



Neotropical Helminthology



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TWO NEW HOSTS FOR *GORYTHOCEPHALUS ELONGORCHIS* (ACANTHOCEPHALA: NEOECHINORHYNCHIDAE), IN *DEKEISERIA AMAZONICA* AND *HYPOSTOMUS OCULEUS* (SILURIFORMES: LORICARIIDAE) FROM THE BRAZILIAN AMAZON

DOS NUEVOS HOSPEDEROS PARA *GORYTHOCEPHALUS ELONGORCHIS* (ACANTHOCEPHALA: NEOECHINORHYNCHIDAE), EN *DEKEISERIA AMAZONICA* E *HYPOSTOMUS OCULEUS* (SILURIFORMES: LORICARIIDAE) DE LA AMAZONÍA BRASILEÑA

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ABSTRACT

Specimens of *Dekeiseria amazonica* Rapp Py-Daniel, 1985 and *Hypostomus oculus* (Fowler, 1943) captured from July 2015 to December 2016, in the Catalão Lake complex, Iranduba, Amazonas, were studied. The specimens of *D. amazonica* measured 12 – 16.5 (13.70 ± 1.33) and weight (g) 29 – 59 (40.85 ± 9.78) and *H. oculus* 12 – 21 (15.80 ± 2.13) and weight (g) 75 - 125.40 (101.11 ± 14.28). Both species were parasitized by the acanthocephalan *Gorythocephalus elongorchis* Thatcher, 1979 (Neoechinorhynchidae), parasitizing the intestine, with a prevalence of 55% and abundance of 18. The intensity ranged from 1 to 3 parasites and the average intensity was 1.63 parasites per fish for *D. amazonica*, and prevalence 59.25%, abundance 29. The intensity of 1 to 4, mean intensity 1.81 for *H. oculus*. Two new hosts for *G. elongorchis* are recorded and their specificity for fish of the Loricariidae is highlighted. This is the first record of *G. elongorchis* parasitizing *D. amazonica* and *H. oculus*.

Keywords: Acanthocephala – Amazon – Loricariidae – Fish Parasite

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RESUMEN

Ejemplares de *Dekeiseria amazonica* Rapp Py-Daniel, 1985 e *Hypostomus oculeus* (Fowler, 1943) capturados entre julio de 2015 y diciembre de 2016 fueron analizados en el complejo lacustre de Catalão, Iranduba, Amazonas. Los ejemplares de *D. amazonica* midieron 12 – 16,5 (13,70 ± 1,33) y peso (g) 29 – 59 (40,85 ± 9,78) y *H. oculeus* 12 – 21 (15,80 ± 2,13) y peso (g) 75 - 125,40 (101,11 ± 14,28). Ambas especies fueron parasitadas por Acanthocephala Neoechinorhynchidae, *Gorytocephalus elongorchis* Thatcher, 1979, parasitando el intestino, con una prevalencia de 55%, abundancia 18, intensidad varió de 1 a 3 parásitos por hospedero y la intensidad promedio fue de 1.63 parásitos por pez para *D. amazonica*, y prevalencia 59,25%, abundancia 29, intensidad de 1 a 4 parásitos, intensidad media de 1,81 para *H. oculeus*. Se registran dos nuevos huéspedes para *G. elongorchis* y se destaca su especificidad para los peces Loricariidae. Este es el primer registro de *G. elongorchis* parasitando a *D. amazonica* y *H. oculeus*.

Palabras clave: Acanthocephala – Amazonas – Loricariidae – Parásito de peces

INTRODUCTION

Acanthocephala species parasitize adult vertebrates and larval invertebrates. In the Amazon they are well represented, parasitizing fish species from different families. They are well known for having as their main feature a reversible proboscis with few to numerous spines, ranging from a few millimetres to more than a meter (Thatcher, 2006; Aquino-Pereira, 2010; Souza & Malta, 2010; Souza *et al.*, 2018).

