

**MALOPHAGES IN *CRYPTURELLUS NOCTIVAGUS* AND *CRYPTURELLUS OBSOLETUS* (BIRDS: TINAMIDAE) IN THE PAMPA BIOME, SOUTHERN BRAZIL**

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Abstract: Tinamous are endemic birds of the neotropical region and are commonly parasitized by nematodes, feather mites and malophagous insects. The current study aimed to identify malophages in a population of Yellow-legged Tinamou (*Crypturellus noctivagus*) and Brown Tinamou (*Crypturellus obsoletus obsoletus*) in the Pampa Biome, state of Rio Grande do Sul, Brazil. In 250 hours of sampling efforts using bell-traps, we captured 11 *C. noctivagus* individuals. Of these, two of them showed occurrence of feather lice. Four *C. o. obsoletus* individuals were also captured and three of them presented lice. In both tinamous, specimens of *Strongylocotes complanatus* and *Heptapsogaster temporalis* (Ischnocera, Philopteridae) were recorded. The frequency of occurrence (FO) of these ectoparasites in *C. noctivagus* was of 18.2%, and 75% in *C. o. obsoletus*. We thus report in a descriptive manner additional information about the occurrence of these ectoparasites, associated with forest tinamous of the genus *Crypturellus*, in Southern Brazil.

Resumo: Malófagos em *Crypturellus noctivagus* e *Crypturellus obsoletus* (Aves: Tinamidae) no Pampa, sul do Brasil. Os tinamídeos são aves endêmicas da região neotropical, comumente parasitados por nematoides, ácaros plumícolas e insetos malófagos. O presente estudo teve por objetivo identificar malófagos numa população de jaó-do-sul (*Crypturellus noctivagus*) e inhambu-guaçu (*Crypturellus obsoletus obsoletus*) no Pampa, estado do Rio Grande do Sul, Brasil. Em 250 horas de esforço amostral com o uso de armadilha-de-sino, capturamos onze espécimes de *C. noctivagus* e destes, dois apresentaram ocorrência de piolhos nas penas. Em *C. o. obsoletus*, quatro indivíduos foram capturados e destes, três ocorreram piolhos. Em ambos tinamídeos foram registrados espécimes de *Strongylocotes complanatus* e *Heptapsogaster temporalis* (Ischnocera, Philopteridae). A frequência de ocorrência (FO) desses ectoparasitos em *C. noctivagus* foi de 18,2% e para *C. o. obsoletus* com 75%. De forma descritiva reportamos assim informações adicionais sobre a ocorrência desses ectoparasitos associados a tinamídeos florestais do gênero *Crypturellus*, no sul do território brasileiro.

Key words: Brown Tinamou · Ectoparasites · *Heptapsogaster temporalis* · *Strongylocotes complanatus* · Yellow-legged Tinamou

Tinamous (Birds: Tinamiformes, Tinamidae), with about 45 known species, are endemic to the Neotropical region, have terrestrial habits and are found in country and forest environments (Cabot 1992). Besides being parasitized by nematodes and feather mites, the occurrence of malophagous insects is significant in this group (Sick 1997, Arzua & Valim 2010). Some studies in the Neotropical region reported malophagous fauna in tinamous (e.g., Guimarães 1944, Clay 1949, Ward 1957, Valim et al. 2005, Linardi 2012, Valim & Silveira 2014, Kuabara & Valim 2017) and, according to these authors, birds belonging to *Crypturellus* host up to 14 genera of malophages.

The Yellow-legged Tinamou (*Crypturellus noctivagus*; Wied, 1820) (Tinamiformes, Tinamidae), is an endemic forest bird from Brazil, known for its two endangered subspecies in need of conservation (Cabot 1992, Sick 1997, Corrêa et al. 2019). In the state of Rio Grande do Sul, *Crypturellus noctivagus*, is known from a single relictual population (Corrêa et al. 2010, Corrêa & Petry 2019), which is considered at a regional level as “Critically Endangered” (Rio Grande do Sul 2014). The Brown Tinamou (*Crypturellus obsoletus*; Temminck, 1815) (Tinamiformes, Tinamidae) of forest habits is known for its three subspecies in the Brazilian territory. In Rio Grande do Sul, the subspecies *Crypturellus obsoletus obsoletus* occurs, being relatively common in

