Monogenean infestations of arowana (*Osteoglossum bicirrhosum*) and cat fish (*Hypostomus plecostomus*)

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Abstract

Arowana (*Osteoglossum bicirrhosum*) and cat fish (*Hypostomus plecostomus*) are two species of ornamental fishes which are mostly imported to Iran. Monogenea are plathyhelminthes which can dominantly infest the fish skin and gills with high host specificity. In this research, 35 *O. bicirrhosum* and 50 *H. plecostomus* with clinical signs were collected from different ornamental fish markets in Semnan, Iran and transferred alive to the Lab. Fish skin and gills were examined for monogenean infestations. No monogenea was observed on the skin specimens, but *Gonocleithrum cursitans* and *Unilatus unilatus* infested 54.28% and 74% of gills in *O. bicirrhosum* and *H. plecostomus*, respectively. This is the first report of both *G.cursitans* and *U. unilatus* in Iran.

Keywords: Arowana, *Osteoglossum bicirrhosum*, Cat fish, *Hypostomus plecostomus*, Monogenea, Iran

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Introduction

The Arowana (O. bicirrhosum) (order: Osteoglossiform, family: Osteoglossidae) is an ornamental fish which has an elongated body covered with large, heavy scales. There is a toothed bone on the floor of its mouth, and the "tongue", is equipped with barbes (Lemos et al., 2012). Therefore, arowana has various diets such as insects, arachnids, small fishes, crustaceans and mollusks (Tavares-Dias et al., 2014). Arowana is one of the most popular ornamental fish in Iran.

Cat fish (order Siluriformes, family Loricariidae) consist of more than 2800 species with worldwide distribution (Mendoza-Palmero et al., 2015). H. plecostomus is one of the most species which is imported to Iran. Cat fishes, especially large pimelodids and doradids, are greatly appreciated by aquarists. They are used for local consumption in aquariums (Mendoza-Palmero et al., 2015).

Monogenea are flatworms or Platyhelminthes (Class Monogenoidea). They have a direct life cycle and can parasitize cephalopods, amphibians, reptiles and mammals. Most of them are fish ectoparasites with relatively high host specificity (Buchmann and Bresciani, 2006). Although, most monogenea are on the skin, fins, gills, mouth cavity and nostrils of the infested fish, few species are adopted for endoparasitic life and can infect the bladder, urinary ducts, digestive tract and even the cloaca (Buchmann and Bresciani, 2006).

Monogenea are hermaphroditic worms. Most of them are oviparous. The worms produce and release eggs into the aquatic habitat. Eggs hatch by releasing ciliated or non-ciliated larva, following a free-swimming larval phase. The larva attach to the host and develop into post larval and adult stages (Cone and Burt, 1981; Buchmann and Bresciani, 2006). Some other monogenea are oviviviparous or viviparous (Buchmann and Bresciani, 2006).

Some of the important monogenean organs which are mostly used in identification keys are anterior bar, posterior bar, anterior anchors, posterior anchors, hooks and some male or female copulatory organs (Boeger and Vianna, 2006). Nowadays, molecular tests are also used for monogenean nomenclature.

The aim of this study was to understand the monogenean infestation rates of arowana (O.bicirrhosum) and cat fish (H.plecostomus) and to identify the monogenea which infest these imported ornamental fishes in Iran.

Materials and methods

35 Arowana (O.bicirrhosum) and 50 cat fish (H.plecostomus) with the clinical signs were selected and collected from ornamental fish markets in Semnan during 2011 to 2015. Fishes (samples) were transferred alive to the laboratory. They were euthanized and wet smears were obtained from their skin and observed under light microscopy. Gills of the fishes were separated and placed in petri dishes and observed under a
stereomicroscope. Helminthes were removed from the gills and put on microscopic slides. Malmberg solution which consisted of ammonium picrate was added to the positive smears and covered with a cover glass. The monogenean genera were identified according to Boeger and Vianna (2006).

