

ADDITIONS TO MAMMALS KILLED BY MOTOR VEHICLES ON VÍA DEL ESCOBERO, ENVIGADO

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ABSTRACT

Vertebrate road kills are a generalized problem around the world, but they are scarcely documented on Colombian highways, especially in peri-urban areas. This study describes the highway mortality of mammals in a six year-period (2008-2013) on Vía del Escobero (Envigado, Antioquia, Colombia). Mammal groups that presented the highest mortality rates were marsupials (54.3%), carnivores (25.7%), and rodents (17.5%). Although there was a lower diversity and fewer individual fatalities than in previous years for the same highway, this study reports a greater number of fatalities for some endangered and unknown species such as *Leopardus tigrinus*, *Puma yagouaroundi*, and *Bassaricyon neblina*. This study also added three new species to the road kill list on this highway.

KEYWORDS: Road ecology, urban ecology, Medellín, Valle de Aburrá, Valle de San Nicolás

ADICIONES AL ATROPELLAMIENTO VEHICULAR DE MAMÍFEROS EN LA VÍA DE EL ESCOBERO, ENVIGADO (ANTIOQUIA), COLOMBIA

RESUMEN

El atropellamiento vehicular de fauna es un problema generalizado alrededor del Mundo pero escasamente estudiado en las carreteras colombianas, especialmente en áreas periurbanas. Aquí se describe la mortalidad de mamíferos entre los años 2008 a 2013 en la vía El Escobero (Envigado, Antioquia). Los mamíferos más atropellados en este periodo fueron los marsupiales (54.3 %), los carnívoros (25.7 %) y los roedores (17.5 %). Aunque en general se encontró una menor diversidad y un menor número de individuos atropellados que en años anteriores en la misma carretera, se reporta un número mayor de algunas especies desconocidas y amenazadas tales como *Leopardus tigrinus*, *Puma yagouaroundi* y *Bassaricyon neblina*. Este estudio también adiciona tres nuevas especies a la lista de atropellamientos de fauna de esta carretera.

PALABRAS CLAVES: ecología de carreteras; ecología urbana; Medellín; Valle de Aburrá; Valle de San Nicolás.

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ADIÇÕES AO ATROPELAMENTO VEICULAR MAMÍFEROS NA ESTRADA DO ESCOBERO, ENVIGADO (ANTIOQUIA), COLÔMBIA

RESUMO

O atropelamento veicular de fauna é um problema generalizado em todo o mundo, mas pouco estudado em estradas colombianas, especialmente em áreas suburbanas. Aqui é descrito a mortalidade de mamíferos, entre os anos de 2008 e 2013, na estrada do Escobero (Envigado, Antioquia). Os mamíferos mais atropelados foram os marsupiais (54,3 %), os carnívoros (25,7 %) e roedores (17,5 %). em geral se encontrou menor diversidade e um menor número de pessoas atropeladas que em anos anteriores na mesma estrada, se reporta um número maior de algumas espécies desconhecidas e ameaçadas de extinção, como *Oncilla*, *Jaguarundi* e *Olinguito neblina*. Este estudo também acrescentou três novas espécies à lista de atropelamentos da vida selvagem nesta estrada.

PALAVRAS-CHAVE: ecologia das rodovias; ecologia Urbana; Medellín; Aburrá Valley; o Vale de São Nicolau.

1. INTRODUCTION

Human activities and urban infrastructures have significant environmental impacts on natural ecosystems. Transportation has one of the greatest impacts not only due to the effects of the opening and construction of roadways, but also due to the constant traffic of automobiles, which causes chemical pollution, noise, and road kills of wild animals (Laurance, Goosem & Laurance, 2009).

The pollution and noise caused by cars and motorcycles negatively affect animals, but their use and abuse (in terms of speed, quantity, and frequency) do also, causing injuries and death for animals. This could eventually lead to the local disappearance of species and populations due to road kills (Laurance, Goosem & Laurance 2009).

As cities are founded, transform, and grow, the roadway infrastructure and its effects on animal life and associated ecosystems tend to increase. Road kills are one of the most evident of these effects (Delgado-V., 2007). However, this problem is ignored in urban and peri-urban areas.