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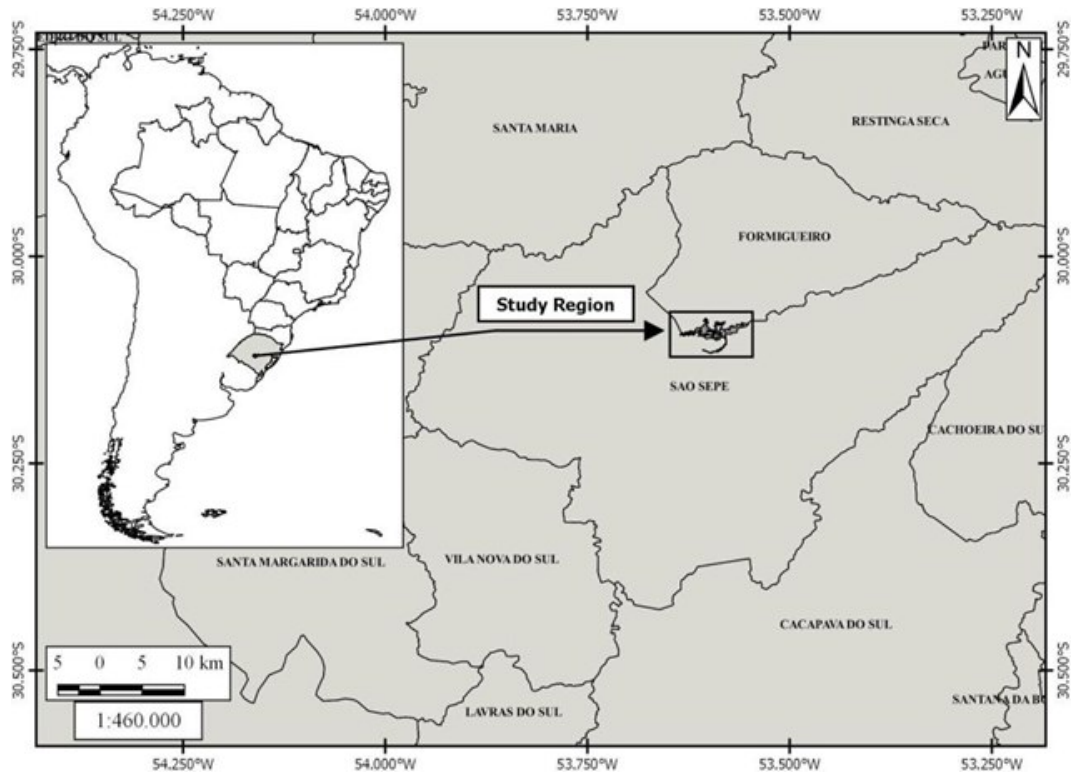


Figure 1. Image identifying the study area. Forest fragment on the border of the cities of Formigueiro and São Sepé, state of Rio Grande do Sul, Brazil.

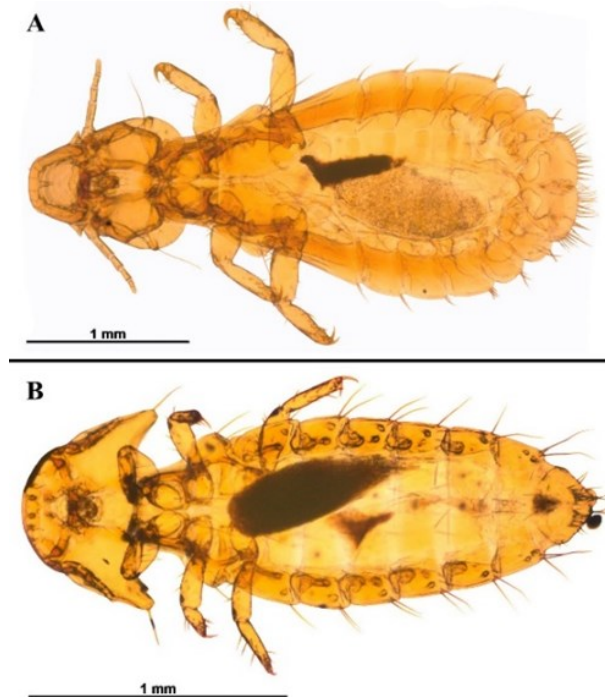


Figure 2. Lice recorded in *Crypturellus noctivagus* and *Crypturellus obsoletus obsoletus* in the *pampa* biome, state of Rio Grande do Sul, Brazil. (A) *Strongylocotes complanatus*. (B) *Heptapsogaster temporalis*.

small and medium sized fragments. Both tinamids are under pressure from hunting and fragmentation of forest remnants (Belton 1994, Sick 1997).

