

Myiasis in the Neotropical amphibian *Hypsiboas caingua* (Anura: Hylidae) by *Megaselia scalaris* (Diptera: Phoridae)

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ABSTRACT - Host-parasite interactions between dipterans and anurans in the Neotropical region are still poorly known; we report here the first case of myiasis in the anuran *Hypsiboas caingua* (Hylidae). Three infecting larvae completed metamorphosis in laboratory conditions. The emerging three adult flies were morphologically identified as *Megaselia scalaris* (Phoridae). This is the first evidence of phorid flies parasitizing a South American wild anuran.

INTRODUCTION

Myiasis is defined as a condition caused by dipterous larvae that can invade a host to complete their development while feeding on its living or dead tissues (Zumpt, 1965). Amphibians are parasitized worldwide by larvae of numerous fly species, however, this is a poorly studied area of amphibian biology. Anuran myiasis in juvenile and adult individuals – in wild and captivity – has been reported recently from the Neotropical region (de Mello-Patiu & de Luna-Dias, 2010; Sousa Pinto et al., 2015). Although infestation by fly larvae could be one explanation for the decline of populations of several amphibians, examples of myiasis in wild amphibians are poorly documented, mainly due to the difficulty of recording the phenomenon, which may be due to the rapid action of parasites and consumption of small host carcasses (Sousa Pinto et al., 2015). The current study describes myiasis in a wild specimen of anuran from the Upper Parana Atlantic Forest of Argentina (province of Misiones).

OBSERVATIONS and DISCUSSION

In 16 November 2015, CAL and MGA were performing a preliminary inventory of anurans in the reserve inside the INMeT (National Institute of Tropical Medicine, Argentina) campus (25°38'29,89"S – 54°34'54,62"W, elev: 179 m. a. s. l.). Around 22 hrs, a medium-sized adult individual of *Hypsiboas caingua* Carrizo, 1991 was observed swimming awkwardly in a small pond with its right leg almost paralysed. This tree-frog (Hylidae) is widely distributed in Argentina, Brazil and Paraguay (Frost, 2016), and it was easily identified in the field by the characters detailed in its original description (Carrizo, 1990). Several males of *H. caingua* and some individuals of *Dendropsophus nanus* were vocalising from grass and bushes surrounding the water body. At closer examination

of the injured specimen, we perceived a circular skin lesion on its thigh, next to the cloaca, infested with larvae (Fig. 1-A and B).

The individual was caught, placed into a plastic box and carried to the Herpetology Laboratory of the INMeT, where 8 spiracles of larvae were observed in the lesion. After 24 hours the frog died but the larvae remained alive inside the body cavity and continued feeding on the frog carcass, of which they left only the anuran skin. Forty-eight hours later, the larvae had reduced the frog body to bones (INMeT Herpetological Collection, code 058), and began to disperse and migrate to drier areas for pupation. One larva was preserved in 70% ethanol. For identification at species level of the imagos, we used the technique proposed by de Mello-Patiu and de Luna-Dias (2010). After 17 days in the pupal state, three larvae completed metamorphosis emerging adult flies, two males and one female.

Using morphological characteristics described in the key to Neotropical species of *Megaselia* given by Borgmeier (1962), such as anepisternum without setae (Fig. 1-C,D); two pair of supra-antennal setae of the same size (Fig. 1-E); scutellum with four setae, the two posterior being greater than the anterior ones (Fig. 1-F); hind tibia with one dorsal setal palisade (Fig. 1-G); female with tergite 6 short, extremely broad, extending laterally on segment (Fig. 1-G) (Brown & Horan, 2011), the dipterans were identified as *Megaselia scalaris* (Phoridae). The three specimens of dipterans were deposited together with the anuran bones in the Herpetological Collection of the National Institute of Tropical Medicine, Puerto Iguazú, Argentina (code INMeT 058).

