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Ectoparsites from Wild Animals Run Over on Brazilian Roads

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Abstract

Anthropization of natural habitats is one of the main causes of biodiversity loss, causing profound changes in these environments. Among these changes, one that generates an important environmental impact is the implementation of highways, which leads to deforestation and consequently an alteration of the natural landscape. The construction of highways generates direct impacts on wildlife, modifying the structure and dynamics of ecosystems. The running over of wild animals is the main cause of vertebrate mortality through human action. One of the reasons for the increase in demand for new roads is the growth of cities, resulting in severe ecological impacts and bringing wild animals closer to the man and domestic animals. The present study aimed to investigate the presence of ectoparasites in wild animals run over on highways in the State of São Paulo. Of 36 animal's investigueted, 11 were infested with ectoparasites, ten were infested exclusively by ticks and one by ticks and lice. Almost all of the animals that presented ectoparasites were mammals, with the exception of one terrestrial bird. Ticks of the species *Amblyomma dubitatum*, *Amblyomma nodosum*, *Amblyomma ovale*, *Amblyomma sculptum*, *Rhipicephalus microplus* and a louse of the species *Solenopotes binipilosus* were collected.

Keywords: *Amblyomma*; *Rhipichephalus*; Ticks; Lice; Wild Animals

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Introduction

Human action in natural habitats is one of the main causes of biodiversity loss [1], significantly altering natural environments [2]. In tropical regions, there is a global loss of biodiversity due to human activities [3].

Among the activities that have a major impact on the natural environment, we have the implementation of highways as a major modifier, generating a change in the natural landscape due to deforestation. Approximately 85% of vegetation loss occurs within fifty kilometers of the highway limit [4].

Highways generate direct impacts on wildlife, modifying the structure and dynamics of these animals' ecosystems, such as, for example, an increase in collisions with vehicles during their natural movement processes [5]. The running over of wild animals is the main cause of vertebrate mortality through human action [6]. According to estimates by the Brazilian Center for Road Ecology, every year 475 million wild animals die on Brazilian roads.

Ectoparasites are arthropods belonging to the classes Arachnida and Insecta, and are represented by mites, ticks and some groups of insects. It has diverse eating habits and can parasitize mammals, birds, reptiles and amphibians. They can affect human and animal health by being vectors or intermediate hosts of several pathogens, in addition to causing dermatitis, damage to epithelial tissue, hypersensitivity and anemia due to their eating habits, such as hematophagy [7].

Currently, there are more than 950 species of ticks in the world, and in Brazil we have records of approximately 80 of them [8]. The *Amblyomma* genus is the one with the greatest diversity of species in the Neotropical Region and the one of greatest health concern, as it has species that are vectors of pathogenic agents, such as the bacterium *Rickettsia rickettsii*, which causes Brazilian Spotted Fever (SANGIONI et al, 2005).

Fleas are wingless insects belonging to the order Phthiraptera and are represented by around 5 thousand species worldwide. They are highly specific and obligate ectoparasites of birds and mammals. Some hematophagous species are capable of transmitting disease-causing pathogens [7].

Different studies related to the detection of pathogens transmitted by ectoparasites in wild animals, have already been carried out In Brazil. The objective of this study was to investigate the presence of ectoparasites in wild animals run over on Brazilian highways.

Materials and Methods

Samples of ectoparasites from 11 wild animals that were run over between 2021 and 2022 on the SP-225, SP-327 and SP-270 highways in the state of São Paulo, Brazil were investigated in this study. These samples were obtained through a donation by the company Via Fauna. All ticks were preserved in absolute ethanol until analyses.

The identification of ectoparasites was based on morphology using specific identification keys for each of the groups collected [9-12].

Results

Eleven wild animals were infested with ectoparasites, ten of these were infested exclusively by ticks and one by ticks and lice. Almost all of the animals that presented ectoparasites were mammals, with the exception of a terrestrial bird of the species *Cariama cristata*.