Despite recent research efforts in Colombia (see Vargas-Salinas, Delgado-Ospina & López-Aranda 2011), the vehicular killing of wild animals is still a problem that is being ignored, especially in peri-urban areas of cities, since the majority of previous studies have been conducted in rural and natural areas far from urban cen-

ters. As such, we do not know which species are affected by this issue in and around Colombian urban areas.

On the southeastern slopes of the Aburrá Valley, there are some fragments of native forests which may be the most biodiverse ecosystems in the region (Delgado-V. 2009). Although these fragments are still home to part of the valley's natural fauna and flora, their conservation is uncertain. These forests are going through processes of degradation and isolation caused by deforestation and urbanization, as well as by the construction and extension of roadways, streets, and highways (Delgado-V. 2007).

On Vía Las Palmas and Vía del Escobero, two of the main highways that cross the southeastern slopes to connect the city of Medellín with the area to the east, several species of wild animals are killed by vehicles. On El Escobero, for example, so far 15 of 30 mammal species that have been registered in the sector have died on the highway (Delgado-V. 2007). This means 50% of registered mammal species are being hit by cars, among them worldwide endangered species like the *oncilla Leopardus tigrinus*.

The goals of this study are to determine temporal changes in the diversity and number of fatalities (considering the results of a previous study conducted for a similar period, 2000 to 2006, on the same highway) and document the points at which most animals are hit along the highway (not considered in the article by Delgado-V. [2007] published previously).

2. MATERIALS AND METHODS

Vía del Escobero, located to the southeast of the city of Medellín (Antioquia), in the jurisdiction of the municipalities of Envigado and El Retiro, is a stretch of pavement of approximately 11 km that connects Envigado with Vía Las Palmas. This highway has both two-way and one-way sections. It is also a highway with attractive landscapes and recreational areas, especially for cycling.

Different land uses can be observed along the slope from approximately 1,800 to 2,600 meters above sea level. Nature reserves like San Sebastián-La Castellana and La Morena are near the highway at its highest point.

A preliminary inventory of flora in this sector showed the primary intervened forest as the main plant cover, with dominant species including *Quercus humboldtii* (Fagaceae), *Schefflera arborea* (Araliaceae), *Ilex laurina* (Aquifoliaceae), *Weinmannia balbisiana* (Cunoniaceae), and *Hyeronima antioquiensis* (Euphorbiaceae). However, there are also homogenous patches of chusquea (*Chusquea* sp., Gramineae) and some exotic pine plantations (*Pinus patula*, Pinaceae) mixed with the native vegetation (Delgado-V., 2002).

Between 2008 and 2013, dead mammals were found dead on the highway. The data was compiled in sporadic rounds made by the author and by local naturalists, people who live in the area, and users of the highway, who compiled their observations and shared them with the author to be published on the platform <http://www.bicicletasparalabiodiversidad.org/registros-de-fauna-en-las-vias.html>, which contains other questions, fields such as Person's full name, photos of animal, town, and exact dates of the record.

For each animal found on the pavement, species, geographical location, and date of observation were noted. A large percentage (94.3%) of the bodies found could be reliably identified through direct examination or photo analysis. The specific determination of small rodents was not possible since few diagnostic characteristics remained in the cadavers.

In order to determine the spatial distribution of the animals hit by cars, the highway was divided into 11 stretches of approximately 1km, and each cadaver

located was assigned the corresponding segment of highway (**Table 1**).

The results obtained were discriminated by the record's year (from 2008 to 2013) and location (kilometer mark) (**Table 1**). Whenever the author recorded the animals, they were removed from the site in order to avoid being counted again.

With the goal of determining whether the number and diversity of animals killed by cars have changed, the results of this study were contrasted with a previous study conducted on the same highway between 2000 and 2006 (Delgado-V., 2007).

3. RESULTS AND DISCUSSION

Thirty-five individuals of at least 13 species of mammals were found dead on the highway. Marsupials (Didelphimorphia) (54.3%), carnivores (Carnivora) (25.7%), rodents (Rodentia) (17.5%), and rabbits (Lagomorpha) (2.9%) were the groups most often hit by vehicles (**Table 1**). This coincides with other studies that report that mammals are the most frequent victims on highways around the world (Smith & Dodd, 2003). As on El Escobero, marsupials, rodents, and carnivores are the groups most often hit on other South American highways (e.g. Pinowski, 2005).

