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Original Article

Phoretic mites (*Rhinoseius* spp.) in Apodiformes from Cerrado and Pantanal Biomes in midwestern Brazil

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Abstract

Nasal mites are commonly found in hummingbirds (Apodiformes). In most cases, endoparasitic mites were reported to parasitize the respiratory system, particularly the anterior nasal chambers, larynx, trachea, lungs, and the air and conjunctival sacs. However, some mites are only carried by hummingbirds, because flowers serving as a nutrient source for these small mites, such as for Apodiformes, a tropical nectar-feeding in their natural habitat. From August 2012 to May 2014, humminbirds were captured using mist nets, and examined for the presence of nasal mites (identified according to specific keys) in the Pantanal, and Cerrado biomes, from the Mato Grosso state, midwestern Brazil. Overall, 76 Apodiform specimens, from the Trochilidae family were captured, and 20 female nasal mites, identified as being from the *Rhinoseius* genus, were collected from eight hosts (10.5%), of the following species: *Amazilia fimbriata*, *Amazilia versicolor*, *Eupetonema macroura*, and *Thalurania furcata*. The *Rhinoseius* spp. has been reported on, in many ecosystems in the Americas, including Brazil, however, this is the first report on Apodiformes from the Pantanal biome. Phoretic mites are not responsible for direct damage to the population of Apodiformes, as they are not pathogenic. However, they compete for food with hummingbirds and decrease the quantity of food available in the environment. They also affect the reproductive dynamics of plants, feed on pollen, and interfere with the intricacies of the biodiversity where they live.

Keywords: hummingbird, nasal mites, Trochilidae, phoresy.

Ácaros Foréticos (*Rhinoseius* spp.) em Apodiformes dos Biomas Cerrado e Pantanal no Centro-Oeste do Brasil

Resumo

Os ácaros nasais são comumente encontrados em beija-flores (Apodiformes). Na maioria dos casos, os ácaros foram relatados como endoparasitas, parasitando o sistema respiratório, particularmente as câmaras nasais anteriores, a laringe, a traqueia, os pulmões e os sacos aéreos e conjuntivais. No entanto, alguns ácaros são transportados apenas por beija-flores, pois flores servem como fonte de nutrientes para esses pequenos ácaros, assim como para Apodiformes tropicais alimentados de néctar em seu habitat natural. De agosto de 2012 a maio de 2014, beija-flores foram capturadas com redes de neblina e examinadas quanto à presença de ácaros nasais (identificados de acordo com chaves específicas) nos biomas Pantanal e Cerrado, no estado do Mato Grosso, Centro-Oeste do Brasil. No total, 76 exemplares Apodiformes da família Trochilidae foram capturados e 20 fêmeas de ácaros nasais, identificados

como pertencentes ao gênero *Rhinoseius*, foram coletados de oito hospedeiros (10,5%), das seguintes espécies: *Amazilia fimbriata*, *Amazilia versicolor*, *Eupetonema macroura* e *Thalurania furcata*. *Rhinoseius* spp. foi relatado em muitos ecossistemas nas Américas, incluindo o Brasil, no entanto, este é o primeiro relato em Apodiformes do bioma Pantanal. Os ácaros foréticos não são responsáveis por danos diretos à população de Apodiformes, pois não são patogênicos. No entanto, eles competem por comida com beija-flores e diminuem a quantidade de comida disponível no ambiente. Eles também afetam a dinâmica reprodutiva das plantas, se alimentam de pólen e interferem nas interações da biodiversidade em que vivem.

Palavras-chave: beija-flor, ácaros nasais, Trochilidae, foresia.

1. Introduction

Nasal mites have been reported in several hummingbird species (Apodiformes) from Latin America (Baker and Yunker, 1964; Dusbabek and Cerny, 1970; Hunter, 1972; Fain et al., 1977; Hyland et al., 1978; Colwell and Naeem, 1979; Fain and Hyland, 1980; Micherdzinski and Lukoschus, 1980; O'Connor et al., 1991; Ohmer et al., 1991; Naskrecki and Colwell, 1998; Dusbabek et al., 2007; López-Orozco and Cañon-Franco, 2013). The reports include a description of infestation of many Mesostigmata mites species, in general, in hummingbirds from Brazil and birds also (De-Castro, 1948; Pereira and De-Castro, 1949; Amaral, 1968; Amaral and Rebouças, 1974; Mascarenhas et al., 2011; Bernardon et al., 2013; Mendes et al., 2014).

In most reported cases, endoparasitic mites that inhabit the respiratory system of Apodiformes parasitize the anterior nasal chambers, larynx, trachea, lungs, and the air and conjunctival sacs (Amaral and Rebouças, 1974). However, in some cases the mites found are only carried, and dispersed by the Apodiformes, with flowers serving as a source of nutrients for these hosts in their natural habitat and for the mites (Proctor and Owens, 2000). Thus, the present study aimed to describe the occurrence of nasal mites in Apodiformes from the Pantanal and Cerrado biomes of the Mato Grosso state, midwestern Brazil.

2. Material and Methods

From August 2012 to May 2014, hummingbirds were captured as primary samples for another project on rickettsial infection spread from ticks of birds (Ramos et al., 2015). These Apodiformes were examined for the presence of ectoparasites that included nasal mites in two different biomes in the Mato Grosso state, including Pantanal and Cerrado biomes in the municipalities of Poconé and Chapada dos Guimarães. In each area, 10 mist nets (10 m long, 3 m high with 1 cm mesh holes) were opened on five days between 6:00 a.m. and 11:00 a.m., resulting in 3500 network hours throughout the study, and captured hummingbirds were identified according to Ridgely and Tudor (1989, 1994), and Sigrist (2006). Mites were collected directly from the nasal fossae, with the aid of brush and forceps, preserved in absolute isopropanol, and then brought to the laboratory. Samples were processed according to Henderson (2001), and were morphologically identified according to the keys proposed by O'Connor et al. (1991) and Naskrecki and Colwell (1998).

