



Monogenoidea from *Eucinostomus argenteus* and *Eucinostomus gula* (Perciformes, Gerreidae) from the littoral of the State of Rio de Janeiro, Brazil

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Abstract: *Eucinostomus argenteus* and *E. gula* (Perciformes, Gerreidae) from Angra dos Reis, littoral of the State of Rio de Janeiro, Brazil, were parasitized by monogenoideans *Darwinoplectanum figueiredoi* (Diplectanidae) and *Microcotyle guanabarensis* (Microcotylidae). In this study, a new morphological detail is added to the ventral bar of *D. figueiredoi* and a new host, *Eucinostomus gula*, is reported for this species. The parasitary indexes of both species are presented.

Key words: Helminths, *Darwinoplectanum figueiredoi*, *Microcotyle guanabarensis*, marine fish

Resumo: Monogenoidea de *Eucinostomus argenteus* e *Eucinostomus gula* (Perciformes, Gerreidae) do litoral do estado do Rio de Janeiro, Brasil. *Eucinostomus argenteus* e *E. gula* (Perciformes, Gerreidae) provenientes de Angra dos Reis, litoral do Estado do Rio de Janeiro, Brasil, estavam parasitados pelos monogenóideos *Darwinoplectanum figueiredoi* (Diplectanidae) e *Microcotyle guanabarensis* (Microcotylidae). Neste estudo, um novo detalhe morfológico é adicionado à barra ventral de *D. figueiredoi* e um novo hospedeiro, *Eucinostomus gula*, é registrado para essa espécie. Os índices parasitários de ambas espécies são apresentados.

Palavras-chave: Helminthos, *Darwinoplectanum figueiredoi*, *Microcotyle guanabarensis*, peixes marinhos

Eucinostomus argenteus Baird & Girard is a fish species distributed in the Pacific and Atlantic oceans, commonly found over sand or shell bottoms, occasionally in ocean inlets to estuaries; and its juveniles occur in lagoons and mangroves. It is omnivorous and has a modest commercial value, as it is processed for fish food or live bait in sport fishing (Denadai *et al.* 2012). *Eucinostomus gula* (Quoy & Gaimard) inhabits shallow waters, being especially abundant over mud bottoms in mangrove-lined lagoons or creeks; larger individuals may also occur on vegetated sand grounds in marine areas. It enters freshwater in limestone regions. May occur in aggregations. Probably feeds on small benthic invertebrates and are marketed fresh, but not highly esteemed (Froese & Pauly 2016).

Monogenoideans in general, like ectoparasitic crustaceans and leeches, can be of particular concern

because their direct life cycles may allow for the development of heavy infestations that reduce fish growth rates or cause mortality in closed recirculating systems, sea cages, and ponds. The Diplectanidae Monticelli, 1903 is a polyonchoinean family of monogeneans with many species worldwide (Domingues & Boeger 2008). Diplectanids are gill parasites that characteristically have a haptor bearing two pairs of hooks, transversal bars, 14 peripheral marginal hooks and, accessory adhesive organ (lamellocdisc or squamodisc) (Sanchez-Garcia *et al.* 2011). Microcotylidae is the largest family in the subclass Oligonchoinea, comprising monogenoideans that present haptor with numerous clamps, usually similar in size and shape, buccal suckers septate, testes usually numerous and copulatory apparatus is very various (Mamaev 1986).

The microcotylid *Microcotyle guanabarensis* Bravo-Hollis & Kohn 1990 was originally described parasitizing *E. argenteus*, from Guanabara Bay, State of Rio de Janeiro and, since the original description, was no longer found (Bravo-Hollis & Kohn 1990; Cohen *et al.* 2013).

Darwinoplectanum (Diplectanidae) was erected to accommodate *D. figueiredoi* Domingues, Diamanka & Pariselle 2011 collected from *Eucinostomus argenteus* in the Pontal do Paraná municipality, State of Paraná, Brazil (Domingues *et al.* 2011). Besides the type species, two other were described: *D. amphiatlanticus* Domingues, Diamanka & Pariselle 2011 from *Eucinostomus melanopterus* (Bleeker), from Senegal and from *E. argenteus* from the municipality of Porto Belo, State of Santa Catarina and from Municipality of Pontal do Paraná, State of Paraná, Brazil and *D. pilittae* Domingues, Diamanka & Pariselle 2011, from *Gerres cireneus* Walbaum from Punta Santiago near Humacao, Puerto Rico.

The aim of this study was to identify the monogenoideans found parasitizing the gills of *E. argenteus* and *E. gula* collected in the littoral of State of Rio de Janeiro, during expeditions to study of their helminthofauna. After analyses of the monogenoideans specimens was possible identify two species: *D. figueiredoi* and *M. guanabarensis*.