The species that were hit in the greatest numbers were the common opossum *Didelphis marsupialis* (48.6%) and the oncilla *Leopardus tigrinus* (11.4%). The porcupine *Coendou rufescens*, the squirrel *Sciurus granatensis*, and unidentified mice were also hit (each representing 5.7% of the animals killed). To a lesser degree, the Andean white-eared opossum *Didelphis pernigra*, the water opossum *Chironectes minimus*, the western mountain coati *Nasuella olivacea*, the crab-eating fox *Cerdocyon thous*, the jaguarundi *Puma yagouaroundi*, the long-tailed weasel *Mustela frenata*, the olinguito *Bassaricyon neblina*, and the tapeti *Sylvilagus brasiliensis* were also found (each one representing 2.9% of the deaths).

From 2000-2006 (Delgado-V., 2007) a greater diversity of mammals was recorded (15 species), as well as a greater number of individual dead animals (58 individuals). Mammals that were not recorded between 2008 and 2013 are insectivores (Insectivora), dasypodidae (Xenarthra), and some marsupials (Didelphimorphia), but from 2008-2013 it is worrisome that there is

an increase in certain groups, especially felines (there is one case of jaguarundi and four more of oncillas), and that there are new additions to the list of mammals hit, such as *Chironectes minimus*, *Puma yagouaroundsi* (Arias-Alzate, Delgado-V., Ortega, Botero-Cañola & Sánchez-Londoño, 2013), and *Bassaricyon neblina*.

The increase in felines killed is worrisome especially in the case of the oncilla *L. tigrinus*, because

in addition to being a vulnerable species in Colombia (Rodríguez-Mahecha, Jorgenson, Durán-Ramírez, Bedoya-Gaitán, & González-Hernández 2006) and hardly known in Antioquia (Navarro, Hincapie & Silva, 2005), road kills of this species in the peri-urban of the Aburrá Valley are not only found on El Escobero, but also between other neighboring highways like Las Palmas (Delgado-V. et al., Obs. Pers). Another endangered species that has been found killed is the olinguito *B. neblina*.

Table 1. List of species and number of individuals killed by vehicles on the Vía del Escobero (Antioquia), Colombia, between 2008 and 2013. This list includes the kilometer on the highway where the cadavers were found (number of individuals in parentheses). The final two columns show the number of animals hit between 2000 and 2006 obtained by Delgado-V. (2007) and the differences in individuals between those years and this study.

| Taxonomy | Common name | Total number of individuals and years of record | Percentage | Stretch of highway | Number of individuals from 2000-2006 | Difference in road kills |
|------------------------------------|----------------------------|---|------------|---|--------------------------------------|--------------------------|
| Didelphimorphia | | | | | | |
| <i>Didelphis marsupialis</i> | Common opossum | 17 (2008-2013) | 48.6% | km3(5), 4(2), 5(1), 6 (5), 7(2), 9(1), 11 (1) | 12 | +5 |
| <i>Didelphis pernigra</i> | Andean white-eared opossum | 1 (2008) | 2.9% | km6 | 1 | 0 |
| <i>Chironectes minimus</i> | Water opossum | 1 (2013) | 2,9% | km5 | 0 | +1 |
| Carnivora | | | | | | |
| <i>Nasuella olivacea</i> | Western mountain coati | 1 (2013) | 2.9% | km7 | 7 | -6 |
| <i>Cerdocyon thous</i> | Crab-eating fox | 1 (2013) | 2.9% | km7 | 2 | -1 |
| <i>Leopardus tigrinus</i> | Oncilla | 4 (2007, 2010, 2011, 2012) | 11.4% | km6(2), 7(2) | 1 | +3 |
| <i>Puma yagouaroundsi</i> | Jaguarundi | 1 (2012) | 2.9% | km3 | 0 | +1 |
| <i>Mustela frenata</i> | Long-tailed weasel | 1 (2012) | 2.9% | km1 | 1 | 0 |
| <i>Bassaricyon neblina</i> | Olinguito | 1 (2013) | 2.9% | km4 | 0 | +1 |
| Rodentia | | | | | | |
| <i>Sciurus granatensis</i> | Squirrel | 2 (2008, 2013) | 5.7% | km1(2) | 4 | -2 |
| Pequeños roedores no identificados | Mouse | 2 (2008) | 5.7% | km3, 7 | 12 | -10 |
| <i>Coendou rufescens</i> | Porcupine | 2 (2012-2013) | 5.7% | km6, 8 | 2 | 0 |
| Lagomorpha | | | | | | |
| <i>Sylvilagus brasiliensis</i> | Tapeti | 1 (2013) | 2.9% | km6 | 2 | -1 |

The present study and the previous one (Delgado-V., 2007) should be taken as complementary projects that work toward an understanding of peri-urban road kills. Both studies show that animals are still killed on this roadway and that the problem affects some species to a greater degree.