Results
No monogenea was observed on the O.bicirrhosum and H.plecostomus skin. 19 out of 35 (54.28%) O.bicirrhosum gills were infested by G. cursitans (Dactylogyridae, Ancyrocephalinae) (Fig.1). 37 out of 50 (74%) H.plecostomus gills were infested by U. unilatus (Dactylogyridae, Ancyrocephalinae) (Fig.2).

Both Gonocleithrum and Unilatus have a single anterior bar. In Gonocleithrum identification; male copulatory organ (MCO), posterior bar and gonadal bar are important, in Unilatus identification; anterior and posterior bar, posterior anchor, MCO, accessory piece and hooks are important. Identifying morphometric measurements of both are presented in Tables 1 and 2. G. cursitans and U. unilatus were well described by Kritsky and Tatcher (1983) and Mizelle et al. (1968), respectively.

Discussion
Different monogen species were reported from various ornamental fish in Iran. For the first time Ebrahimzadeh Mousavi (2003) examined ornamental fish parasites and reported Dactylogyrus vastator from catfish. Shoaibi reported Trichodina sp., Ichthyophthirius multifiliis and also a species of Ancyrocephalus and Gyrodactylus from the gills of imported catfish (Shoaibi, 2009).

Different species of Gonocleithrum have been reported. Kritsky and Tatcher (1983) described Gonocleithrum as a new genus and five new species; G. planacrus, G. aruanae, G. coenoideum, G. cursitans and G. planacroideum on O. bicirrhosum gills in Brazil. In other similar studies, 100% and 87.5% of examined O.bicirrhosum gills were infested by G. aruanae in Brazil (Lemos et al., 2012; Tavares-Dias et al., 2014).

In this research, the monogenean infestation rate of O. bicirrhosum was relatively high (82.8%) in Iran, the same as previous studies in Brazil, but all the removed monogenea were G.cursitans. The identified G. cursitans were similar to what Kritsky and Tatcher (1983) described; anterior bar had enlarged ends and median anterior process, posterior bar was broadly v-shaped, gonadal bar was Y-shaped with inconspicuous flanges on anterior arms, the MCO was coiled.

Unilatus and U.unilatus was proposed by Mizelle and Kritsky (1967) on Plecostomus gills. In 1968 U.brittani was reported on Plecostomus gills (Mizelle et al., 1968) and U.anoculus on Hypostomus bolivianus gills (Price, 1968). In 1974, U. unilatus was identified on Hypostomus robinii gills (Molnar et al., 1974).
Table 1: Morphometric measurements of *Unilatus unilatus*.

<table>
<thead>
<tr>
<th><em>Unilatus unilatus</em> measurement</th>
<th>Micrometer (n=10)</th>
</tr>
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<tbody>
<tr>
<td>Body length</td>
<td>560(487-632)</td>
</tr>
<tr>
<td>Body width</td>
<td>135(127-149)</td>
</tr>
<tr>
<td>Anterior anchor length</td>
<td>35(30-39)</td>
</tr>
<tr>
<td>Anterior anchor base width</td>
<td>18(17-19)</td>
</tr>
<tr>
<td>Anterior bar length</td>
<td>32(29-36)</td>
</tr>
<tr>
<td>Posterior anchor length</td>
<td>22(20-24)</td>
</tr>
<tr>
<td>Posterior anchor base width</td>
<td>16(14-18)</td>
</tr>
<tr>
<td>Posterior bar length</td>
<td>42(35-49)</td>
</tr>
<tr>
<td>Hook length</td>
<td>12(10-14)</td>
</tr>
<tr>
<td>Cirrus length</td>
<td>61(59-63)</td>
</tr>
<tr>
<td>Accessory piece length</td>
<td>42 (37 – 46)</td>
</tr>
</tbody>
</table>

Table 2: Morphometric measurements of *Gonoleithrum cursitans*.