Between August 2008 to June 2012, 127 specimens of *Eucinostomus argenteus* and 134 of *E. gula* were collected from “Saco Piraraquara de Dentro”, Angra dos Reis municipality (Latitude 23° 00' 24" S, Longitude 44° 19' 05" W), State of Rio de Janeiro, Brazil. The gills were removed and placed in vials containing 1:4000 formalin solution. The vials were vigorously shaken and after one hour, fixed in ethanol 70° GL. In the laboratory, the parasites were collected with the aid of a stereoscopic microscope and stored. Some specimens were mounted unstained in Hoyer's medium for study of the sclerotized parts and others were stained with Langeron's carmine, cleared in beechwood creosote and mounted in Canada balsam as permanent slides. All specimens were observed and photographed in a Zeiss Axioskop bright-field microscope, equipped with a millimeter ocular, differential interference contrast (DIC) optics, and a Sony MPEGEX digital camera. Measurements are in micrometers; the range is followed by the mean and the number of measurements in parentheses. The parasitary indexes were followed as proposed by Bush *et al.* (1997). Confidence intervals (95%) were calculated assuming a binominal distribution, using

software Quantitative Parasitology 3.0 (Rózsa *et al.* 2000). Representative specimens were deposited in the Helminthological Collection of the Oswaldo Cruz Institute (CHIOC), Rio de Janeiro, Brazil.

A total of 473 monogeneans specimens were collected, 264 specimens of *Darwinoplectanum figueiredoi* in 42 *E. argenteus* and 208 specimens in 42 *E. gula*, and one specimen of *Microcotyle guanabarensis* was collected in one *E. argenteus*.

Darwinoplectanum figueiredoi (Fig. 1): Morphometry of body and hard parts of haptor and copulatory organ of specimens collected from *E. argenteus*: Body 350–570 (450; n=13) long by 70–120 (86; n=13) wide; ventral bar 8–13 (10; n=13) long by 85–140 (116; n=13) wide; paired dorsal bar 55–85 (71; n=25) long; ventral anchor 30–34 (33; n=19) long; dorsal anchor 28–33 (30; n=19) long (Figures 1A-B); male copulatory organ 43–58 (50; n=13) long; accessory piece 34–48 (39; n=13) long (Figures 1C-D).

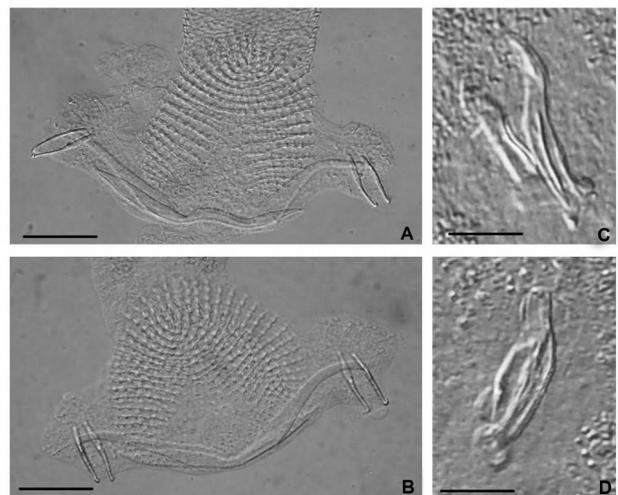


Figure 1. *Darwinoplectanum figueiredoi* Domingues, Diamanka & Pariselle, 2011. A. Specimen with haptor presenting a W-shaped ventral bar. B. Specimen with haptor presenting a slightly recurved ventral bar. C, D. Copulatory complexes. Scale bars: A, B = 50 μ m; C, D = 20 μ m.

Morphometry of body and hard parts of haptor and copulatory organ of specimens collected from *E. gula*: Body 330–485 (393; n=12) long by 55–95 (79; n=12) wide; ventral bar 5–10 (9; n=13) long by 88–143 (109; n=13) wide; paired dorsal bar 55–76 (67; n=24) long; ventral anchor 27–34 (31; n=24) long; dorsal anchor 27–33 (30; n=23) long; male copulatory organ 43–53 (48; n=10) long; accessory piece 37–45 (40; n=10) long.

Morphometry of the specimens of the present study are in agreement with the original description (Domingues *et al.* 2011). Considering the morphology of the species, some specimens studied in the present study show the ventral bar with a little difference than in original description. In the type material, the ventral bar was described as elongate with delicate tapered ends and it was drawn as W-shaped. Some specimens in the present study bears a W-shaped ventral bar, while the most of them present a slightly recurved ventral bar (Figures 1A

and B). When the type material (CHIOC 37545) was analyzed, it was possible to observe in the holotype and also in some paratypes the same aspect of ventral bar observed in the specimens of present study.

