

## ORIGINAL ARTICLE / ARTÍCULO ORIGINAL

*HIRUDINELLA VENTRICOSA* (TREMATODA) PARASITIZING *MAKAIRA NIGRICANS* AND *ACANTHOCYBIUM SOLANDRI* FROM NEOTROPICAL REGION, BRAZIL

*HIRUDINELLA VENTRICOSA* (TREMATODA) PARASITANDO *MAKAIRA NIGRICANS* Y *ACANTHOCYBIUM SOLANDRI* DE LA REGIÓN NEOTROPICAL, BRASIL

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### Abstract

In January 2002, were caught 11 *Makaira nigricans* Lacepède, 1802 (Istiophoridae) and two *Acanthocybium solandri* (Cuvier, 1832) (Scombridae) off Cabo Frio municipality, Rio de Janeiro State, Brazil. We collected digenetic trematodes from the stomach of some of these fishes. We studied these trematodes with optical and scanning electron microscopy and identified them as *Hirudinella ventricosa* (Pallas, 1774) Baird, 1835. This is the first report of this species in *A. solandri* in the Brazilian coast, and in *M. nigricans* in South America.

**Keywords:** *Acanthocybium solandri* - Brazil - *Hirudinella ventricosa* - *Makaira nigricans* - Neotropical region.

### Resumen

En enero del 2002, fueron capturados 11 *Makaira nigricans* Lacepède, 1802 y dos *Acanthocybium solandri* (Cuvier, 1832) en la costa del municipio de Cabo Frio, Rio de Janeiro, Brasil. Del estómago de algunos de estos peces fueron colectados trematodos digenéticos. Después del análisis macroscópico y microscópico de la morfología y la morfometría de las estructuras externas e internas de los helmintos, mediante estereoscópio, microscopio de campo claro, de cortes histológicos coloreados con hematoxilina-eosina, y microscopio electrónico de barrido, los especímenes fueron identificados como pertenecientes a la especie *Hirudinella ventricosa* (Pallas, 1774) Baird, 1835. Este es el primer reporte de esta especie en *A. solandri* en la costa brasileña, y en *M. nigricans* en América del Sur.

**Palabras clave:** *Acanthocybium solandri* - Brasil - *Hirudinella ventricosa* - *Makaira nigricans* - región Neotropical.

## INTRODUCTION

The present study had as the starting point the Marlin Project (Pimenta *et al.*, 2001) aimed to study the biology of sport fishing in the municipality of Cabo Frio, Rio de Janeiro, Brasil, in competitions sponsored by Iate Clube de Cabo Frio. This project consisted of researchers from Grupo de Estudos de Pesca (GEPESCA); Coordenação de Programas de Pós-Graduação em Engenharia (COPPE), Universidade Federal do Rio de Janeiro; Instituto de Pesca de São Paulo (IP-SP); The Billfish Foundation (TBF); International Commission for Conservation of Atlantic Tunas (ICCAT); students of biology and correlated sciences and off shore sports fishermen. On this occasion were caught some blue marlin, *Makaira nigricans* Lacepède, 1802, and wahoo, *Acanthocybium solandri* (Cuvier, 1831). In the stomach contents of these fish was found a species of worm, that was collected and preserved for identification.

*Makaira nigricans* is the largest billfish, length reaches around 5.0 m and about 820 Kg, being target in sport fishing and appreciated as food (Figueiredo & Menezes, 2000; Pimenta *et al.*, 2001; Froese & Pauly, 2012). *Acanthocybium solandri* (Cuvier, 1831) reaches 2.10 m in length and 83 kg, their meat is commercialized fresh or canned. Both are pelagic fish, migratory and oceanic, known as agile swimmers, inhabit tropical and subtropical seas. In the Brazilian coast occurs mainly in running waters in the Southeast. Their diets consist mainly of fish like tuna, dolphinfish, flying fish and squid (Figueiredo & Menezes, 2000; Pimenta *et al.*, 2001; Froese & Pauly, 2012).

