



Taxonomy and systematics

A new species of *Neoechinorhynchus* (Eoacanthocephala: Neoechinorhynchidae) from the freshwater fish *Ageneiosus inermis* (Siluriformes) in the Brazilian Amazon

Una especie nueva de Neoechinorhynchus (Eoacanthocephala: Neoechinorhynchidae) del pez dulceacuícola Ageneiosus inermis (Siluriformes) en el Amazonas brasileño

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Received 23 September 2016; accepted 24 July 2017

Available online 28 November 2017

Abstract

This work describes a new species of the genus *Neoechinorhynchus*, a parasite found in the Siluriformes fish, *Ageneiosus inermis* collected in Catalão Lake. This species is most closely related to *N. (N.) pterodorides* and *N. (N.) pimelodis* than other species registered in Brazil. The size of its trunk, hooks and male reproductive system distinguish it from these 2 species. This work contributes to increase the knowledge of the biodiversity of fish parasites in the Amazon.

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Keywords: Fish parasite; *Ageneiosus inermis*; Solimões and Negro rivers; Catalão Lake; Amazon

Resumen

En este trabajo se describe una nueva especie del género *Neoechinorhynchus*, un parásito del pez *Ageneiosus inermis* (Siluriformes), recolectado en el lago Catalão. Esta especie está más estrechamente relacionada con *N. (N.) pterodorides* y *N. (N.) pimelodis* que otras especies de *Neoechinorhynchus* registradas en Brasil. El tamaño del tronco, los ganchos y el sistema reproductor masculino son los caracteres que la distinguen de estas 2 especies. Este trabajo contribuye al conocimiento de la biodiversidad de los parásitos de los peces en el Amazonas.

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Palabras clave: Parásito de peces; *Ageneiosus inermis*; Ríos Solimões y Negro; Lago Catalão; Amazonas

Introduction

The phylum Acanthocephala is a poorly known helminth group in Neotropical fishes. The composition of the known acanthocephalan fauna shows that the Neoechinorhynchidae is

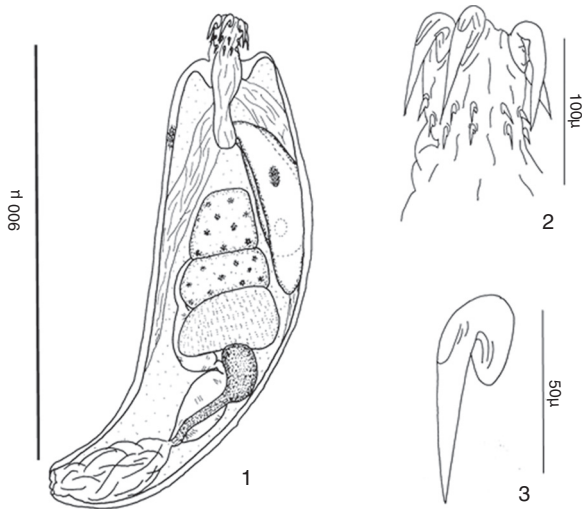
the family most represented (Santos, Gibson, Tavares, & Luque, 2008). In Brazil few species are known from this genus. Of the 109 species described as belonging to the genus *Neoechinorhynchus* Stiles & Hassall, 1905, 7 are relegated to other genera, 14 are considered invalid, 11 belong to the subgenus *Hebesoma*, 48 belong to the subgenus *Neoechinorhynchus* and 29 are retained as valid but cannot be assigned to any subgenus (Amin, 2002).

In Brazil, only 7 species have been described thus far. This study describes a new species of *Neoechinorhynchus* a parasite

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Peer Review under the responsibility of Universidad Nacional Autónoma de México.



Figures 1–3. 1, *Neoechinorhynchus inermis* sp. n., male; 2, proboscis; 3, thorn.

of *Ageneiosus inermis*, collected from a floodplain lake in the Amazon.