Prevalence, mean intensity, mean abundance, range of intensity and the number of CHIOC deposit number of *D. figueiredoi* are given in Table I. This species presented a similar pattern on both hosts parasitized, considering these indexes.

Table I: Prevalence (P), mean intensity (MI), mean abundance (MA), range of infection (RI) and CHIOC deposit number of *Darwinoplectanum figueiredoi* from *Eucinostomus argenteus* and *E. gula* from the coast of Angra dos Reis municipality, State of Rio de Janeiro, Brazil. CI= Confidence interval

	P(%)	MI (CI)	AM (CI)	IR	CHIOC
<i>E. argenteus</i>	33.1 (25–42)	6.29 (4.12–10.50)	2.08 (1.30–3.47)	1–49	38.472 a-d, 38.473, 38.474, 38.475 a-c
<i>E. gula</i>	31.3 (24–40)	4.95 (3.64–6.81)	1.55 (1.05–2.31)	1–22	38.476, 38.477, 38.478, 38.479 a-b

Microcotyle guanabarensis from *E. argenteus* (Figure 2): Morphometry of body and hard parts of haptor. Body 2,650 long by 280 wide; anterior suckers 57 long by 62 wide and 52 long by 65 wide; clamps 25–32 (27; n=15) long by 40–52 (46; n=15) wide.



Figure 2. *Microcotyle guanabarensis* Bravo-Hollis & Kohn, 1990. Total. Scale bar: 250 μ m.

The morphometry of the specimen of the present study is in agreement with the original description (Bravo-Hollis & Kohn, 1990).

Nevertheless, the authors only deposited the material in “Colección Helminológica del Instituto de Biología de la Universidad Nacional Autónoma de México”. Considering that it comprises a Brazilian species, the material studied herein was deposited in a Brazilian collection. Prevalence, intensity, abundance, range of intensity and the number of CHIOC deposit number of *M. guanabarensis* are given in Table II.

Table II: Prevalence (P), intensity (I), abundance (A) and CHIOC deposit number of *Microcotyle guanabarensis* from *Eucinostomus argenteus* from the coast of Angra dos Reis municipality, State of Rio de Janeiro State, Brazil.

	P(%)	I	A	CHIOC
<i>E. argenteus</i>	0.79	1	0.0079	38.480

Darwinoplectanum figueiredoi was originally described from *E. argenteus*, from of Pontal do Paraná municipality, State of Paraná, Brazil, sharing the gills with *D. amphiatlanticus* from hosts collected from the same municipality and from Porto Belo municipality, State of Santa Catarina, Brazil and also from *E. melanopterus* from Senegal (Domingues *et al.* 2011). In the present study, specimens of *D. figueiredoi* were found parasitizing *E. argenteus* and *E. gula*, therefore, this last fish species represents a new host record for this monogenoidean species. *M. guanabarensis* have been collected from *E. argenteus*, the same host from Guanabara Bay reported by Bravo-Hollis & Kohn (1990).

The migratory habits of diadromous fishes expose their ectoparasitic monogenoideans to environmental stressors that frequently result in loss of specific parasite infestations as fishes move from one environment to another. Reportedly few monogenoidean species are euryhaline, although congeneric species frequently show varying abilities to osmoregulate or osmoconform (Kritsky *et al.* 2010). Species of monogenoideans were reported from *Centropomus* spp. in marine and freshwater habitats, as *Rhabdosynochus hargisi* Kritsky, Boeger & Robaldo 2001 and *Rhabdosynochus hudsoni* Kritsky, Boeger & Robaldo 2001 in *Centropomus undecimalis* from Itamaraca (Kritsky *et al.* 2001), littoral of Pernambuco State and *Annakohnia brasiliiana* Bravo-Hollis, 1986 in *Centropomus paralellus* Poey from the littoral of State of Rio de Janeiro (Bravo-Hollis, 1986). These monogenoideans were reported from *C. undecimalis* in Guandu river by Azevedo *et al.* (2010). Comparing with the present paper, the association between Diplectanidae and Microcotylidae in the same host species was also observed, although *M. guanabarensis* was observed in lower numbers.

In the present paper, it was observed that *D. figueiredoi* showed W-shaped and slightly straight ventral bar, probably due to intraspecific variations. These variations are also observed in other monogenoideans species, e.g. Plaisance & Kritsky (2004), that showed variations in the dorsal bar of *Euryhaliotrematoides aspistis* Plaisance & Kritsky 2004, from *Chaetodon auriga* Forsskal, from the absence of a posteromedial protuberance in some specimens to a well-developed bulb or a poorly developed expansion in others.

The present study brings new data on the morphology of this species. Considering that in Monogenoidea and specially in Diplectanidae, the systematic of the groups is based in the sclerotized parts, variations in the morphology of these structures must be characterized, for a complete definition of species.

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