends in WVC in relation to landscape and road-related variables.

Variables (and possible buffer)	Odds Ratio	P-Value
(Intercept)	-3,11E+00	0,003**
Distance to crop fields [in m]	-1,17E-03	0,001***
Distance to hardwood forest [in m]	1,31E-03	0,035*
Mean slope (500m) [in degrees]	-1,94E-01	0,005**
Road lightings (absence:0 or presence:1)	1,00E+00	0,028*
SD of the area of softwood patches (250m) [in m ²]	-7,85E-05	0,003**
Proportion of softwood forest (250m) [in %]	5,92E+00	0,008**
SD of the fractal index of softwood patches (1000m)	-5,69E+00	0,016*
SD of the shape index of hardwood patches (1000m)	2,83E+00	0,000***
Patch density of hardwood forest (1000m) [nb of patches/m ²]	2,70E+05	0,002**
Proportion of urban area (250m) [in %]	-8,52E+00	0,002**
Proportion of water area (500m) [in %]	2,58E+01	0,020*
Mean of the fractal index of grassland patches (500m)	1,07E+00	0,044*

Material and Methods

Study site

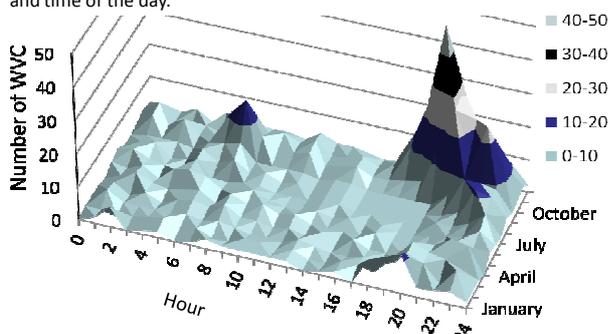
The study site is located in Wallonia (Southern Belgium) in the provinces of Liege and Namur (5,875 km²). Ungulates species present in this area are wild boar, roe deer and red deer. The UVC data were collected by the police and covered the period between 2008 and 2011 (n= 2,704).

Spatial analysis

We analyzed the landscape and road-related variables of sections with high UVC risk in contrast with section of low risk.

The landscape and road-related variables related to the location of UVC were highlighted using a generalized linear model (GLM) with simulated pseudo-absences.

Figure 2. Average number of WVC over the course of the year and time of the day.



The study also points out a negative correlation between the occurrence of UVC and the traffic volume ($R^2 = 9.79\%$). This result doesn't match with the literature but can be explained if we assume that when traffic increase, the road represents a more impassable barrier for animal species.

As expected we also noticed a positive correlation between game density and UVC risk (figure 3).

Spatial analysis exhibited clustering of WVC along the road network. The result of the logistic regression (AIC = 256,19) match with the wild boar habitat preferences (table 1).

Conclusion and perspectives

- These results indicate clear spatial and temporal clustering of WVC.
- Identification of hotspots enables us to identify the priority areas where mitigation measures must be considered.
- For further research, the accuracy of the police data should be improved in order to predict more exactly the risk of UVC. This would also make the mitigation measures more cost-effective.