Revista Brasileira de Gestão Ambiental e Sustentabilidade (2022): 9(22): 973-979.
ISSN 2359-1412
https://doi.org/10.21438/rbgas(2022)092228

Felidae (Carnivora) as roadkill on highway in the Semiarid Region of Northeast Brazil

Erly de Lima Ferreira[1], Arthur Albuquerque Pereira[1], Carlos Danillo Claudino dos Santos[1], Silvio Felipe Barbosa Lima[1,2,3,4] and Luana Marina de Castro Mendonça[5]

[1]Federal University of Campina Grande. Teacher Training Center. Academic Unit of Exact and Natural Sciences. Rua Sérgio Moreira de Figueiredo, S/No. Casas Populares. Cajazeiras-PB, Brazil (CEP 58900-000).
[2]Federal University of Paraíba. Exact and Natural Sciences Center. Department of Systematics and Ecology. Post-Graduate Program in Biological Sciences (Zoology). *Campus* I. Cidade Universitária. João Pessoa-PB, Brazil (CEP 58051-900).
[3]Federal University of Paraíba. Center for Applied Sciences and Education. Post-Graduate Program in Ecology and Environmental Monitoring. Rua Mangueira, S/No. Centro. Rio Tinto-PB, Brazil (CEP 58297-000).
[4]Regional University of Cariri. Center for Biological and Health Sciences. Post-Graduate Program in Biological Diversity and Natural Resources. Pimenta. Crato-CE, Brazil (CEP 63105-000). Email: sfblima@gmail.com.
[5]Federal University of Alagoas. Institute of Biological and Health Sciences. Avenida Lourival Melo Mota, S/No. Tabuleiro do Martins. Maceió-AL, Brazil (CEP 57072-900).

Abstract. The death of wild vertebrates by roadkill on highways in Brazil mainly threatens endangered fauna. The aim of the present study was to report roadkill deaths of endangered felids on the PB-400 highway between the Municipalities of Cajazeiras and Monte Horebe, in the State of Paraíba, Northeast Brazil. Two individuals of *Herpailurus yagouaroundi* and one of *Leopardus tigrinus* were found, which are respectively listed as vulnerable and endangered. These results show the need for actions by the government and civil society for better management regarding the conservation of wild medium-sized felines and mitigating actions to avoid the death of wild fauna on highways.

Keywords: Caatinga; Conservation; Ecology Road; Mammals.

Resumo. ***Felidae* (*Carnivora*) *atropelados em rodovia no alto sertão do semiárido brasileiro***. A morte de vertebrados silvestres por atropelamento em rodovias no Brasil ameaça principalmente a fauna em risco de extinção. O objetivo deste estudo foi reportar a morte por atropelamento de felídeos ameaçados na rodovia PB-400 entre os Municípios de Cajazeiras e Monte Horebe, no Estado da Paraíba, Nordeste do Brasil. Dois indivíduos de *Herpailurus yagouaroundi* e um de *Leopardus*

Received
July 25, 2022

Accept
August 20, 2022

Released
August 31, 2022

Open access

tigrinus atropelados foram encontrados e estão listados como vulneráveis e ameaçados de extinção, respectivamente. Tais resultados mostram a necessidade de ações governamentais e da sociedade civil tendo em vista uma melhor gestão na conservação de felídeos de médio porte para evitar a morte da fauna silvestre em rodovias.

Palavras-chave: Caatinga; Conservação; Ecologia de Estradas; Mamíferos.

ORCID
0000-0003-0074-1231 Erly de Lima Ferreira
0000-0002-9062-0400 Arthur Albuquerque Pereira
0000-0002-1366-4119 Carlos Danillo Claudino dos Santos
0000-0001-7892-5773 Silvio Felipe Barbosa Lima
0000-0002-0302-4046 Luana Marina de Castro Mendonça

Introduction

The construction of roads and highways causesthe destruction and fragmentation of habitats, leading to the isolation of natural populations and a reduction in gene exchange. The edge effect alters the structure of the forest community. Fragmentation also increases the likelihood of the introduction of invasive species and pathogens and leads to greater interactions between wildlife and humans. The death of wild animals truck by motor vehicles is the main negative anthropogenic impact leading to the loss of terrestrial biodiversity (Trombulak and Frissell, 2000).

Wild animals are more vulnerable to roadkill due to their active habits (Orlandin et al., 2015). Estimates suggest that approximately 473,000,000 vertebrates are killed each year by motor vehicles on Brazilian highways. Small animals are by far the most affected, followed by medium-sized and large vertebrates (CBEE, 2020).

Felids are among the most threatened mammals due to motor vehicle incidents on roads and highways in Brazil (Corrêa et al., 2017; Abra et al., 2021; Pereira et al., 2021). The jaguarundi *Herpailurus yagouaroundi* (É. Geoffroy Saint-Hilaire, 1803) is a small, dark brown feline and one of the most sighted species due to its preference for open areas and its diurnal habits (Oliveira et al., 2010; Oliveira, 2011; Almeida et al., 2013). The Northern tiger cat *Leopardus tigrinus* (Schreber, 1775) is the smallest wild felid in Brazil, has predominantly nocturnal-twilight habits and is one of the most killed species by motor vehicles in the country (ICMBio, 2018; Abra et al., 2021;Cerqueira et al., 2021).

Both felids have a wide distribution in South America, especially in the Northern and Central Western Regions of Brazil (Bumstead et al., 2004; ICMBio, 2018). The main threat to *H. yagouaroundi*, *L. tigrinus* and other wild felids is habitat fragmentation due to agricultural expansion. However, hunting, the burning of forests and roadkill incidentes also cause the death of a considerable number of individuals (Santos et al., 2004; Michalski and Peres, 2005; ICMBio, 2018).