Malophages are apterous insects, ectoparasites, chewers of both mammalian hair and bird feathers. These insects, commonly known as lice, can cause severe disturbance to their host when abundant, resulting in behavioral changes, weight loss and even skin lesions (Linardi 2012). Phylogenetically, they are divided into three suborders: Rhynchoph-

thirina, Amblycera and Ischnocera. Lice of the family Heptapsostridae (Ischnocera) are distinguished from the other families for having seven abdominal segments and visible spiracle in the first segment, occurring mainly in Tinamiformes (Carriker 1936, Linardi 2012). In this sense, the present study aimed to identify lice occurring in populations of *C. noctivagus* and *C. o. obsoletus* in the state of Rio Grande do Sul, Brazil.

From October 2015 to December 2016, field activities

were carried out to capture *C. noctivagus* and *C. o. obsoletus*, using the bell-trap adapted from Corrêa & Petry (2018). The study region is located on the border of the cities of São Sepé and Formigueiro (Figure 1), state of Rio Grande do Sul, Brazil, in a forest fragment of about 450 hectares ("30° 05'35,3" S 53° 36'22,9" W) completely isolated from the rest of the region (Corrêa et al. 2010, Corrêa & Petry 2018, 2019). The locality is inserted in the *pampa* biome, presenting a domain of deciduous seasonal forest (IBGE 2004) and what is considered a temperate climate, with annual average temperature of 19°C and annual average precipitation of 1,750 mm (Alvares et al. 2013).

We verified the presence of lice by inspecting their body feathers. The malophages were manually removed with the aid of tweezers, packed in Eppendorf tubes and preserved in ethanol 70% (Arzua & Valim 2010). To identify the species of malophages found, the authors followed Carriker (1936, 1944, 1955). Afterwards, the frequency of occurrence (FO) was calculated, and we presented the frequency of infestation for each species (*C. noctivagus* and *C. o. obsoletus*). The tinamids were banded with a numbered aluminum band, a standard model used by the National Center for Wild Bird Research and Conservation (Centro Nacional de Pesquisa e Conservação de Aves Silvestres – CEMAVE), and released in the wild. All techniques used were licensed by the Biodiversity Authorization and Information System (Sistema de Autorização e Informação da Biodiversidade – SISBIO, n° 47126-3) and were done accordingly with the Ethics Committee on Animal Use in Research (Comitê de Ética em Uso de Animais na Pesquisa – CEUA, n° PPECEUA10.2014), Universidade do Vale do Rio dos Sinos (UNISINOS).

A total of 250 hours of sampling effort were spent in field activities. Eleven *C. noctivagus* individuals were captured, and of these only two had malophages in their feathers. Additionally, four *C. o. obsoletus* individuals were captured and three of them had malophages. Specimens of *Strongylocotes complanatus* (Piaget, 1880) (Ischnocera, Philopterae) and *Heptapsogaster temporalis* (Carriker, 1936) (Ischnocera, Philopterae) were recorded in both tinamids (Figure 2). In total, 44 specimens of lice were collected, 20 in *C. noctivagus* and 24 in *C. o. obsoletus*. Of the lice found in *C. noctivagus*, nine individuals belonged to the species *S. complanatus*, five to *H. temporalis*, and six specimens not identified at species level belonged to Philopterae (FO = 18.2%). In *C. o. obsoletus*, we found 15 *S. complanatus* and six *H. temporalis* specimens, as well as three specimens unidentified at species level belonging to Philopterae (FO = 75%).

In birds of the genus *Crypturellus*, several infestations by this group of ectoparasites have been described. (e.g., Carriker 1944, Valim et al. 2005): for *C. noctivagus*, the occurrence of *Heptapsogaster stulus noctivagus* and *H. temporalis* was reported by Carriker (1944); *Rhopalocerus almeidai* was reported by Guimarães (1944); and *Microctenia soaresi*, *Hypocrypturellus coniceps latifrons*, *Pectenosoma parva noctivagi*, *R. almeidai*, *Pseudolipeurus megaceros*, and *P. noctivagus* were reported by Valim (2009). For *C. o. obsoletus*, *S. complanatus*, *Megapeostus petersi*, *H. mandibularis*, *Discocorpus microgenitalis*, and *Kelloggia ribeiroi* were reported by Valim et al. (2005), and *P. conspicuus* was reported as well by Valim (2009). We consider the occurrence of *S. complanatus* on Yellow-legged Tinamou and *H. temporalis* on Brown Tinamou to be the first records of these lice on those tina-

mous.

Tinamous malophages are of particular interest because a large number of species can be found co-infesting a single host (Valim & Silveira 2014). Further research studies reporting the respective species found and their host (Kuabara & Valim 2017) are needed for these groups; however, information about malophages associated to birds in Rio Grande do Sul is scarce and/or even unknown (Brum et al. 2003). Therefore, our descriptive study reports additional information to the specialized literature, mentioning the occurrence of these ectoparasites associated with the group of forest tinamous birds.

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