Therefore the aim of this study was to identify stout digenetic trematodes found in the stomachs of *M. nigricans* and *A. solandri*, from off shore sport fishing, providing new data on the morphology and morphometry through observation of whole specimens in a stereomicroscope and scanning electron microscope, and of histological sections in a bright field microscope.

## MATERIAL AND METHODS

In January 2002 were caught 11 *Makaira nigricans* Lacepède, 1802 and two *Acanthocybium solandri* (Cuvier, 1832) off Cabo Frio municipality, Rio de Janeiro State, Brazil (22°52'46"S, 42°01'07"W), by fishermen, during the off shore sport fishing tournament of the "Iate Club do Rio de Janeiro". These fishes were necropsied and their stomachs collected and labeled. In the stomach content from both fish was found a species of digenetic trematode.

The helminths were fixed and preserved according to the usual technics in helminthology (Eiras *et al.*, 2006), after they were analyzed by stereomicroscopic, and a specimen was included in paraffin and sectioned at 7  $\mu$ m of thickness and stained with hematoxylin and eosin (HE) for histological study of internal structures of taxonomic interest. Observations were made using a Zeiss stereomicroscope and a Zeiss Axiophot microscope and photomicrographs were taken with a Canon digital camera attached. Measurements are presented in millimeters (mm) and were made with the aid of an Olympus BX 41 microscope with a micrometric ocular. Range of measurements is presented followed by the mean in parentheses. For the study of scanning electron microscopy (SEM), a specimen was dehydrated in a graded ethanol series (20°-100° GL) for one h each step, critical-point dried in CO<sub>2</sub>, mounted on metallic stubs and coated with gold (20-25 nm deposited). The sample was examined under FEI Quanta 250 scanning electron microscope, operating at 25 kV. The taxonomic classification was made according to Gibson (2002). Comparison was made with a specimen of *H. ventricosa* deposited in the "Coleção Helmintológica do Instituto Oswaldo Cruz" (CHIOC), Fiocruz, Rio de Janeiro State, Brazil, under the number 32140 CHIOC. The terminology adopted for forebody and hindbody follows the pattern used by Manter (1970). Representative specimens preserved in ethanol 70 °GL and histological sections of a specimen were included in CHIOC under no. 34884-34887, and 37.808a-d. Parasitological

parameter of intensity of infection follows Bush *et al.* (1997).

## RESULTS

The analyse of the stomach contents from two of 11 *M. nigricans* (Istiophoridae) and from the two *A. solandri* (Scombridae) necropsied fishes were found a total of 17 helminth specimens (8 from *M. nigricans* and 9 from *A. solandri*), with 3-5 and 2-7 of range of infection, respectively, belonging to a species of adult digenetic trematode identified beneath.

Hemiuroidea Looss, 1899 in part  
(Hirudinellidae Dollfus, 1932)

Hirudinellidae Dollfus, 1932

*Hirudinella ventricosa* (Pallas, 1774) Baird, 1835 (Figs. 1-8).

Main morphological characteristics: Body stout, elongate or keyhole-shaped. Body surface strongly marked with transverse folds and wrinkles, papillae mainly present in forebody. Forebody is narrower and shorter than hindbody. Oral sucker sub-terminal, well developed, opens directly into the pharinx. Pharinx well

developed and oesophagus short. Ventral sucker, well developed, higher than oral sucker. Gut-caeca fused subterminally, forming cyclocoel. Uroproct present. Testes two, small, oblique, in anterior hindbody, pre-ovarian. Seminal vesicle thin-walled, tubular, convoluted, in the forebody, antero-dorsally to anterior margin of ventral sucker; pars prostatica, tubular, convoluted, surrounding the distal seminal vesicle. Ejaculatory duct long, muscular, surrounded by 'cirrus-sac' muscular, opens in a genital atrium. Genital pore midventral, close to the middle of forebody, with small aperture. Ovary oval, post-testicular, in anterior hindbody; Mehlis' gland present. Uterus mainly intercaecal, coils extending posteriorly from ovary to near posterior limit of vitellarium; metratermo opens into the genital atrium, immediately posterior to 'cirrus'. Eggs small, numerous. Vitellarium, composed of convoluted tubules, in two lateral fields, caecal, between levels of testes and mid-hindbody. Excretory pore, terminal present.