3. Results

Among the 76 Apodiformes from the Trochilidae family captured, there was a total of 12 different species. Table 1 provides a list of all the captured Apodiform species, and the results of infestation by nasal mites, grouped according to biomes. Overall, 20 female mites were collected and identified as being from the *Rhinoseius* genus (*Rhinoseius* spp.), as shown in figure 1.

4. Discussion

The term "hummingbird flower mite", although little known, is used to define the relationship that occurs with Apodiformes (hummingbird), flowers and mites of

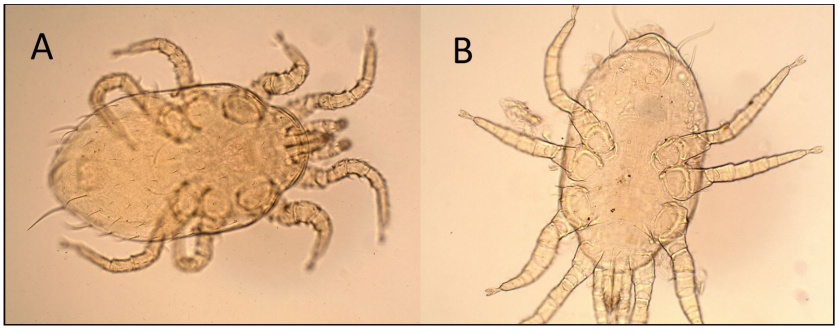

Figure 1. Nasal mites collected in hummingbird (Apodiformes) from Pantanal and Cerrado biomes of Mato Grosso state, midwestern Brazil, from August 2012 to May 2014. (A) *Rhinoseius* spp. female collected from nasal fossae of *Amazilia versicolor*; (B) *Rhinoseius* spp. female collected from nasal fossae of *Thalurania furcata*.

Table 1. Apodiformes (Trochilidae) from Cerrado and Pantanal biomes of the Mato Grosso state between 2012 and 2014, quantified by species and biomes, and *Rhinoseius* spp. occurrence and abundance in these hummingbirds.

Biome	Host	Captured Hummingbirds	Positive for *Rhinoseius* spp.	Abundance of *Rhinoseius* spp. (female) collected
Cerrado	*Amazilla fimbriata*	10	2	6
	Amazilla versicolor	1	1	2
	Chlorostilbon lucidus	3	-	-
	Chrysolampis mosquitos	9	-	-
	Colibri serrirostris	2	-	-
	Eupetomena macroura	2	1	3
	Hylocharis cyanus	7	-	-
	Phaethornis nattereri	1	-	-
	Phaethornis petrei	2	-	-
	Thalurania furcata	12	2	5
Pantanal	*Amazilla fimbriata*	12	1	3
	Amazilla versicolor	8	-	-
	Anthracothorax nigricolis	2	-	-
	Chrysolampis mosquitos	1	-	-
	Eupetomena macroura	1	-	-
	Phaetornis ruber	2	-	-
	Thalurania furcata	1	1	1
TOTAL		76	8	20

the family Ascidae (Mesostigmata) (López-Orozco and Cañon-Franco, 2013). These mites have been described as parasitizing to Apodiformes and Passeriformes, and are identified into approximately 22 genera, and 60 species (Naskrecki and Colwell, 1998), with the most common genera being: *Lasioseius* Berlese, *Proctolaelaps* Berlese, *Rhinoseius* Baker and Yunker, and *Tropicoseius* Baker and Yunker (O'Connor et al., 1991; Proctor and Owens, 2000; Dusbabek et al., 2007).

According to MacChioni (2007) phoresy is the interaction between one species of animal that passively attaches to another species of animal, the relationship ranges from a state of quiescence, to life cycle synchronization. If the relationship involves hummingbirds, plants and mites, then the plants act as habitats, while the hummingbirds only act as carriers and dispersers for the mites, parasitism does not occur as part of the mites biological life cycle (Hunter, 1972; Guerra et al., 2010). Following this model, *Rhinoseius* spp. feed on pollen during the nymph stage, and nectar in the adult stage (Hunter, 1972), this food habit decreases the amount of food available in the environment for nectarivorous species, and also causes a negative impact on the reproductive dispersion of the plants carried by these hummingbirds (Heyneman et al., 1991; Lara and Ornelas, 2001; Velázquez and Ornelas, 2010). Thus, although phoresy is an interspecific relationship classified as commensal, it does have a negative impact, because there is less food available for the Apodiform species, and reduced reproduction in plants (Colwell, 1995).

There are reports of the *Rhinoseius* spp. being found in hummingbirds from Colombia (Fain and Hyland, 1980; Ohmer et al., 1991; López-Orozco and Cañon-Franco, 2013), Costa Rica (Hunter, 1972), Ecuador (Micherdzinski and Lukoschus, 1980), United States of America (Colwell and Naeem, 1979), Mexico (Hyland et al., 1978), Panama (Fain et al., 1977), Trinidad and Tobago (Fain et al.,1977), Venezuela (Fain et al., 1977; Micherdzinski and Lukoschus, 1980), and also in Brazil (Fain et al., 1977; Flechtmann and Johnston, 1978). However, this is the first report of *Rhinoseius* spp. being detected in Apodiformes from the Pantanal biome, thus amplifying the knowledge of the distribution of phoretic mites in hummingbirds.

The knowledge about phoretic mites is important, mainly for the development and conservation of biodiversity. It is important to consider that phoretic mites can cause indirect damage to the Apodiform population, and also to the reproductive dynamics of plants, and their ecosystems, in which these mites are inserted.

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