The aim of the present work was to report the occurrence of *H. yagouaroundi* and *L. tigrinus* killed on a highway in the Semiarid Region of the State of Paraíba, in Northeast Brazil, contributing knowledge on roadkill incidents involving wild fauna as well as the geographic distribution of these species in the Semiarid Region of Brazil.

Material and methods

PB-400 state highway is 102 km in length and connects the Municipalities of Cajazeiras to Conceição in the State of Paraíba, Northeast Brazil. The highway is located in the Semiarid Region, which has a predominantly warm, dry, tropical climate, with temperatures ranging from 12 °C to 30 °C and annual rainfall ranging from 201.3 to 1,561.3 mm (Araújo et al., 2005; Francisco and Santos, 2017).

The felids studied were found on March 27, 2020, March 15, 2021 (*H. yagouaroundi*) and March 15, 2021 (*L. tigrinus*) on the stretch of the PB-400 highway between the Municipalities of Cajazeiras (06° 53' 24" S, 38° 33' 43" W) and Monte Horebe (07° 12' 54" S, 38° 35' 09" W). The individuals were located through active searches during the morning period on weekdays using a motorcycle at an average speed of 60 km/h. The individuals were photographed *in situ* and subsequently identified.

Three felids were found on a stretch of the PB-400 highway in the Semiarid Region of the State of Paraíba, Brazil, over a year of systematic monitoring of wild roadkill. Members of the Order Carnivora and suborder Feliformia are among the main mammals threatened with extinction due to negative human impacts on the environment, including vehicular traffic, which causes roadkill (Cáceres, 2011; Freitas et al., 2015), especially in the Southern and Central Western regions of the country (Abra et al., 2021; Pereira et al., 2021).

Results and discussion

The felids studied were one individual of *L. tigrinus* (Figure 1-1) and two individuals of *H. yagouaroundi* (Figure 1-2, 1-3). All three animals were freshly dead and the bodies were in an excellent state of preservation. The individuals appeared to have been healthy, with a good nutritional status. The animals died due to an impact to the head, causing skull fractures in multiple locations, jaw fractures and perforation of the skin by the bones of the skull and teeth. Bruises were also found on one individual of *H. yagouaroundi*.

H. yagouaroundi and *L. tigrinus* are commonly recorded in monitoring studies of wild fauna run over on highways in Brazil and other parts of South America (Cherem et al., 2007; Weiss and Vianna, 2012; Preuss, 2015). However, these felids are among the least abundant large mammals in roadkills in the States of Pernambuco and Paraíba (Northeast Region of Brazil), Goiás (Central West Region), Espírito Santo (Southeast Region), Santa Catarina and Rio Grande do Sul (South Region) (Cherem et al., 2007; Martinelli and Volpi, 2011; Hegel et al., 2012; Corrêa et al., 2017; Miranda et al., 2017; Ramos-Abrantes et al., 2018). In contrast, Weiss and Vianna (2012) found a considerable number (16 individuals) of *L. tigrinus* roadkill in a survey of the impact of federal highways BR-376, BR-373 and BR-277 on wild animals in the stretch between Apucarana and Curitiba, in the State of Paraná (South Region). Preuss (2015) also found a considerable number (11 individuals) of *H. yagouaroundi* roadkill in a stretch of the BR-282 in the Western portion of the State of Santa Catarina (South Region).

The individuals studied were likely run over at night during movements between fragments of vegetation. These mammals travel long distances between interconnected forest fragments as well as over sugarcane, soybean and corn plantations in search of food (Almeida et al., 2013). *H. yagouaroundi* is nocturnal, but also exhibits diurnal activity and may be found in a variety of habitats (successional and primary tropical to subtropical rainforests, the edges or interior of dense forests and shrubbery) feeding mainly on birds, reptiles and small rodents (Oliveira, 1998).

Figures 1. Felids killed by motor vehicles on the PB-400 highway between the Municipalities of Cajazeiras and Monte Horebe in the Semiarid Region of the State of Paraíba, Northeast Brazil. **1**. *L. tigrinus* on the highway in the Municipality of Monte Horebe; **2**. *H. yagouaroundi* on the highway between Municipalities Cajazeiras and São José de Piranhas; **3**. *H. yagouaroundi* on the highway in the Municipality of São José de Piranhas.

According to the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN), *H. yagouaroundi* is considered a species of least concern internationally (Caso et al., 2015), but is considered vulnerable in Brazil (Brasil, 2022). *L. trigrinus* is recognized as vulnerable internationally (Payan and Oliveira, 2016), but considered endangered in Brazil (Brasil, 2022).

Roadkill can place substantial pressure on threatened species, especially those with a life-history of few offspring and extensive parental care (K-strategists) (Barros et al., 2016). *H. yagouaroundi* is one of the most common wild felids in Brazil, but can be considered a rare species in comparison to other mammals. The low population density of

the species makes roadkill events a determining factor of the decline in the number of individuals in certain regions of the country (Almeida et al., 2013).

Conclusion

Roadkill may be an important factor contributing to the extinction rare species, endangered species and those with K-strategist population dynamics. The records presented here contribute knowledge on wild animals killed by motor vehicles, especially on stretches of highway connecting municipalities in the semiarid region (Caatinga Biome) of the State of Paraíba, Northeast Brazil. These findings underscore the need for more research focused on the conservation status, management and environmental monitoring of local and regional fauna killed by motor vehicles.

Acknowledgments

Erly L. Ferreira and Carlos D. C. Santos are grateful to the CNPq (Process No. 104218/2021-5) for the Scientific Iniciation Scholarship.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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