Ticks (Acari: Ixodidae) and lice (Phthiraptera: Trichodectidae) infesting free-living coatis (Nasua nasua Linnaeus, 1766) with sylvatic and synanthropic habits in the Atlantic rainforest of Southern Brazil

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Abstract

This research describes the infestation by ticks and lice in free-living coatis (Nasua nasua Linnaeus, 1766) with sylvatic and synanthropic habits living at the Iguacu National Park (INP), state of Parana, southern Brazil. During the months of September 2014 and from March to April 2015, ticks and lice were collected from 86 free-living coatis from INP. Among the animals analyzed, 99% (85/86) were infested with ectoparasites, Amblyomma spp. larvae (n=23), nymphs of Amblyomma brasiliense (n=77), Amblyomma coelebs (n=427) and Haemaphysalis juxtakochi (n=6) being observed, as well as Amblyomma ovari adults (n=46). Lice were found in lower prevalence (13%, 11/86), nymphs (n=31) and adults (n=9) of Neotrichodectes pallidus. Summary results show feral coatis with sylvatic and synanthropic habits as competent hosts for ixodid ticks and lice, arthropods responsible for the transmission of pathogens for carnivores, others wildlife and humans. This paper presents the first record of H. juxtakochi infesting coatis in Brazil.

Key words: Procyonidae, Ticks, lice, Atlantic forest, Iguacu National Park, Brazil

Introduction

Ticks, lice, and fleas are considered the main arthropods infesting animals. These ectoparasites are important not only because they suck blood and/or cause epithelial lesions in hosts, but also because of the ability some species have to transmit pathogens to animals, including humans (Tuff 1977, Linardi & Guimarães 2000, Barros-Battesti et al. 2006). Wild animals present a substantial diversity of species of ectoparasites (Barros-Battesti et al. 2006), although not much is known about the eco-epidemiology of such infestations in different regions of Brazil.

The Iguacu National Park (INP) is one of the largest conservation areas of the Atlantic forest, comprising 457,794 acres. It comprises the Iguacu Falls (Cáceres 2011), receiving annually around 1.5 million visitors from many regions of the world (ICMBio 2016). INP has a very diverse fauna, deserving highlight mammals such as the jaguar, tapir, coati, deer, agouti, and the collared peccary, among other species. The coatis (Nasua nasua Linnaeus, 1766) are carnivores from the Procyonidae family, widely distributed all over South America, and it is one of the species presenting the largest synanthropy in the areas of visitation at the INP, especially near the viewpoint of the Iguacu falls (Cáceres 2011).
The knowledge about the dynamics of the infestation by ectoparasites in coatis is important, since it establishes the role of this species as the host of different ectoparasites, including the ones transmitting pathogens to other animals and to humans living in the same habitats. Thus, this study has the purpose of describing the infestation with ticks and lice in coatis with sylvatic and synanthropic habits in the areas of visitation at the INP, in the state of Parana, south of Brazil.

Material and methods

The animals analyzed in this research were randomly sampled from the touristic visitation area at INP, located in the city of Foz do Iguaçu, state of Parana, south of Brazil. The samples comprise the Iguaçu Falls viewpoint (25°41′03″S, 54°26′24″W, with a total length of around 1.2 km) and the access to two trails inside the forest (25°39′05″S, 54°26′16″W and 25°37′36″S, 54°27′39″W). During the month of September 2014, and from March to April 2015, totaling 42 days of collection in the morning and in the afternoon, ticks and lice were collected from free-living coatis. The animals were attracted with a bait of peanut butter and were captured actively with a hand net. After holding them manually, the coatis were anesthetized with a combination of tiletamine and zolazepam (zolotil 50\(^6\), 7mg/Kg dose) and xylazine 2% (2mg/Kg), via intramuscular injection. All coatis analyzed were identified with numbered ear tags to avoid recapture. After recovered from anesthesia, the animals were reintroduced in their original habitats. Road-killed coatis at the BR-469 highway, which runs inside the park, were also analyzed.