The morphometric data of specimens of *H. ventricosa* are presented in Table 1.

**Table 1.** Morphometric data (mm) of specimens of *H. ventricosa* from *Makaira nigricans* and *Acanthocybium solandri* off the coast of Cabo Frio, State of Rio de Janeiro, Brazil.

Hosts	<i>M. nigricans</i> *	<i>M. nigricans</i> **	<i>A. solandri</i> **
Body length	17.4	15.5-27.5 (21.6)	28-59 (29.7)
Body depth or width	5.2	6-7 (6.8)	7-22 (15.8)
Forebody	4.3	3-4 (3.6)	4-11 (7.3)
Hindbody	10.4	7-17 (12.2)	18-45 (25.9)
Oral sucker	1.4 x 1.5	1-1.2 (1.1) x 1	1-2.5 (1.7) x 1-3 (2.1)
Ventral sucker	4.6 x 2.8	5-7(5.8) x 4-7 (5.6)	4-7 (5.4) x 3-6.5 (5.1)
Pharynx	1.3 x 1.1	-	-
Testes (depth)	0.5 x 2.2	-	-
Ovary (depth)	0.4 x 0.9	-	-
Eggs	0.03 x 0.02	-	-

\*Measurements from specimens of histological sections (length x depth).

\*\* Measurements from specimens preserved in ethanol 70 °GL (length x width).

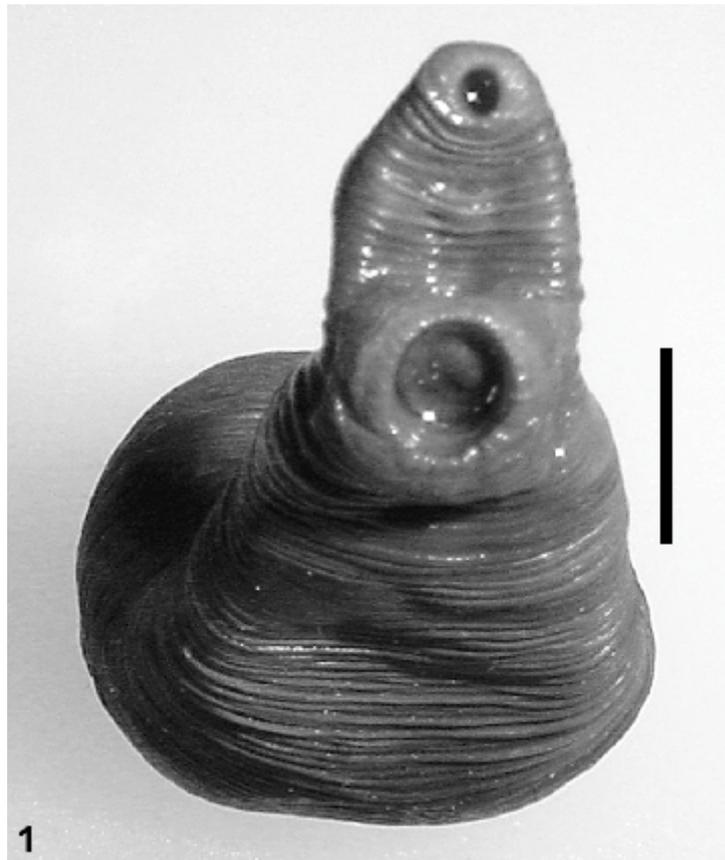


Figure 1. *Hirudinella ventricosa* from *Acanthocybium solandri*. Scale bar = 1 mm.