In Colombia, few highway ecology studies have been conducted. The most important efforts in the country have been focused on reptiles and amphibians (Quintero-Ángel, Osorio-Dominguez, Vargas-Salinas & Saavedra-Rodríguez, 2012) (Vargas-Salinas, Delgado-Ospina & López-Aranda, 2011), but there are no data to make comparisons with mammals hit and killed on other highways. However, it is suspected that El Escobero is one of the highways with the greatest number and diversity of mammals killed in a peri-urban area.

It is worrisome that more than 50% of the diversity of earthbound mammals in the area is hit on El Escobero (Delgado-V., 2009). This may be due to the fact that near the highway is one of the most diverse areas between the Aburrá and San Nicolás Valleys (Delgado-V., 2009). This region borders the highway and is also highly influenced by urbanization, a phenomenon that fragments and deteriorates original ecosystems.

As occurs on other South American highways, the registry of new species hit and the number of certain groups (especially felines) may be due to several factors; among them, the increase in automobile traffic and changes in land use (Seijas, Araujo-Quintero & Velásquez, 2013), or a combination of these. However, there is no systematic study that allows us to better understand the local reasons and causes or efficient mitigation measures.

It is unclear why some species registered by Delgado-V. (2007) do not appear in this study (including insectivores, armadillos, and certain marsupials). It is suspected that this is due to various factors, such as the species being eradicated from the area, avoidance of the highway, and lack of observations by the roadway's users (see Vargas-Salinas & López-Aranda, 2012), but this note cannot determine the concrete reasons for this situation.

The differences in mammal diversity between the studies may also be intrinsic to the methodology. While in the study by Delgado-V. (2007) a large percent-

age (76%) were collected by the author, the majority of the data in this case were shared by residents and highway users who recorded observations of medium-sized mammal cadavers, which are usually conspicuous (especially if they have been recently hit). However, more careful observations are required in order to see smaller mammals given that these victims are more difficult to see on the highway.

Initial mitigation measures were recently established for El Escobero such as road signs (Delgado-V., 2007) warning of animals crossing at some points on the highway (Delgado-V., Obs. Pers.). However, the effectiveness of these signs is unknown, partly because some of them may not coincide with the points at which collisions are most frequent. The possibility of implementing a passage for animals must also be considered. Along the highway, there are some waterways and sewage systems that connect one side of the highway to the other; these could be evaluated as possible animal passages for different groups of vertebrates.

Finally, the numbers are too few and sporadic in time to detect a definite pattern of deaths or sites where animals are most frequently hit along the highway due to the season or vehicle traffic (e.g. during the week and on weekends; during the night and during the day; or in summer and winter). However, kilometer six (with 10 individuals of 5 species hit), seven (with 7 individuals of 5 species), and three (with 7 individuals of 3 species) (**Table 1**) stand out as some of the sectors on the Vía del Escobero with the highest number of animals hit. The author suggests concentrating monitoring efforts and conducting more systematic studies to corroborate road kills in these areas with regards to other stretches of road.

4. CONCLUSIONS

This contribution is a description of mammals hit on the Vía del Escobero. Although in general a lower degree of diversity and a lower number of individuals hit was found compared to previous years, this study reports greater number of unknown species and endangered species such as *Leopardus tigrinus*, *Puma yagouaroundi*, and *Bassaricyon neblina*, which are also new additions to the list of animals hit on this highway.

No study has been performed that systematically collects mammals and other groups of vertebrates killed by cars and that understands the effect of this problem and the most affected areas of Vía del Escobero. The author hopes this article will motivate completion of a larger project that will be useful in understanding and mitigating the problem on this roadway and other nearby highways.

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