Acanthocephala species are highly specific to definitive hosts and very little specific to their intermediate and paratenic hosts. They are less specific than other helminth groups and have more intermediate and paratenic hosts than parasitic species of other phyla. The variety of hosts depends more on their ecological similarities than on their taxonomic proximity (Poulin & Mouillot, 2003; Poulin, 2005).

The host species in this study belong to the Loricariidae family, represented by fish with mainly detritivorous and iliophagous feeding habits. They have a ventral mouth, in the form of a suction cup, adapted to scrape and suck surfaces in search of food. They are benthic, some with adaptations to anoxic environments, using accessory organs as an oxygen reservoir. Their body almost entirely covered by bone plates with most of them active after sunset (Eigenmann & Eigenmann 1890; Regan, 1904; Bowen, 1983; Araújo-Lima *et al.*, 1986). The objective of this work is to record new hosts for *Gorytocephalus*

elongorchis Thatcher, 1979, Acanthocephala, Neoechinorhynchidae for the Brazilian Amazon.

MATERIAL AND METHODS

The fish were collected in the Catalão lake complex (3°10'04''S and 59°54'45''W), municipality of Iranduba, about 10 km from the city of Manaus, Amazonas (Figure 1). The hosts were captured with gill nets, with meshes of 20 to 160 mm between adjacent nodes, randomly arranged at the collection site, with fishing every two hours during the day and night. The captured fish were screened and identified in the field and transported to the “Laboratory of Fish Parasitology (LPP)” at the Instituto Nacional de Pesquisas do Amazonas (INPA) in Manaus, state of Amazonas.

Taxonomic studies were carried out according to Amin (1987, 2002 and 2013); and Thatcher (1979). For morphological studies, acanthocephalans were stained with hydrochloric alcoholic carmine, diaphanized in beech creosote and mounted in Canada balm between a slide and a coverslip, adapted from Amato *et al.* (1991) and Eiras *et al.* (2006). For the identification of acanthocephalan species, the bibliographies were used; Thatcher (1979, 1998 and 2006). Taxonomic data considered for specimen identification were body size and shape, type and number of proboscis spines, lemniscus and proboscis pouch, male and female reproductive system and type egg.

Ethic aspects: For the present research, material

from a sample bank collected from July 2015 to December 2016 was used, under the SISBIO 26612-1 collection license and license from the

Animal Use Ethics Committee - CEUA nº 036/2016–INPA.

