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## First record of acari *Arrenurus* Dugès, 1834 as a parasite of Odonata species in Brazil

Marciel Elio Rodrigues<sup>1,2,7</sup>, Cesar Carriço<sup>3,6</sup>, Zeneida Teixeira Pinto<sup>4,5</sup>,

Paloma Martins Mendonça<sup>3,5</sup> & Margareth Maria de Carvalho Queiroz<sup>3</sup>

<sup>1</sup>Programa de Pós-graduação em Entomologia e Conservação da Biodiversidade, Universidade Federal da Grande Dourados – UFGD, CEP 79804-970, Dourados, MS, Brasil. <http://www.ufgd.edu.br/>

<sup>2</sup>Programa de Pós-graduação em Ecologia e Conservação, Universidade Federal Mato Grosso do Sul – UFMS, CEP 79070-900, Campo Grande, MS, Brasil. <http://www-nt.ufms.br/>

<sup>3</sup>Laboratório de Transmissores de Leishmanioses, Setor de Entomologia Médica e Forense, Instituto Oswaldo Cruz – IOC, Fundação Oswaldo Cruz – Fiocruz, Av. Brasil, 4365, Pavilhão Herman Lent, Sala 14, Térreo, CEP 21040-900, Rio de Janeiro, RJ, Brazil. <http://www.ioc.fiocruz.br>

<sup>4</sup>Laboratório de Educação em Ambiente e Saúde, Instituto Oswaldo Cruz – IOC, Fundação Oswaldo Cruz – FIOCRUZ, Av. Brasil, 4365, Pavilhão Herman Lent, Sala 14, Térreo, CEP 21040-900, Rio de Janeiro, RJ, Brazil. <http://www.ioc.fiocruz.br>

<sup>5</sup>Programa de Pós-graduação Ciências Veterinárias, Universidade Federal Rural do Rio de Janeiro – UFRRJ, BR 465, Km 7, CEP 23890-000, Seropédica, RJ, Brazil. <http://www.cveterinarias.ufrj.br> - CAPES

<sup>6</sup>Programa de Pós-graduação em Biologia Animal – PPGBA, Instituto de Biologia, Universidade Federal Rural do Rio de Janeiro – UFRRJ, BR 465, Km 7, CEP 23890-000,

Seropédica, RJ, Brazil. <http://www.ufrj.br/posgrad/cpgba>

<sup>7</sup>Corresponding author: Marciel Elio Rodrigues, e-mail: [rodrigues.mbio@gmail.com](mailto:rodrigues.mbio@gmail.com)

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**Abstract:** Water mites are common and widespread parasites of some aquatic insects in freshwater habitats. This is the first record of acari *Arrenurus* Dugès, 1834, as a parasite of Odonata in Brazil. Water mites were sampled from *Miathyria marcella* (Selys, 1857) and *Ischnura fluviatilis* (Selys, 1876).

**Keywords:** dragonfly, parasitism, water mites.

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**Resumo:** Ácaros aquáticos são parasitas comuns de alguns insetos aquáticos em habitats de água doce. Este é o primeiro registro do ácaro *Arrenurus* Dugès, 1834, como parasita de Odonata no Brasil. Ácaros aquáticos foram coletados em *Miathyria marcella* (Selys, 1857) e *Ischnura fluviatilis* (Selys, 1876).

**Palavras-chave:** libélulas, parasitismo, ácaros aquáticos.

## Introduction

Water mites are common and widespread parasites of some aquatic insects in freshwater habitats (Milne et al. 2009, Rolff 2000). Mites establish a brief phoretic association, they use one animal by another for transportation, finding food, finding more favorable environmental conditions and expanding the species' range (Lajeunesse 2007, MuMcuoğlu & BraverMan 2010). Their hosts during a very vulnerable stage: the larvae's transition from its aquatic habitat to the terrestrial habitat of the adult (Andrés & Cordero 1998, Forbes et al. 1999, Rolff et al. 2001). Hydrachnidia (Hydracarina) is the most diversified and abundant group of Acari in freshwaters (Sabatino et al. 2000). According to Andrew et al. 2012, water mites that use odonates as hosts are predominantly *Arrenurus* and at least 55 species have been described as ectoparasites of Odonata. Studies indicate that mite parasitism can affect longevity, the flight, the fecundity impeding the copulation or by blocking sperm transference to the male's secondary genitalia (Bonn et al. 1996, Forbes 1991, Forbes & Baker 1991).

