Monogenea (Platyhelminthes) parasites from the gills of Hoplias aff. malabaricus (Bloch, 1794) (Pisces: Erythrinidae) in the Upper Paraná River Floodplain, States of Paraná and Mato Grosso do Sul, Brazil

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ABSTRACT: In this paper, nine species of Monogenea were recorded parasitizing the gills of Hoplias aff. malabaricus from the Upper Paraná River. The host were collected by gillnets in different regions to the Upper Paraná River Floodplain between March 2010 and March 2011. The parasites were quantified, fixed and preserved according with specialized literature. All hosts analyzed were parasitized by monogeneans. The monogeneans species were recorded Urocleidoides malabaricus, U. cuiabai, U. eremitus, U. brasiliensis, Cosmetocleithrum bulboircus, Vancleavesus janaauacaensis, Anacanthorus sp., Dactylogyridae gen. sp. and Dactylogyridae gen. 1 sp.

INTRODUCTION

Hoplias aff. malabaricus (Bloch, 1794), popularly known as “traíra” or “lobó”, is widely distributed in freshwater of South America (Oyakawa 2003). This fish is carnivores, sedentary and occur in several types of fluvial and lacustrine environments (Nakatani et al. 2001), especially in shallow water environments and near submerged or marginal vegetation. This fish is easily found in the Upper Paraná River Floodplain and although it is identified as H. aff. malabaricus several authors agree this fish is a species complex (Graça and Pavanelli 2007). Paiza and Júlio Jr. (2003), based on cytogenetic data, found three cytotypes in the region, two natives of the Upper Paraná River (Hoplias sp. 2 and sp. 3) and one specie introduced Hoplias sp. 1, which occur after the flood of Sete Quedas falls by Itaipú Reservoir. Oyakawa (2003) mentioned that the situation of the genera Hoplias is quite confusing, because of the large number of species described and the use of features appropriate for their delimitation.

In Brazil, the first record of monogenean species in Hoplias aff. malabaricus was Urocleidoides eremitus Kritsky, Thatcher and Boeger, 1986 from State of Amazonas. In 1995 Boeger and Popazoglo described Gyrodactylus trairae parasitizing the body surface of the same host from State of Rio de Janeiro. Rosim et al. (2011) reported six species of monogeneans in H. aff. malabaricus collected from rivers in different Brazilian regions: Guandu, Jaguar-Mirim and Machado from the Northeast, Araguaia, Cristalino and Cuiabá from Midwest and Paraná between the South and Midwestern regions.

Studies carried out between the years 2000 to 2007 about the diversity of fish parasites from the Upper Paraná River Floodplain registered the occurrence of 20 species of parasites in H. aff. malabaricus. However, in this paper, there were no register of monogeneans in this host (Takemoto et al. 2009). Recently Graça et al. (2013) studied the ecological aspects of monogeneans of H. aff. malabaricus from the Upper Paraná River Floodplain and recorded nine species of these parasites in this host. Currently, 10 species of monogeneans are known to H. aff. malabaricus (Kritsky et al. 1986; Boeger and Popazoglo 1995; Rosim et al. 2011; Graça et al. 2013).

The present study offers information about gill ectoparasites through a checklist of monogeneans species of Hoplias aff. malabaricus from Upper Paraná River Floodplain.

MATERIALS AND METHODS

The study area is part of the Upper Paraná River Floodplain in the Paraná and Mato Grosso do Sul States from Brazil (22°43’S, 53°10’W), where is located the base of advanced research at the State University of Maringá (UEM) - Center of Research in Limnology, Ichthyology and Aquaculture (Nupélia) (Figure 1). The sampling points are those used by the project PELD - CNPq (Long Term Ecological Projects) - Site 6. The Site six covers most of the last remaining lowland not dammed the River Paraná in Brazil. In this stretch, the River presents a broad canal anastomosed with reduced slope, sometimes with extensive floodplain and large accumulation of sediment in its bed, resulting in more than 300 bars and small islands, sometimes with large islands and floodplain narrower (Agostinho et al. 1995). The floodplain has an extension of approximately 130 km and it is connected numerous secondary channels, backwaters, Baia River and the lower reaches of Ivaí and Ivinheima Rivers.
A total of 54 specimens of *H. aff. malabaricus* were collected quarterly from March 2010 to March 2011, totaling five collection campaigns. The fishes were euthanized with benzocaine 10%. Subsequently, the specimens were identified, the gills removed and fixed in formalin 5%. Collecting, preparation, fixation and mounting of parasites were treated according to Eiras *et al.* (2006). The identification was according to Kritsky *et al.* (1986), Boeger and Vianna (2006) and Rosim *et al.* (2011). Voucher parasite specimens are deposited in the Helminthological Collection of the Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Rio de Janeiro, Brazil.

