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ORIGINAL ARTICLE / ARTÍCULO ORIGINAL

HELMINTHS OF FIVE SPECIES OF GYMNOPHTHALMIDAE (SAURIA: REPTILIA) FROM BRAZILIAN CERRADO

HELMINTOS DE CINCO ESPÉCIES DE GYMNOPHTHALMIDAE (SAURIA: REPTILIA) DO CERRADO BRASILEIRO

HELMINTOS DE CINCO ESPECIES DE GYMNOPHTHALMIDAE (SAURIA: REPTILIA) DEL CERRADO BRASILEÑO

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Running Head: Helminths of five species of Gymnophthalmidae

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ABSTRACT

Gymnophthalmidae is a highly diverse lizard family, endemic to the neotropical region. Despite the existence of extensive data about their morphology and phylogenetics, encompassing most species, there are knowledge gaps in their parasitic relations. In this work we present data on helminth infection of five gymnophthalmid species, *Cercosaura parkeri* (Ruibal, 1952), *Cercosaura schreibersii* Wiegmann, 1834, *Colobosaura modesta* (Reinhardt & Lütken, 1862), *Micrablepharus maximiliani* (Reinhardt & Lütken, 1862) and *Vanzosaura rubricauda* (Boulenger, 1902). Thirty-two specimens were examined, among which the nematode *Skrjabinodon spinosulus* Vicente, Vrcibradic, Rocha & Pinto, 2002 was found in *C. schreibersii*, *M. maximiliani* and *V. rubricauda*. A helminth from the family Cosmocercidae was also found in *V. rubricauda*. Our study provides the first record of parasites infecting *C. schreibersii* and *V. rubricauda*.

Keywords: Brazil – Cerrado – helminths – lizards – Nematoda – parasites

RESUMO

Gymnophthalmidae é uma família de lagartos altamente diversa e endêmica da região neotropical. Apesar da existência de uma quantidade considerável de informação sobre sua morfologia e filogenética, envolvendo a maioria das espécies, existem lacunas de conhecimento acerca de suas relações parasitárias. Neste trabalho apresentamos dados acerca da infecção de helmintos em cinco espécies da família Gymnophthalmidae, *Cercosaura parkeri* (Ruibal, 1952), *Cercosaura schreibersii* Wiegmann, 1834, *Colobosaura modesta* (Reinhardt & Lütken, 1862), *Micrablepharus*

maximiliani (Reinhardt & Lütken, 1862) and *Vanzosaura rubricauda* (Boulenger, 1902). Trinta e dois espécimes foram examinados, dentre os quais o nematódeo *Skrjabinodon spinosulus* Vicente, Vrcibradic, Rocha & Pinto, 2002 foi encontrado em *C*. *schreibersii*, *M*. *maximiliani* and *V*. *rubricauda*. Um helminto da família Cosmocercidae também foi encontrado em *V*. *rubricauda*. Nosso estudo fornece o primeiro registro de parasitas infectando *C*. *schreibersii* and *V*. *rubricauda*.

Palavras-chave: Brazil – Cerrado – helmintos – lagartos – Nematoda – parasitas

RESUMEN

Gymnophthalmidae es una familia de lagartos altamente diversa y endémica de la región neotropical. A pesar de la existencia de una cantidad considerable de información sobre su morfología y filogenética, que abarca a la mayoría de las especies, existen lagunas de conocimiento acerca de sus relaciones parasitarias. En este trabajo presentamos datos sobre la infección por helmintos en cinco especies de la familia Gymnophthalmidae, *Cercosaura parkeri* (Ruibal, 1952), *Cercosaura schreibersii* Wiegmann, 1834, *Colobosaura modesta* (Reinhardt & Lütken, 1862), *Micrablepharus maximiliani* (Reinhardt & Lütken, 1862) and *Vanzosaura rubricauda* (Boulenger, 1902). Se examinaron treinta y dos especímenes, entre los cuales el nematodo *Skrjabinodon spinosulus* Vicente, Vrcibradic, Rocha & Pinto, 2002 fue encontrado en *C*. *schreibersii*, *M*. *maximiliani* y *V*. *rubricauda*. Un helminto de la familia Cosmocercidae también fue encontrado en *V*. *rubricauda*. Nuestro estudio proporciona el primer registro de parásitos que infectan *C*. *schreibersii* y *V*. *rubricauda*.

Palabras-clave: Brasil – Cerrado – helmintos – lagartos – Nematoda – parasitos

INTRODUCTION

Gymnophthalmidae Fitzinger, 1826 is the largest lizard family endemic to the neotropical region, with more than 290 species and over 50 genera (Vásquez-Restrepo *et al.*, 2024).

Despite the existence of an extensive availability of data for most species, encompassing their morphology and phylogenetics, studies on aspects of their ecology, such as diet and parasitism are still scarce for most species (Almeida *et al*., 2009; Ávila, 2009; Carvalho *et al*., 2024).

Parasitological studies are an essential component in the ecology of species (Loreau *et al*., 2005; Balashov, 2011; Frainer *et al*., 2018). Although studies on helminths of gymnophthalmids lizards have increased in the past years (Ferreira *et al.*, 2020; Sousa *et al*., 2022; Quirino *et al*., 2024; Holanda *et al*., 2025), the persistence of knowledge gaps in parasitological aspects remains a problem for most species. In this work we present parasitism data for the species *Cercosaura parkeri* (Ruibal, 1952), *Cercosaura schreibersii* Wiegmann, 1834, *Colobosaura modesta* (Reinhardt & Lütken, 1862), *Micrablepharus maximiliani* (Reinhardt & Lütken, 1862) and *Vanzosaura rubricauda* (Boulenger, 1902), expanding the knowledge about their host–parasite interactions.