The genus *Arrenurus*, contains 800 species (Smit 2010), is the largest within the Arrenuridae and 161 of these species occur in South America (Rosso-de-Ferradás & Fernández 2005, Rosso-de-Ferradás 2006). The basic life cycle of *Arrenurus* consists of seven stages: egg, inactive prelarvae, larvae, protonymph, deutonymph, tritonymph, and adult (Smith 1988). The larval stage is the only parasitic phase. *Arrenurus* larvae are parasites of some species of Odonata, Diptera, and Coleoptera (Smith 1988, Zawal 2006). For example, in Europe *Arrenurus* was recorded on the following species of Odonata: *Ceriagrion tenellum* (De Villers, 1789); *Coenagrion puella* (Linnaeus, 1758); *C. hastulatum* (Charpentier, 1825); *C. pulchellum* (Vander Linden, 1823), and *Erythromma najas* (Hansemann, 1823) (Andrés & Cordero 1998, Rolff 2000, Zawal 2006). In North American, Lajeunesse (2007), recorded *Arrenurus* in *Argia fumipennis atra* Gloyd, 1968; *Ischnura hastata* (Say, 1840); *Ischnura ramburii* (Selys, 1850), and *Nehalennia gracilis* Morse, 1895. Reports and records of the interactions between Odonata and mites have been explored very little (Smith 1988), mainly in the Neotropical Region. In Brazil water mite parasitism (Acari: Hydrachnidia) within and among odonate species is scarce, many species could only be identified as morphospecies of particular genera (Rosso-de-Ferradás 2006).

Our study is the first record of *Arrenurus* parasitism on *Miathyria marcella* (Selys, 1857) and *Ischnura fluviatilis* Selys, 1876 in the Neotropical region. *Miathyria* Kirby, 1889 is a Neotropical genus that comprises two species, *M. marcella* and *M. simplex* (Rambur, 1842), both of which occur in Brazil (Garrison et al. 2006). *Ischnura* Charpentier, 1840 is cosmopolitan genus, with three described species in Brazil: *I. capreolus* (Hagen, 1861) *I. ramburii* (Selys, 1850) and *I. fluviatilis* (Selys 1876) (Lencioni 2006, Garrison et al. 2010).

## Material and Methods

The specimens of Odonata were captured with an entomological net and examined under a stereoscopic microscope, the species was identified following the work of Heckman (2006) and Lencioni (2006). Only three specimens *M. marcella* and one *I. fluviatilis* were found with dust mites attached to the body. Two males of *Miathyria marcella*, were collected in Porto Murinho (22°9'41.55"S and 57°32'2.68"W) and one in Bodoquena (20°42'15.38"S and 56°50'58.99"W), in the state of Mato Grosso do Sul, Brazil. The specimen of *I. fluviatilis* was captured in the Estação Ecológica Águas Emendadas (15°34'48.36"S and 47°41'26.22"W) in Brasília, Distrito Federal, Brazil. Both the species were in inhabit slow lotic waters.

The mites removed from the odonates were put into lactophenol to make them transparent; semi-permanent slide mounts were made



**Figure 1.** Aquatic mites *Arrenurus* on the thorax and abdomen of *M. marcella*. (Picture by Carlos Fernando S. Andrade).

using Hoyer's mounting media as preservative and examined under optical light microscopy (40x, 100x, 400x), the species was identified according to the key of Krantz (1978). The species in question could not be determined since the most important subgenera from the genus *Arrenurus* have been originally identified based on Palaearctic species. This has changed subsequently since their boundaries and definitions have become confusing and, in many cases, completely overlap (Rosso-de-Ferradás 2006). In addition, samples were not sufficient for an exhaustive comparison. The specimens of Odonata and water mites are deposited in the Setor de Entomologia Médica e Forense, Instituto Oswaldo Cruz, Fundação Oswaldo Cruz (IOC/FIOCRUZ).

## Results and Discussion

Two of the three specimens of *M. marcella* were found with five to 10 aquatic mites attached to the ventral side of their thorax and some attached ventrally on the abdomen (Figure 1). Second Rolff (2000) the abundance of mites can range from 1 to 45 mites per host. Of the three specimens *M. marcella* had only one aquatic mite on the thorax. In *I. fluviatilis*, two aquatic mites were found on the thorax and abdomen of the specimen. Zawal (2006) stated that mites show preference for the thorax and the middle segments of the abdomen. On the other hand, Mitchell (1959) suggested that the selection of the attachment site on the hosts is directly related to the way Odonata females lay eggs above the water surface, but Rolff (2000) and Lajeunesse (2007) no found differences in parasite abundance due to host sex. However the behavior the oviposition from Odonata species can increase significantly the rate from infestation in hosts with submerged oviposition (Rolff 1997). Specimens of *Arrenurus* were found on *M. marcella* during their larval phase, when they typically inhabit temporary or permanent lentic or slow lotic waters (Peckarsky et al. 1990) and Lajeunesse (2007) reported for North American *Arrenurus* parasitizing *I. hastata* and *I. ramburii* also inhabit temporary or permanent lentic or slow lotic waters. Some studies indicate that the abundance of water mites can be synchronized with host's emergence patterns (Rolff 2000). Therefore basic information on the natural history of water mite parasitism is urgently needed to assess the host range and geographic distribution of these parasites (Bush et al. 2001, Rolff 2001).

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