The ticks and lice were searched across the body surface of the animals, collected manually, preserved in isopropanol, and sent to the laboratory for analyses. The taxonomic identification of the ticks was carried out in a stereomicroscope (Olympus\(^a\) SZX16, program cellSens 1.12), based on their morphologic aspects, as per Barros-Battesti et al. (2006) for adults, as per Cooley (1946) and Kohls (1960) for Haemaphysalis nymphs, and as per Martins et al. (2010) for Amblyomma nymphs. Larvae from ticks were identified only at their genus level, since in Brazil there is no literature for specific identification. Lice were clarified with a mix of potassium hydroxide 10% and identified in an optical microscope (Olympus BX45\(^b\)) based on Tuff (1977) and compared with Werneck’s (1936) description. The parasites ecology parameters were calculated according to Bush et al. (1997). After identified, the species of ticks and lice were deposited at the collection “Colecção de Artrópodes Vetores de Importância na Saúde das Comunidades” (Collection of Aptera Vector Arthropods of Importance in the Health of Communities) of the Oswaldo Cruz Institute (CAVAISC – FIOCrux), in Rio de Janeiro, with deposit numbers CAVAISC-IXO 2424 at 2429 for ticks, and CAVAISC-PHT 190 and 191 for lice. Other ectoparasites such as fleas and mites were not considered for this study.

The capture of these animals and the research of ectoparasites were authorized by the Chico Mendes Biodiversity Institute (ICMBio), through the Sistema de Autorização e Informação em Biodiversidade (SISBio, Authorization and Information on Biodiversity System), number 43614-2. The research was also approved by the research ethics committee at the Federal Rural University of Rio de Janeiro (UFRRJ), number 058/2014.

Results and discussion

Samples of 86 free-living coatis from the INP (84 captured, 2 road-killed) were collected, totalizing 619 ectoparasites, among ticks (n=579) and lice (n=40). These coatis were infested by Amblyomma spp. larvae, nymphs of Amblyomma brasiliense, Amblyomma coelebs and Haemaphysalis
justakochi, as well as Amblyomma ovale adults. Lice were found in lower prevalence, being nymphs and adults of Neotrichodectes pallidus. The prevalence and ecological parameters of the infestation are presented in Table 1.

The coatis analyzed presented high prevalence (99%) and abundance (7.2) of infestation by ectoparasites, mainly represented by ticks, which corresponded to 93% of the total ectoparasites obtained. The most abundant species of ticks and the one that has also infested most of the animals was Amblyomma coeles Neumann, 1899, suggesting that coatis have an importance for the ecology of this species of tick at the INP.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Stage</th>
<th>Number of parasites</th>
<th>Prevalence (+/-)</th>
<th>Mean intensity ± SD</th>
<th>Mean abundance ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ixodida</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amblyomma sp.</td>
<td>Larvae</td>
<td>23</td>
<td>14% (12/86)</td>
<td>1.9±1.3</td>
<td>0.3±0.8</td>
</tr>
<tr>
<td>Amblyomma brasiliense</td>
<td>Nymph</td>
<td>77</td>
<td>45% (39/86)</td>
<td>2.0±1.0</td>
<td>0.9±1.2</td>
</tr>
<tr>
<td>Amblyomma coeles</td>
<td>Nymph</td>
<td>427</td>
<td>96% (83/86)</td>
<td>5.1±4.5</td>
<td>5.0±4.5</td>
</tr>
<tr>
<td>Haemaphysalis justakochi</td>
<td>Nymph</td>
<td>6</td>
<td>6% (5/86)</td>
<td>1.2±0.4</td>
<td>0.1±0.3</td>
</tr>
<tr>
<td>Amblyomma ovale</td>
<td>Adult</td>
<td>46(22, 24)</td>
<td>23% (20/86)</td>
<td>2.3±2.5</td>
<td>0.5±1.5</td>
</tr>
<tr>
<td>Phthiraptera</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neotrichodectes pallidus</td>
<td>Nymph, Adult</td>
<td>40(31n, 6, 3)</td>
<td>13% (11/86)</td>
<td>3.6±2.6</td>
<td>0.5±1.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>619</td>
<td>99% (85/86)</td>
<td>7.3±6.1</td>
<td>7.2±6.1</td>
</tr>
</tbody>
</table>

+/-: infested animals/total. SD: Standard deviation.