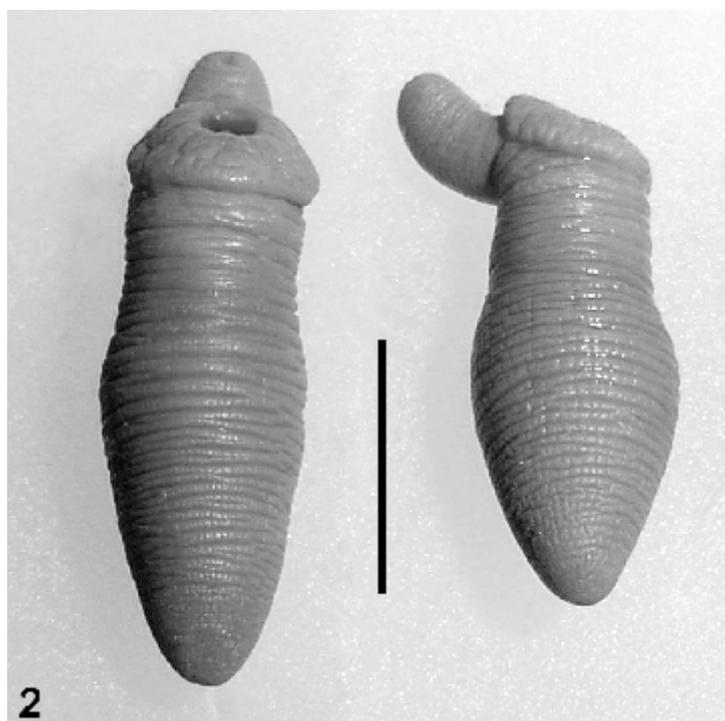
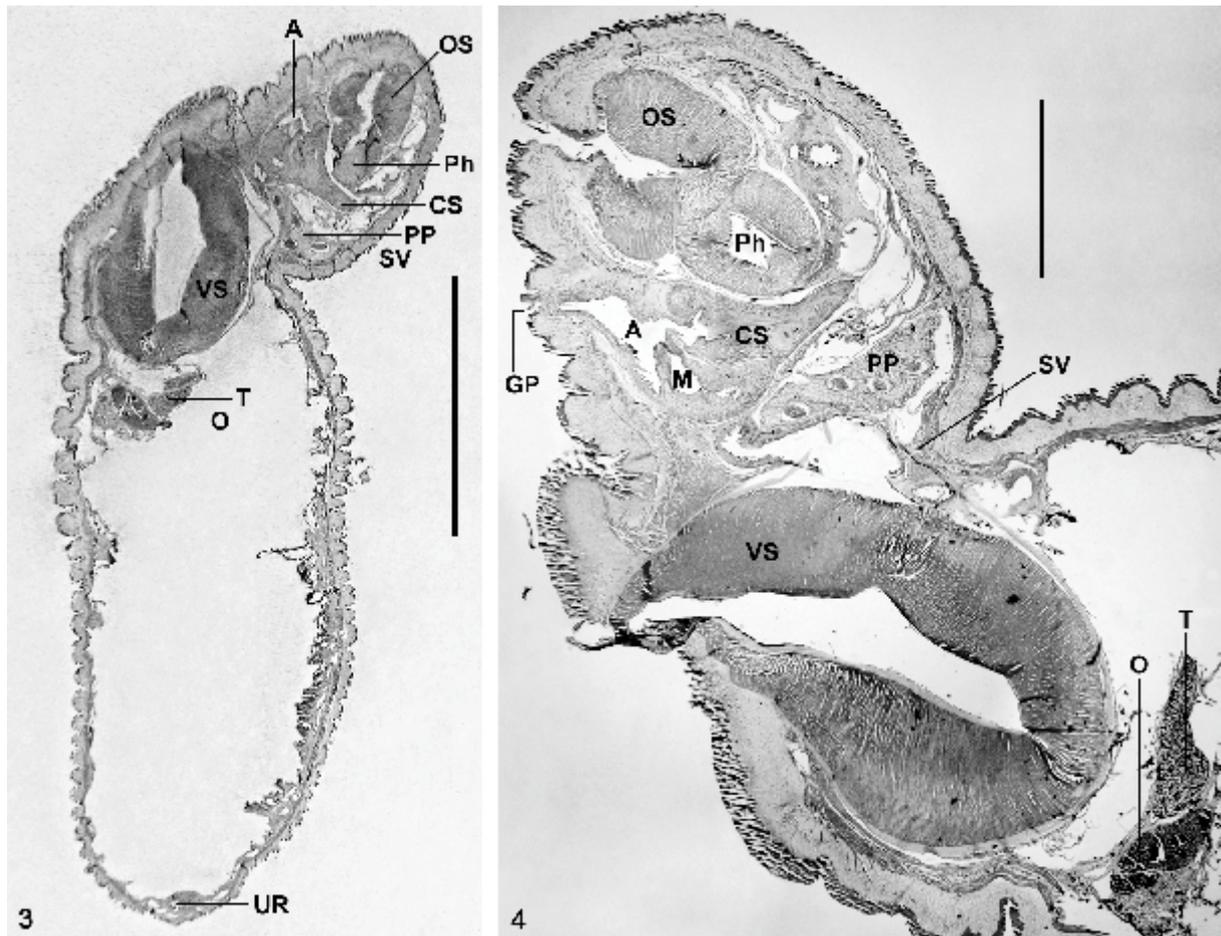