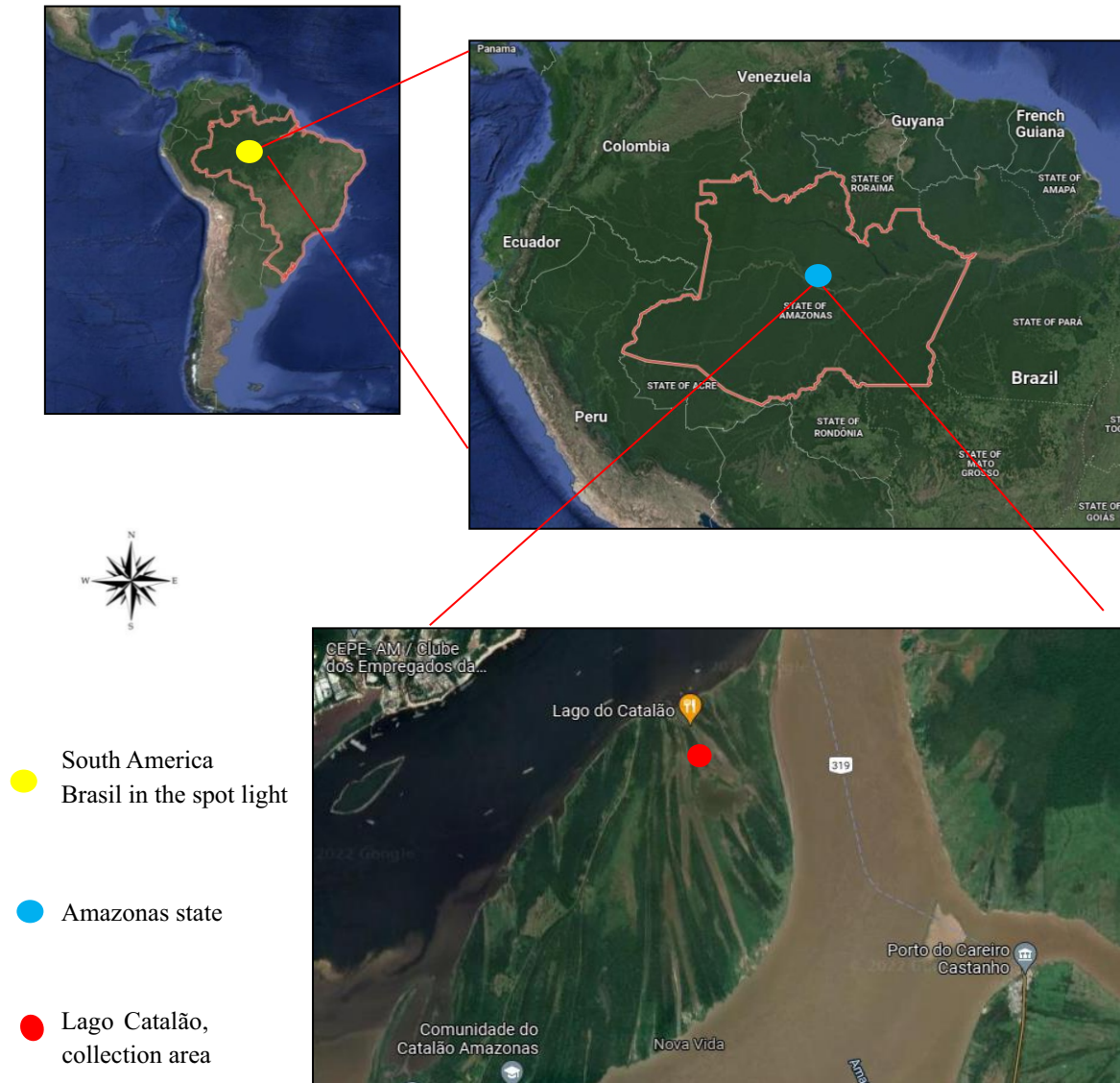


Figure 1. Collection area, Catalão lake, Brasil. Images obtained through the landsat /Copernicus system.

RESULTS

Twenty specimens of *D. amazonica* and 27 specimens of *H. oculus* were analyzed. The fish measured (cm) 12 – 16.5 (13.7 ± 1.33) in length and weighed (g) 29 – 59 (40.85 ± 9.78) and (cm) 12 – 21

(15.80 ± 2.13) in length and weighed (g) 75 – 125.40 (101.11 ± 14.28), respectively.

Gorythocephalus elongorchis was found parasitizing the intestine of *D. amazonica* and *H. oculus*. The parasitic indices are in table 1. The highest values of the parasitic indices were for *H.*

oculeus. Both hosts serve as the final host for *G. elongorchis*. This species has a specificity for the Loricariidae family. This is the first record of this parasite for these two fish species.

There was no correlation between host length and parasite abundance; the community status of *G. elongorchis* was the same for both hosts (table 1).

Table 1. Parasitic indices of *Gorytocephalus elongorchis* parasitizing *Dekeiseria amazonica* and *Hypostomus oculeus* in the Catalão lake. P-prevalence; IR- Intensity range and MI- mean intensity; S- status community secondary.