Materials and methods

The fish were collected from the Catalão Lake, a fluvial-lacustrine system at the confluence of the Negro and Solimões rivers (03°10'04" S, 59°54'45" W) during the flood period in May 2015. The fish were necropsied in the field and their bodies were fixed, labeled and analyzed in the Laboratory of Fish Parasitology at the National Institute for Amazonian Research (INPA). The specimens were then fixed in 70% ethanol for processing. Worms stained in regressive staining techniques (Carmin alcoholic) according to Amato, Boeger, and Amato (1991), and cleared in immersion oil and mounted in Canada balsam. Drawings were made with the assistance of a lightfield Olympus BH-2 microscope. All measurements are in micrometers (μm). Ecological parameters follow Bush, Lafferty, Lotz, and Shostak (1997). Holotype and paratypes were deposited in the Non-insect Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia-INPA.

Description

Neoechinorhynchus (Neoechinorhynchus) inermis n. sp. (Figs. 1–3)

General. With characters of the genus and subgenus *Neoechinorhynchus*. Elliptical or ovoid body, smooth and rough edges. Neck visible and well developed. Proboscis globular, with 18 hooks distributed in 3 rows of 6 hooks. Larger anterior hooks. Proboscis sheath with simple muscular layer. Central ganglion spherical and located in the proboscis sheath. 5 giant nuclei present on the dorsal side of the amebiform's trunk and 1 on the ventral side. Lemnisci of different sizes. Lacunar system with main channels situated on dorsal and ventral sides (Table 1).

Male: measurements based on 2 male specimens. Trunk length 1.836–1.296 ($1,556 \pm 381.4$) and width 540. Coni-

cal neck length 99–68.4 (83.7 ± 21.9) and width 82.8–54 (68.1 ± 19.9). Proboscis length 126–99 (112.5 ± 19) and width 108–79.2 (93 ± 20). Lemniscus uninucleate length 490–210 (350 ± 198) and width 140–105 (122.5 ± 24.7) and binucleate with saccule format length 301–140 (220 ± 113) and width 105–98 (101.5 ± 4.9). Giant amoeboid nuclei, 5 dorsal and 1 or 2 ventral. Anterior hooks (the largest) length 133–116.2 (124.5 ± 12) and width 14–10.5 (12.2 ± 2.8), middle hooks length 79.4–29.4 (54 ± 35.4) and width 5.1–3.4 (4 ± 1.4) and posterior hooks 26.6–23.1 (24.8 ± 2.1) and width 2.1. Proboscis receptacle length 414–288 (351 ± 89.1) and width 324–198 (261 ± 89.1). Anterior testis length 246.6–198 (222.3 ± 33.9) and width 216–180 (198 ± 25.5). Posterior testis length 133.2–270 (201.6 ± 96.9) and width 97.2–127 (112.1 ± 21.2). Cement gland length 198–288 (243 ± 63.6) and width 369–180 (270 ± 127.3). Ovoid shaped cement reservoir length 270–180 (225 ± 63.6) and width 118.8–108 (113 ± 7.1). Saeftigen's elongated pouch length 504–396 (450 ± 76.4) and width 127.8–126 (126 ± 0.7). Male reproductive system occupies 71–75% of the body length.

Female: it was not found.

Taxonomic summary

Type host: *A. inermis* (Linneus, 1766) Auchenipteridae, common name: Mandubé.

Type locality: Catalão Lake (03°10'04" S, 59°54'45" W); the confluence of the Negro and Solimões rivers near Manaus city.

Specimens deposited: holotype INPA-17: non-insect Invertebrate Collection INPA; Paratypes INPA-18.

Site of infestation: upper intestine.

Prevalence: 55; mean intensity: 5.6; mean abundance: 3.1.

Etymology: its name is derived from the host's name.

Remarks

In Brazil, 7 species of *Neoechinorhynchus* (*N.*) have been registered: *N. (N.) buttnerae* Golvan, 1956; *N. (N.) curemai* Noronha, 1973; *N. (N.) macronucleatus* Machado Filho, 1954; *N. (N.) paraguayensis* Machado Filho, 1959; *N. (N.) pimelodi* Brasil-Sato & Pavanelli, 1998; *N. (N.) pterodoridis* Thatcher, 1981 and *N. (N.) veropesoi* Melo et al., 2015 (Amin, 2002; Santos et al., 2008; Thatcher, 2006).

N. (N.) buttnerae; *N. (N.) pterodoridis*; *N. (N.) veropesoi*, and *N. (N.) curemai* have been registered in the Amazon region (Martins, Fujimoto, Andrade, & Tavares-Dias, 2000; Noronha, 1984; Santos et al., 2008; Thatcher, 2006).