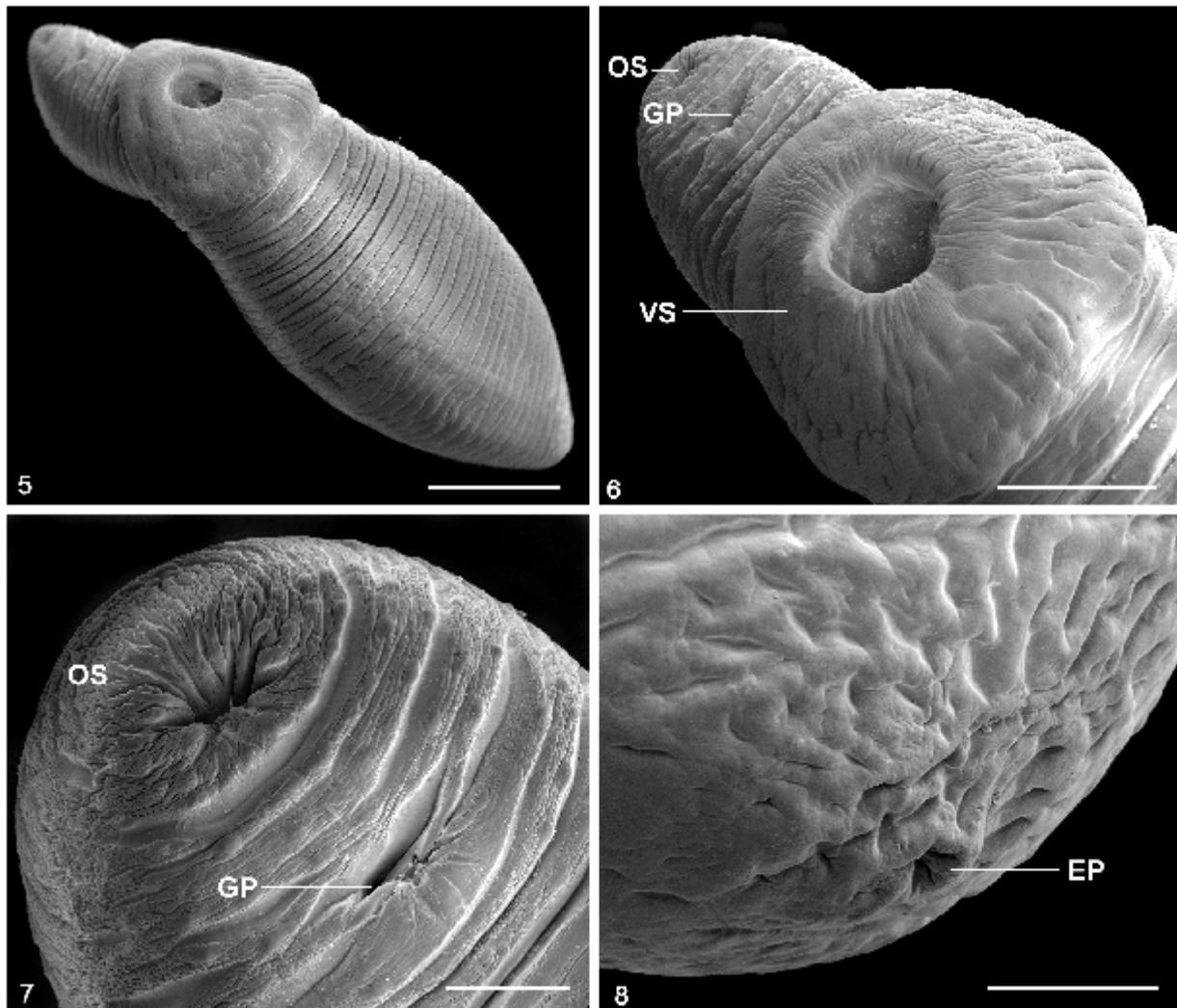