Host	P (%)	IR	MI	p	r
<i>D. amazonica</i>	55 ^s	1-3	1,6	0.94	0.01
<i>H. oculeus</i>	59. 25 ^s	1-4	1,8	0.72	-0.07

Eight adults, one male and seven females (Fig. 2) in mm were measured: females length 18.5 ± 5.6 (11.8–29.4); width 1.6 ± 1.2 (0.8–4.5); crest width 0.08 (0.05–0.1); length of lemniscus major 1.8 ± 1.7 (2.6–3.8), lemniscus minor 1.4 ± 1.3 (2.3–2.7)

wide; reproductive area 0.3 ± 0.06 (0.3–0.5). Male length 11.5; width 1.2; crest width 0.05; greater lemniscus length 2.8; lemniscus minor 1.8 wide; anterior testis 1.6 x 0.3 and posterior 0.9 x 0.2. Reproductive area 0.4.

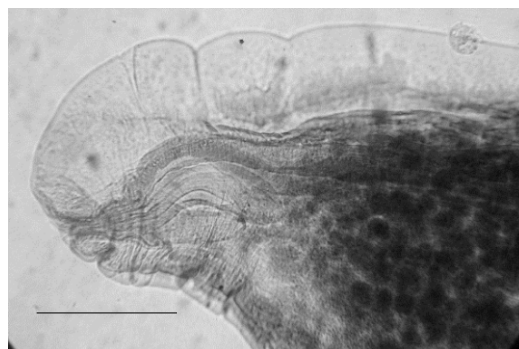


Figure 2. Parte anterior fêmea adulta de *Gorytocephalus elongorchis* Escala = 1mm. Seta- crista.

DISCUSSION

Few studies on the fish parasite fauna that occur in the Loricariidae family have been carried out for the Amazon region. Among them we can highlight: *Hypostomus carinatus* (Thatcher, 1979), and, *Pterygoplichthys pardalis* (Castelnau, 1875) (Porto, 2009; Porto *et al.*, 2012; Cardoso *et al.*, 2017). Studies of fish fauna show us that there is limited understanding of the ecosystem as a whole (Bellay *et al.*, 2013), and record of parasite species for *D. amazonica* and *H. oculeus* is scarce or non-existent.

For Antoniutti *et al.* (1985), among the Siluriformes, some species of Loricariidae are considered fish of great commercial value, being widely exploited in the rivers of the state of São Paulo. In the Amazon region, the Loricariidae *P. pardalis* is of great commercial value (Santos *et al.*, 2006). There is no record of local consumption of the species in this study, *D. amazonica* and *H. oculeus*, however, they are important species for the niche to which they are inserted and are of ornamental interest.

For the Loricariidae, with more than 960 known species (Eschmeyer & Fong, 2017), four species

have record of parasitism by *G. elongorchi*. They are: *P. pardalis* (Porto *et al.*, 2012), *Hypostomus carinatus* (Steindachner, 1881) (Thatcher, 1979, 2006), *Hypostomus ventromaculatus* Boeseman, 1968 (Borges *et al.*, 2018) *Peckoltia braueri* (Eigenmann, 1912) (Cardoso *et al.*, 2017). This work presents two new records of hosts for *G. elongorchi*, in fish of the Loricariidae family.

In general, the parasitic fauna of fish is formed by a mixture of adult individuals and larval forms (Poulin & Leung, 2011). In this work, all specimens of *G. elongorchi* were found in the adult form in both host species. In this case, we can say that *D. amazonica* and *H. oculeus* are definitive hosts of *G. elongorchi*.

Gorytocephalus elongorchi it was cited as parasitizing the intestine of *Hypostomus carinatus* (Thatcher, 1979, 2006); *P. pardalis* (Porto, 2009; Porto *et al.*, 2012; Cardoso *et al.*, 2017). The preference of *G. elongorchi* for species of the Loricariidae family must be associated with the feeding habit and the niche explored by these hosts, which facilitates contact with the intermediate host. The feeding habit of the host is a characteristic to be considered, as it has a strong relationship with the incidence of endoparasites (Dogiel, 1961). Another factor is the richness of the fauna of aquatic arthropods in the Amazon, insects and crustaceans that serve as intermediate hosts for several groups of parasites (Junk & Robertson, 1993).