**RESULTS**

In total, 3640 specimens of monogeneans were registered in this study. All fishes were parasitized by at least one species of parasites. *Urocleidoides cuiabai* Rosim, Mendoza-Franco and Luque, 2011 was the most prevalent species (96.29%), followed by *U. malabaricusi* Rosim, Mendoza-Franco and Luque, 2011 (92.59%). The species with the lowest prevalence were Dactylogyridae gen. 1. sp. and *Cosmetocleithrum bulbocirrus* Kritsky, Thatcher and Boeger, 1986 (1.85%). The list of species of monogenetic and information on levels of parasitism are presented in Table 1.

**DISCUSSION**

*Platyhelminthes Gegenbaur, 1859*

*Monogenea van Beneden, 1858*

*Dactylogyridae Bychowsky, 1933*

*Ancyrocephalinae Bychowsky, 1937*

*Urocleidoides Mizelle and Price, 1964*

The genus *Urocleidoides* was reviewed by Kritsky *et al.* (1986) and from the 30 species listed by Kritsky and Thatcher (1983), only eight were kept in this genus (Kritsky *et al.* 1986). *Urocleidoides* has 22 species in South America.

### Table 1

<table>
<thead>
<tr>
<th>MONOGENEA</th>
<th>AN</th>
<th>NI</th>
<th>NP</th>
<th>AI</th>
<th>AP</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Urocleidoides malabaricus</em></td>
<td>CHIOC 37791</td>
<td>50</td>
<td>691</td>
<td>13.82</td>
<td>1 – 117</td>
</tr>
<tr>
<td><em>Urocleidoides eremitus</em></td>
<td>CHIOC 37790</td>
<td>35</td>
<td>736</td>
<td>21.02</td>
<td>1 – 143</td>
</tr>
<tr>
<td><em>Urocleidoides cuiabai</em></td>
<td>CHIOC 37793</td>
<td>52</td>
<td>1532</td>
<td>29.46</td>
<td>1 – 193</td>
</tr>
<tr>
<td><em>Urocleidoides brasiliensis</em></td>
<td>CHIOC 37795</td>
<td>37</td>
<td>240</td>
<td>6.48</td>
<td>1 – 42</td>
</tr>
<tr>
<td>Anacanthorus sp.</td>
<td>CHIOC 37800</td>
<td>30</td>
<td>215</td>
<td>7.16</td>
<td>1 – 29</td>
</tr>
<tr>
<td>Vancleaveus janauacaensis</td>
<td>CHIOC 37797</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1 – 2</td>
</tr>
<tr>
<td>Cosmetocleithrum bulbocirrus</td>
<td>CHIOC 37799</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Dactylogyridae gen. sp.</td>
<td>CHIOC 37802 a-b</td>
<td>26</td>
<td>222</td>
<td>8.53</td>
<td>1 – 47</td>
</tr>
<tr>
<td>Dactylogyridae gen. 1. sp.</td>
<td>CHIOC 37803</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

**Figure 1.** Upper Paraná River Floodplain located in the States of Paraná and Mato Grosso do Sul, Brazil.
America (Cohen et al. 2013), four of them described recently by Rosim et al. (2011) parasitizing Hoplias aff. malabaricus. According to Eiras et al. (2010), the genus Urocleidoides does not have host specificity, and this genus can be found in fish of different orders, such as: Siluriformes, Characiformes, Gymnotiformes and Cyprinodontiformes. However, Urocleidoides cuiabai, U. malabaricus, U. brasiliensis and U. eremitus so far, has been recorded only in H. aff. malabaricus, indicating the specificity for this host.