Figure 2. *Hirudinella ventricosa* from *Makaira nigricans*. Scale bar = 1 mm.



**Figures 3-4.** *Hirudinella ventricosa* from *Makaira nigricans*, histological sections in HE. **Fig. 3.** Entire worm at mid longitudinal section: oral sucker (OS), pharynx (Ph), ventral sucker (VS), one of the testes (T), seminal vesicle (SV), pars prostatica (PP), 'cirrus-sac' (CS), ovary (O), atrium (A), uroproct (UR). Scale bar = 5 mm. **Fig. 4.** Detail of forebody and anterior portion of hindbody of the species, oral sucker (OS), pharynx (Ph), ventral sucker (VS), one of the testes (T), seminal vesicle (SV), pars prostatica (PP), 'cirrus-sac' (CS), ovary (O), metraterm (M), atrium (A), genital pore (GP). Scale bar = 1.5 mm.



**Figures 5-8.** *Hirudinella ventricosa* from *Makaira nigricans* by SEM. **Fig 5.** Entire worm latero-ventral view. Scale bar = 2.5 mm. **Fig. 6.** Details of forebody surface: oral sucker (OS), genital pore (GP), ventral sucker (VS). Scale bar = 1.5 mm. **Fig 7.** Forebody, detail of tegument near of oral sucker (OS) and genital pore (GP) showing folds, wrinkles and papillae. **Fig. 8.** Detail of wrinkles surrounded excretory pore (EP). Scale bars of figs. 7 and 8 = 0.5 mm.

## DISCUSSION

The collected specimens in *M. nigricans* and *A. solandri* of the present study are in accordance with the morphological and morphometric data of species *H. ventricosa* found in most previous descriptions from several marine fish, mainly scombroids (Nigrelli & Stunkard, 1947; Gibson, 1976; Fernandes & Kohn, 1984). Other records have indicated greater lengths from 80 to 170 mm and widths of 30 to 40 mm in fixed specimens, demonstrating a wide range in body

size (Gibson & Bray, 1977; Romeo *et al.*, 2005). The SEM held in this study showed body papillate mostly in forebody and add new details of genital and excretory pores beyond previous observations (Nigrelli & Stunkard, 1947; Gibson & Bray, 1977).

*Hirudinella ventricosa* was reported in *M. nigricans* from Puerto Rico (Williams Jr & Bunkley-Williams, 1996), and for *A. solandri* by Manooch and Hogart (1983) collected in the Gulf of Mexico and in the States of Florida and

North Carolina, Atlantic coast of the United States; Romeo *et al.* (2005) recorded in the Mediterranean Sea, Italy; Kohn *et al.* (2007) listed it in Galapagos and Venezuela, and a further six species of scombroids in South America, also in *Coryphaena hippurus* (Diesing, 1850), Coryphaenidae, in Brazilian coast. This is the first record of that species in *A. solandri*, on the Brazilian coast, and in *M. nigracans* in South America.

This study was limited to research with the parasites of hosts provided by Marlim Project, which follows the recommendations of the International Commission for Conservation of Atlantic Tunas.

Records of *H. ventricosa* showed it occurring in various populations of migratory marine fish, mainly scombroid, suggesting it such as a biomarker able in identification of these fish populations (Manooch & Hogart, 1983; Eggleston & Bochenek, 1990; Mosquera *et al.*, 2003). The finding of this helminth in *M. nigracans* and *A. solandri* in the present study corroborates with these records, showing these helminths have a preference with the large migratory fishes.

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