<table>
<thead>
<tr>
<th><em>Gonoleithrum cursitans</em> measurement</th>
<th>Micrometer (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body length</td>
<td>371(360-381)</td>
</tr>
<tr>
<td>Body width</td>
<td>69(65-73)</td>
</tr>
<tr>
<td>Dorsal anchor length</td>
<td>34(31-37)</td>
</tr>
<tr>
<td>Dorsal anchor base width</td>
<td>14(11-17)</td>
</tr>
<tr>
<td>Dorsal bar length</td>
<td>40(38-42)</td>
</tr>
<tr>
<td>Ventral anchor length</td>
<td>42(40-44)</td>
</tr>
<tr>
<td>Ventral anchor base width</td>
<td>21(19-23)</td>
</tr>
<tr>
<td>Ventral bar length</td>
<td>40(32-47)</td>
</tr>
<tr>
<td>Hook length</td>
<td>29(26-32)</td>
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</tbody>
</table>

Figure 1: *Gonoleithrum cursitans*; a: copulatory complex, b: gonadal bar, c: hook, d: Ventral anchor, e: Ventral bar, f: Dorsal anchor, g: Dorsal bar. 400X.
Figure 2: *Unilatus unilatus*; Aa: male copulatory organ and accessory piece, Ab: egg, Ac: egg filament, Ba: anterior sucker, Bb: male copulatory organ, Bc: accessory piece, Bd: egg, Ca: anterior bar, Cb: anterior anchor, Cc: posterior anchor, Cd: posterior bar. A 400X, B and C 400X.

Suriano reported *U. unilatus* on *Hypostomus* sp., *U. scaphirhynchae* on *Dekeyseria scaphirynchia* and *U. dissimilis* on *Hemiancistrus* sp., all of the reported species were removed from the gills of their hosts (Suriano, 1985). In 2012, *U. unilatus* was observed on *Hypostomus iheringii* and *Hypostomus strigaticeps* gills (Zica et al., 2012) and *U. unilatus, U. brittani* on *Pterygoplichthys anisitsi* in Peru (Mendoza-Palmero et al., 2012). A new species of *Unilatus*, named *U. irae*, was described in 2014 and was removed from armed cat fish (*Leporacanthicus galaxias*) gills and the infestation rate was 62.5% (Branches and Domingues, 2014).

In this research the monogenean infestation rate of *H. plecostomus* was 74% and all the identified monogenea were *U. unilatus*. According to the results, all *U. unilatus* specimens were more similar to what Mizelle *et al.* (1968) explained than the *U. unilatus* which was observed by Zica *et al.* (2012); the accessory piece was straight and anteriorly bowed as a hook. Both the anterior and posterior bar ends were slightly curved and tapered in the anterior end. A mid-portion projection was found posteriorly in the anterior and posterior bar.

In Iran, Both *G. cursitans* and *U. unilatus* were recorded for the first time on *O.*
bicirrhossum and H. plecostomus, respectively.

The monogenean pathogenicity is closely related to the fish population, parasite number, Monogenean attachment organs and its physiology, gland secretions and feeding strategy (Boeger and Vianna, 2006; Buchmann and Bresciani, 2006). In crowded condition monogenea can rapidly become a problem and can easily transmit from one host to another by direct transmission. Large numbers of the parasite can produce extensive damage to the gills. Some abnormalities which can be observed in monogenean infested gills are; excessive production of mucus, reduced respiratory capacity in mucus coated gill filaments, sudden death of fish due to hypoxia and gill epithelial hyperplasia (Boeger and Vianna, 2006).

Ornamental fishes are imported in large numbers to Iran, especially from Southeastern Asian countries. According to the results and due to high monogenean infestation rates of the examined ornamental fishes, it is recommended that all the imported fishes are well quarantined and treated before releasing to the markets. The importation of these monogenean infested fishes not only is cost beneficial but also can change the parasitic fauna of our endemic fishes.

References


Parasitological evaluation and body indices of Osteglossum bicirrhosum (Vandelli, 1829) traded in a fair of Manaus, Amazonas, Brazil. *Journal of Fisheries Sciences*, 6(3), 263-270.