Thatcher (1981) outlines the characteristics that distinguish *N. pterodoridis* from other species: (1) neck long and visible, (2) anterior, middle and posterior circles of hooks larger than in other species. This species was compared with *N. paraguayensis* and *N. golvani* Salgado-Maldonado, 1978.

Brasil-Sato and Pavanelli (1998) distinguish *N. pimelodis* from the 8 species of Acanthocephala registered in Brazil: *N. (N.) buttnerae*, *N. (N.) curemai*, *N. (N.) macronucleatus*, *N. (N.) paraguayensis*, *N. (N.) pimelodi*, *N. (N.) pterodoridis*, *N. (N.) golvani* Salgado-Maldonado, 1978, and *N. (N.) villoldoi* Viz-

Table 1
Comparison between *Neoechinorhynchus inermis* n. sp. and other species of *Neoechinorhynchus*. All measurements are in micrometers. AH = anterior hook, middle hook or posterior hook; Lt = length trunk, Gc = cement gland, Si = site of infection.

Especies/host	AH, MH, PH	Ct (trunk)	Gc	SI	Distribution
<i>N. (N.) inermis/Ageneiosus inermis</i>					
Male	124.2, 54, 4	1,556	243	Upper intestine	Amazonas
Female	No date				
<i>N. (N.) veropesoi/Plagiosciom squamosissimus</i>					
Male	67.9, 22.2, 12	2,800	203.6	Small intestine	Pará – Guajará Bay
Female	87.1, 25.5, 13.8	5,870			
<i>N. (N.) pterodoridis/Pterodoras granulatus</i>					
Male	143, 45, 10	2,250	336	Intestine	Amazonas
Female	139, 39, 12	2,700			
<i>N. (N.) pimelodi/Pimelodus maculatus</i>					
Male	105, 36, 23	1,450	162	Anterior intestine	Mato Grosso – São Francisco River
Female	129, 47, 29	2,440			

cain, 1992. *N. pimelodis* is shown to be most closely related to *N. (N.) pterodoridis* Thatcher, 1981. Of the species that occur in Brazil, this new species described here is most similar to *N. (N.) pterodoridis* and *N. (N.) pimelodis*.

N. (N.) inermis sp. n. shows most similarity to *N. (N.) pterodoridis* collected from the Amazonas River (Thatcher, 1981) and *N. (N.) pimelodis* collected from the São Francisco River (Brasil-Sato & Pavanelli, 1998). It is distinguished from *N. (N.) pterodoridis* with smaller trunk length, and from *N. (N.) pimelodis* with greater trunk length.

The proboscis of *N. (N.) inermis* sp. n. is smaller than that of *N. (N.) pterodoridis* and approximately the same size as that of *N. (N.) pimelodis*. Its neck is much smaller than the necks of both other species. The lemnisci are also much smaller. The male reproductive system occupies 75% of its cavity which is larger than in both *N. (N.) pterodoridis* (73%) and *N. (N.) pimelodi* (50.73%).

The anterior and medium hooks of *N. (N.) inermis* sp. n. are smaller than those of *N. (N.) pterodoridis* and larger than those of *N. (N.) pimelodis*. The posterior hooks are of similar size as *N. (N.) pimelodis*. Anterior testis is smaller compared to the other species and the posterior testis is smaller than that of *N. (N.) pterodoridis* and larger than that of *N. (N.) pimelodis*.

The cement gland of *N. (N.) inermis* sp. n. is smaller than that of *N. (N.) pterodoridis* and larger than that of *N. (N.) pimelodis*. The cement reservoir is larger than those of both other species. Morphological study presents similarities between the anatomy of the *N. (N.) inermis* sp. n. and both *N. (N.) pterodoridis* and *N. (N.) pimelodis*, but it is distinguished by significant differences in the main organs of these 2 species.

Based on these characteristics, the present work describes the first species of the genus parasitizing *A. inermis*, the eighth species of the genus described from Brazil. Thus, the present work contributes to the knowledge of Brazilian parasites by

adding a new species and new host for the genus *Neoechinorhynchus*.

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