**Urocleidoides eremitus** Kritsky, Thatcher and Boeger, 1986

Urocleidoides eremitus was described parasitizing Hoplias aff. malabaricus collected at Lake Janauacá in Manaus, Amazonas State, Brazil. Recently, Rosim et al. (2011) registered U. eremitus in H. aff. malabaricus collected in four Rivers in Brazil such as, Guandu River in the State of Rio de Janeiro, Jaguari-Mirim River in the State of São Paulo, Machado River in the State of Minas Gerais and Cuiabá River in the State of Mato Grosso.

**Urocleidoides malabaricus** Rosim, Mendoza-Franco and Luque, 2011

**Urocleidoides cuiabai** Rosim, Mendoza-Franco and Luque, 2011

**Urocleidoides brasiliensis** Rosim, Mendoza-Franco and Luque, 2011

Urocleidoides malabaricus, U. cuiabai and U. brasiliensis were described by Rosim et al. (2011) parasitizing the gills of Hoplias aff. malabaricus collected in different rivers of Brazil. Urocleidoides malabaricus was only registered in the hosts collected in the Paraná and Cuiabá Rivers. Urocleidoides cuiabai was registered in hosts collected in Paraná, Cuiabá, Guandu, Jaguari-Mirim, Araguaia and Cristalino Rivers (the latter two rivers are located in the State of Mato Grosso). Urocleidoides brasiliensis was registered in H. aff. malabaricus collected in Guandu, Cuiabá, Cristalino and Paraná Rivers. These same species, described by Rosim et al. (2011), were found in H. aff. malabaricus collected in the Upper Paraná River Floodplain by Graça et al. (2013).

**Vancleaveus** Kritsky, Thatcher and Boeger, 1986

Vancleaveus janauacaensis Kritsky, Thatcher and Boeger, 1986

Currently, the genus Vancleaveus is composed of five species registered in gills of Siluriformes (Cohen et al. 2013). Vancleaveus janauacaensis was described parasitizing gills of Pterodoras granulosus (Valenciennes, 1821) collected in Lake Janauacá in Manaus in State of Amazonas, Brazil. Recently, V. janauacaensis was also registered in P. granulosus by Chemes and Takemoto (2011) in the Middle Paraná River in Argentina.

**Cosmetocleithrum** Kritsky, Thatcher and Boeger, 1986

Cosmetocleithrum bulbocirrus Kritsky, Thatcher and Boeger, 1986

The genus Cosmetocleithrum has eight species of fish parasites in Siluriformes (Cohen et al. 2013). Cosmetocleithrum bulbocirrus was described parasitizing gills of Pterodoras granulosus also collected at Lake Janauacá in Manaus. This parasite also was registered in Oxydoras niger (Valenciennes, 1821) by Silva et al. (2011) in Coari Lake, tributary of the Solimões River in Amazonas State, Brazil.

**Dactylogyridae** Bychowsky, 1933

**Dactylogyridae gen. sp. of Rosim, Mendoza-Franco and Luque, 2011**

Rosim et al. (2011) registered Dactylogyridae gen. sp. in Hoplias aff. malabaricus collected in the Jaguari-Mirim, Machado, Cuiabá and Paraná Rivers. Graça et al. (2013) reported this parasite specie in H. aff. malabaricus collected in the Upper Paraná River Floodplain. These authors, as well as Rosim et al. (2011), found none diagnostic features for the inclusion of this species in a known genus.

**Dactylogyridae gen. 1. sp.**

Dactylogyridae gen. 1 sp. didnothinghave any characteristics that enable the fit in a genera known of monogeneans. This species has a complex copulatory and haptor totally different of the species found by Rosim et al. (2011).

**Anacanthorinae** Price, 1967

**Anacanthorus** Mizelle and Price, 1965

Anacanthorus is a genus represented by 70 species of monogeneans. It has been described for Characiformes species, according the checklist presented by Cohen et al. (2013): Species of Anacanthorus were registered by Takemoto et al. (2009) parasitizing the gills of Salminus brasiliensis (Cuvier, 1816) and Serrasalmus marginatus Valenciennes, 1837 from the the Upper Paraná River Floodplain. Cohen et al. (2012) described five new species of Anacanthorus in S. brasiliensis in the Paraná River, Anacanthorus bicuspidatus, A. contortus, A. daulometrus, A. douradensis and A. parakruidenieri. The first record of a species of Anacanthorus in this Hoplias aff. malabaricus was recently by Graça et al. (2013). The species recorded in this study differs from other species of Anacanthorus registered in other hosts and it is probably a new species.

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