Gorytocephalus elongorchi was described from the intestine of *Hypostomus carinatus* (Steindachner, 1881) captured in Lake Janauacá, Solimões River, in the state of Amazonas (Thatcher, 1979, 2006). *Gorytocephalus elongorchi* does not have attachment structures that could cause great pathogenicity in its hosts. It has a very small proboscis and low infestation intensity. A maximum of ten individuals were found in the intestine of *H. carinatus*.

Hypostomus carinatus is detritivorous, has a long and delicate intestine with a slow movement. *G. elongorchi* does not need a strong fixation organ. These characteristics of its host made it possible for it to be present in the intestine, with minimal tissue damage and without its elimination (Thatcher, 1981). The host specimens studied in this work, *D.*

amazonica and *H. oculeus*, showed low intensity of *G. elongorchi* 1–3 in *D. amazonica* and 1–4 in *H. oculeus*, and were not attached to the wall. intestines of their hosts.

Gorytocephalus elongorchi was the only species of Acanthocephala found parasitizing *P. pardalis* in the floodplain lakes of the Solimões River in the state of Amazonas (Porto, 2017). *Pterygoplichthys pardalis* captured in the Fortaleza stream, in the state of Amapá, were also parasitized by *G. elongorchi* and parasitized the abdominal cavity (Cardoso *et al.*, 2017). In this work, all specimens of *G. elongorchi* were found parasitizing the intestine of *H. oculeus* (MI 1.8) and *D. amazonica* (MI 1.6).

Gorytocephalus elongorchi is specific to fish of the Loricariidae family that are its definitive hosts (Porto *et al.*, 2012). In this work, two new hosts for *G. elongorchi* are known and the first record of parasites for these hosts.

The prevalence of parasitism by *G. elongorchi* was recorded in *P. pardalis* by Porto (2017) and varied between 3.9% and 36.3% in different lakes in the stretch between the cities of Coari and Manaus. Cardoso *et al.* (2017) found a prevalence of 45.5%. In this study, the recorded prevalence was 55% for *D. amazonica* and 59.25% for *H. oculeus*.

Porto (2017), studying the *P. pardalis* parasite fauna in different lakes, recorded the community status among populations of *G. elongorchi*, based on prevalence, as satellite and secondary species. Analyzing the prevalence found by Cardoso *et al.* (2017), the prevalence of the population of *G. elongorchi* (45%) is classified as a secondary species. In this work, *G. elongorchi* is a secondary species, with prevalence for *D. amazonica* and for *H. oculeus* between 33 and 66%.

Communities made up of secondary species are an indication that the parasite community is in balance, they parasitize similar organs and the parasite rates do not show significant differences (Hanski, 1982; Bush & Holmes, 1986; Price, 1987). In the works by Porto (2009), Porto *et al.* (2012) and Porto (2017), *G. elongorchi* was found parasitizing the intestine. Cardoso *et al.* (2017) recorded the parasitism of *G. elongorchi* in the

visceral cavity. Thatcher (1979, 1991), recorded *G. elongorchis* parasitizing the intestine of *H. carinatus* collected in Lake Janauacá, Amazonas. In this study, collected *G. elongorchis* specimens were found parasitizing the intestine of *D. amazonica* and *H. oculus*.

The parasite specificity depends, first, on the ecological conditions that allow the encounter between parasite and host, the ability to invade and evolve and the behavior of the host (Ferreira, 1973). *Gorythocephalus elongorchis* is specific for species of the Loricariidae family, species with similar behavior and feeding habits, which share the same ecological niche.

This study discovers two new hosts for *G. elongorchis*, expanding the knowledge of the number of hosts for this parasite. It makes the first record of parasites for *D. amazonica* and *H. oculus*, and adds more knowledge about the parasite dynamics in fish from the Amazon.

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