MATERIAL AND METHODS

Host specimens were preserved at Coleção Zoológica de Referência do Campus de Corumbá, Seção de Herpetologia da Universidade Federal de Mato Grosso do Sul (CEUCH), Campo Grande, Mato Grosso do Sul, Brazil. The lizards were captured in Cerrado zones at the Dois Irmãos do Buriti municipality (20° 41' 23" S, 55° 16' 43" W), Mato Grosso do Sul State, from September 2003 to October 2004, using pitfall traps with drift fences (Corn & Bury, 1990).

Lizards were euthanized, fixed with 10% formalin and conserved in 70% ethanol. The snout-vent length (SVL) of each individual was measured with an aid of a digital caliper to the nearest mm. Hosts were necropsied and their body cavity, lungs, and digestive tract were analyzed under a stereoscopic microscope for the presence of helminths. Helminths found were placed in vials of 70% ethanol for later identification. For species

identification, nematodes were cleared in phenol, mounted on temporary slides, and analyzed under a light microscope. Following identification, voucher helminths were deposited in the Coleção Helmintológica do Instituto de Biociências da Unesp de Botucatu (CHIBB 1031, 1034, 1035, 1075, 1076, 1077, 1078, 1079, 1080, 1086).

The Shapiro-Wilk test was used to verify the normality of the tests. Spearman's Correlation Coefficient (r_s) was used to test the correlation between host body-size (SVL) and helminth abundance.

Ethic aspects: This study was approved by the Animal Ethics Committee of the Universidade Federal do Ceará (CEUA-UFC), process #CEUA 6314010321.

RESULTS

Seven *C. schreibersii* (36.82 ± 2.59 mm SVL; being one female and six males), were examined and the helminth *Skrjabinodon spinosulus* Vicente, Vrcibradic, Rocha & Pinto, 2002 (n=3) was found. Overall prevalence was 14.3%. The parasite was found in the large intestine of an adult male.

Ten *M. maximiliani* (39.05 ± 6.43 mm SVL; being two females and eight males), were examined and the helminth *S. spinosulus* (n=18) was found once more. Overall prevalence was 50.0%. The parasites were found in the large intestines of one adult female and four adult males.

Ten *V. rubricauda* (31.55 ± 1.33 mm SVL; being three females and seven males), were examined and two helminths were found: an unidentified species of Cosmocercidae (n=4) and the helminth *S. spinosulus* (n=3) was found once more. Overall prevalence was 40.0%, while the individual prevalence was 30.0% for *S. spinosulus* and 10.0% for

Cosmocercidae. *Skrjabinodon spinosulus* was found in the large intestines of three adult males, while Cosmocercidae was found in only one.

Two *C. parkeri* (36.58 ± 0.81 mm SVL; being both males) and three *C. modesta* (47.0 ± 4.36 mm SVL; being all males) were also examined but did not present any parasitic infections.

Larger body size influence helminth abundance in *Cercosaura schreibersii* (r_s = 0.41; P = 0.000; n = 7), but are negatively correlated in *Micrablepharus maximiliani* (r_s = -0.42; P = 0.008; n = 10) and *Vanzosaura rubricauda* (r_s = -0.47; P = 0.000; n = 10).

DISCUSSION

The Cerrado is the second largest biome in South America, occupying an area of approximately 23% of the Brazilian national territory and is considered a diversity hotspot, nevertheless, it suffers greatly with habitat loss due to agricultural activities (MMA, 2024). Besides the state of Mato Grosso do Sul (MS), its area also reaches the states of Goiás (GO), Tocantins (TO), Mato Grosso (MT), Minas Gerais (MG), Bahia (BA), Maranhão (MA), Piauí (PI), Rondônia (RO), Paraná (PR), São Paulo (SP) and the Federal District (DF) (MMA, 2024). Despite the importance of the biome, according to Vieira *et al.* (2019), the studies about helminth parasites cover less than 30% of the species of lizards in the Cerrado. This demonstrates the knowledge gap about helminth parasites in lizards from this biome, which our findings help to reduce.

Our study provides the first record of the helminth *S. spinosulus* infecting the lizards *M. maximiliani*, *C. schreibersii* and *V. rubricauda*. To the best of our knowledge, this is also the first report of parasitism in general for *C. schreibersii* and *V. rubricauda*, while *M. maximiliani* has been reported as a host of other helminth species, *Raillietiella*

mottae Almeida, Freire and Lopes, 2008 (Almeida *et al.,* 2009); *Physaloptera lutzi* Guimaraes, Cristófaro and Rodrigues, 1976 (Brito *et al*., 2014); *P*. *venancioi* and *Skrjabinodon campiaoae* Sousa, Oliveira, Morais, Pinheiro & Ávila 2022 (Carvalho *et al*., 2024), none of which were found in our study.

The richness and abundance of parasites being positively correlated with host body size, as proposed by Kuris *et al*. (1980), has been corroborated by other studies involving lizards and may explain the lower diversity of helminth fauna in gymnophthalmid lizards as a result of their reduced body size (Ferreira *et al*., 2020; Holanda *et al*., 2025; Ribeiro *et al*., 2018; Silva-Neta & Ávila, 2018). However, it is not unknown for studies to report conflicting results for this relationship (Cirino *et al*., 2025; Ibrahim & Soliman, 2006; Villalobos-Segura *et al*., 2020). Our findings agree with the reported patterns for parasite-host interactions in *C*. *schreibersii*, but the opposite effect was found for helminth abundance in *M*. *maximiliani* and *V*. *rubricauda*. Subsequent studies with bigger sample sizes would be beneficial in providing further data for this hypothesis.

Our findings agree with the pattern of low helminth richness found in gymnophthalmids, although revealing inconsistencies in the pattern for helminth abundance, and increase the knowledge of parasitism for the group.

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