Previously, myiasis has been reported for the following species of *Hypsiboas*: *H. atlanticus* (Oliveira et al., 2012), *H. beckeri* (de Mello-Patiu & de Luna-Dias, 2010), being both caused by Sarcophagidae flies, and *H. curupi* (López & Nazer, 2009) caused by an unidentified fly. Herein,

we present the first evidence of myiasis on *H. caingua* as well as the first evidence of phorid flies, *M. scalaris*, parasitising a South American wild anuran. Disney (2008) has indicated that the larvae of this species are generalised feeders, eventually able to infest invertebrates under laboratory conditions (Koch et al., 2013). Until this report, among the poikilothermic tetrapods, only snake (Vanin et al., 2013) and amphibian (Zwart et al., 2005) species from zoological collections have been associated as hosts for this fly species.

The infestation reported herein occurred in a neighbourhood with rapid anthropogenic change, next to the city of Puerto Iguazú, where the territory is organised into forest patches and inhabitant units. The fly *M. scalaris* has a cosmopolitan distribution, with records in a wide range of habitats, from tropical rainforests to urban buildings. This plasticity has been explained by the large diversity of niches of *M. scalaris* larvae. The latter can be found in natural habitats as scavengers in nests of social insects, and feed on invertebrate carrion, live insects, vertebrate eggs, fungi and living plants (Disney, 2008).

Coincidentally with other authors (Bolek & Coggins, 2002), we observed a rapid death of the parasitised anuran (24 to 48 hours), with the consequent decomposition of the affected carcass in 48 to 72 hours (in laboratory conditions). It is probably that this process could be faster in natural conditions, which would jeopardise the observation of anuran myiasis in the wild. Nevertheless, Eaton et al.

(2008) found differential mortality index in anurans from North America that were parasitised with *Lucilia silvarum*, and they demonstrated that it was inversely correlated with their body size. Surveys on either infection prevalence or virulence profile have not yet been delineated in anuran hosts of communities from south America. Thus, further studies on the host-parasite interactions between dipterans and anurans in the Neotropical region will be useful in understanding their impact on declining anuran populations in climate change scenarios.

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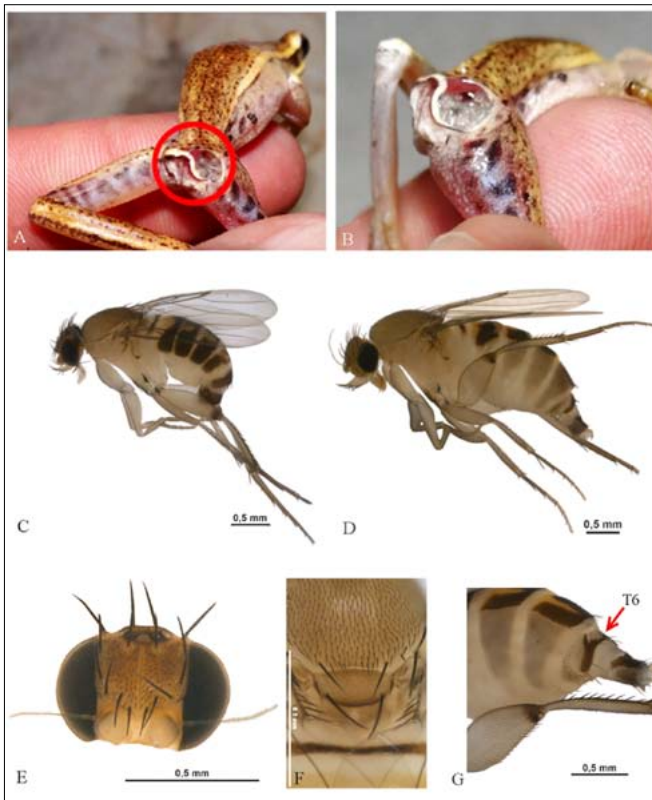


Fig.1 **A-** *Hypsiboas caingua* specimen infested with myiasis in right posterior limb. **B-** Close up of the lesion marked by red circle in Figure **A**. **C-G-** Specimens of *M. scalaris*. **C-** Male adult. **D-** Female adult. **E-** Head with emphasis on forehead. **F-** Scutellum with emphasis on setae. **G-** Hind tibia with one dorsal setal palisade (T6 - Tergite 6). The photographs were taken by the authors.

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