In Brazil, previous records of the infestation by ticks in coatis report a parasitism by Amblyomma aureolatum (Pallas, 1772), A. brasiliense Aragão, 1908, Amblyomma cajennense Fabricius, 1787, A. coeles Neumann, 1899, Amblyomma humeral Koch, 1844, Amblyomma naponense (Packhard, 1869), Amblyomma oblongoguttatum Koch, 1844, Amblyomma ovale Koch, 1844, Amblyomma parvum Aragão, 1908, Amblyomma rotundatum Koch, 1844, Amblyomma sculptum Berlese, 1888, Amblyomma tigrimum Koch, 1844, Ixodes loricatus Neumann, 1899, and Amblyomma spp. larvae (Aragão 1936, Barros & Baggio 1992, Pereira et al. 2000, Arzua et al. 2005, Labruna et al. 2005a, Rodrigues et al. 2006, Acosta et al. 2016, Witter et al. 2016). It is important to highlight the occurrence of A. ovale infesting coatis from the INP, a species of tick that usually infests carnivores (Labruna et al. 2005a) and which is the vector of Rickettsia parkeri Lackman et al., 1965 strain Atlantic forest, an etiologic agent from a rickettsioses recently described as important to humans (Szabó et al. 2013). This paper also reports on the infestation of coatis by Haemaphysalis justakochi Cooley, 1946, a species in which Labruna et al. (2005b) isolated the Rickettsia rhipicephali Burgdorfer et al., 1978 bacteria in the state of Rondonia, in the Brazilian Amazon.

A. coeles, A. brasiliense Aragão, 1908, and A. ovale were recently registered infesting coatis from the Iguazu National Park, in Puerto Iguazu, Argentina (Lamattina et al. 2014). Although this area is physically separated from the INP by the Iguazu River, similarities between the fauna of ectoparasites from both areas could be observed. This can be explained by the similarity of the climatic and environmental conditions of both parks, such as temperature, humidity and rainfall levels, as well as by the co-occurrence of species hosting adult forms of these ticks, that is, tapirs (Tapirus terrestris Linnaeus, 1758), peccaries (Pecari tajacu Linnaeus, 1758, Tayassu pecari Link, 1795 and carnivores, respectively (Barros-Battesti et al. 2006).

Unlike what was reported in Argentina by Lamattina et al. (2014), in the present study there were observed infestations with nymphs of H. justakochi, a species whose adults infest mammals of
the Cervidae family (Barros-Battesti et al. 2006), such as Mazama americana Erxleben, 1777 (Jones et al. 1972), and Mazama nana Hensel, 1872 (Martins et al. 2007). Immature forms of H. justakochi can parasitize birds such as Pyrrhocoma ruficeps Strickland, 1844 (Arzua et al. 2005) and Harpia harpyja Linnaeus, 1958 (Labruna et al. 2010), as well as mammals such as rodents, primates, tapirs, and peccaries (Jones et al. 1972). Although H. justakochi nymphs have been reported parasitizing coatis in Panama (Fairchild et al. 1966), this is the first report of this species infesting coatis in Brazil.

Less prevalent and abundant (13%; 0.47), infestation by Neotrichodectes pallidus (Piaget, 1880) lice was observed, different from the observations made by Rodrigues et al. (2006). This study was carried out in the Atlantic forest area in the city of Juiz de Fora, state of Minas Gerais, Brazil, where this species was observed in 52.6% (10/19) of the coatis and in higher abundance (3.21) than the one from this present work. These data suggest that the coatis analyzed in the Atlantic forest of Juiz de Fora have an epidemiologic role which is more important to the maintenance of lice than the coatis from the INP, which, in turn, have been more important to the maintenance of ticks of the genus Amblyomma, because of their high prevalence, intensity, and parasitical abundance.

Coatis with sylvatic and synanthropic habits in the touristic areas of the INP are highly infested with ectoparasites, mainly by ticks, acting as hosts and dispersers of ticks vectors, such as A. ovale and H. justakochi.

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References


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http://dx.doi.org/10.2307/3275499


http://dx.doi.org/10.1007/s10493-005-2563-1


http://dx.doi.org/10.1016/j.vetpar.2004.09.024


http://dx.doi.org/10.1590/S1984-29612010000300014


http://dx.doi.org/10.1007/s11315-014-0047-8


http://dx.doi.org/10.1590/S1984-29612007000300012


http://dx.doi.org/10.1016/j.ttbdis.2010.03.002


http://dx.doi.org/10.1603/0022-2585-37.6.979


http://dx.doi.org/10.1590/S0102-09352006000500043


http://dx.doi.org/10.1017/S0031182120002065


http://dx.doi.org/10.1016/j.ttbdis.2015.12.019

https://doi.org/10.1590/S0074-02761936000300001

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