A total of 106 ticks were collected, 21 (19.8%) nymphs and 85 (80.2%) adults [46 (54.1%) males and 39 (45.9%) females]. Of these, 105 belong to the genus *Amblyomma,* of the species *Amblyomma dubitatum* (12), *Amblyomma nodosum* (26), *Amblyomma ovale* (1), *Amblyomma sculptum* (65), *Amblyomma* sp. (2) and a single specimen of the species *Rhipicephalus microplus*. Three specimens of lice of the species *Solenopotes binipilosus* were collected from *Mazama* sp. (Table 1).

The tick species *A. sculptum* was found parasitizing three *Hidrochoerus hydrochaeris* and a *Myrmecophaga tridactyla*. Mixed infestation by ticks of the species *A. dubitatum* and *A. sculptum* were recorded in two *H. hydrochaeris*, and infestation by *A. nodosum* and *A. sculptum* in a *M. tridactyla*.

Specimens of *A. nodosum* were collected in four *Myrmecophaga tridactyla* and one *Tamandua tetradactyla*, and only one female of *A. ovale* was collected on *Procyon cancrivorus*. A specimen of *Mazama* sp. was parasitized by ticks of the species *R. microplus* and by lice *S. binipilosus*. And in the only bird infested with ectoparasites, two tick nymphs of the genus *Amblyomma* were found (Table 1).

Discussion

In the present study, a total of five tick and a lice species were collected from roadkill wild animals. The ticks speceis *A. sculptum* was far the most abundant species, with 65 specimens (61.3 % of all ticks collected) collected from four individuals of two mammalian species.

Two of the three specimens of *H. hydrochaeris* examined were infested with *A. dubitatum* and *A. sculptum* and the third one only with *A. sculptum*. Although the capybara is considered the main host of *A. dubitatum* [13], in southeastern Brazil, infestation of these rodents with both tick species is relatively common [14,15]. Also in this region, high environmental infestations by *A. sculptum* are associated with the presence of horses and capybaras that are hosts of the adults of this tick [16,17].

One of the four specimens of *M. tridactyla* examined was parasitized by adults of *A. nodosum* and *A. sculptum*, and the number of specimens of the latter tick species exceeding more than seven times that of the former.

The finding of *A. ovale* in carnivores such as *P. cancrivorus* is not an unusual record, since the species has this group of mammals, mainly canids, as its preferred hosts [18]. The same for *M. tridactyla* and *T. tetradactyla*, from which specimens of *A. nodosum* were collected, and whose adult stage parasitizes almost exclusively this group of mammals [19-28].

A specimen of *Mazama* sp. was infested by *R. microplus*, a species of tick that parasitizes cattle [29], recorded the occurrence of the tick species *R. microplus*, *D. nitens* and *A. sculptum* parasitizing free-living *M. gouazoubira* in the state of Minas Gerais, Brazil.

In the same specimen of *Mazama* sp. which was parasitized by *R. microplus*, lice of the species *S. binipilosus* were found. Cervids are its usual hosts and its distribution is restricted to the American continent, occurring in North, Central and South America [30]. In South America, it was recorded in Argentina parasitizing *M. gouazoubira* and *M. americana* [31], in Chile on *Pudu puda* and *Hippocamelus bisulcus* [32,33] and in Peru on *Odocoileus virginianus peruvianus* [34].

In Brazil, there is a single report of specimens of *S. binipilosus* parasitizing *M. gouazoubira* in Minas Gerais [35], but these data are part of the results of a doctoral thesis that, to date, has not been published. Parasitism in *Mazama* sp. registered in this study is the second record for the country and the first for the state of São Paulo.

Conclusions

Parasitism of ticks from domestic animals to wild animals was observed in this sudy, indicating that the latter are probably moving through areas where domestic animals are. Thus increasing the risk of transmission of agents between wild and domestic animals.

The results of this study reinforce the relevance of research into arthropod parasites of wild animals, and may even serve as an alert to the presence of ectoparasites that vector pathogenic agents, such as *A. sculptum*, found parasitizing capybaras and anteaters. In the ectoparasite samples analyzed, it was possible to observe the low specificity of *A. sculptum* in relation to its hosts.

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