

# THREE NEW SPECIES OF *DEMIDOSPERMUS* (MONOGENEA: DACTYLOGYRIDAE) PARASITIC ON *BRACHYPLATYSTOMA FILAMENTOSUM* (SILURIFORMES: PIMELODIDAE) FROM THE ARAGUAIA RIVER, BRAZIL

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**ABSTRACT:** Three new species of dactylogyrids (Monogenea) from the Araguaia River in Brazil are described herein. Specimens of *Demidospermus ceccarellii* n. sp., *Demidospermus brachyplatystomae* n. sp., and *Demidospermus araguaiaensis* n. sp. were collected from the gills of the siluriform fish, *Brachyplatystoma filamentosum* (Lichtenstein, 1819). The 3 new species can be easily distinguished from their congeners by the shape of the male copulatory organ (MCO) and accessory piece. *Demidospermus ceccarellii* n. sp. presents a J-shaped and robust MCO, a base with a short sclerotized margin, and a slightly curved and robust accessory piece with the base slightly dilated. In contrast, *D. brachyplatystomae* n. sp. has a thin MCO forming an incomplete ring, a base with an irregular sclerotized margin, and a long and curved accessory piece with a wider distal portion. *Demidospermus araguaiaensis* n. sp. has a thin MCO with a base directly coupled to the accessory piece and an articulated accessory piece that is sinuous in shape in the distal portion. In addition, the 3 species present haptor hooks similar in shape and size and, thus, were compared in detail with the other *Demidospermus* species with this particular characteristic. This is the first record of monogeneans that are parasitic on *B. filamentosum*.

Monogeneans are the most speciose and diversified group of ectoparasites in neotropical actinopterygian fishes. According to Boeger and Vianna (2006) and Luque and Poulin (2007), there are a significant number of host species that have not been studied for monogeneans. As such, additional efforts to carry out studies of monogenean biodiversity are particularly relevant.

*Brachyplatystoma filamentosum* (Lichtenstein, 1819) is the largest catfish species, reaching 3.6 m in length. It is a potamodromous brackish species with a known distribution that comprises the Amazon and Orinoco River Basins, as well as the major rivers of the Guianas and northeastern Brazil (Froese and Pauly, 2009). This species has a very high vulnerability and is currently threatened due to overfishing (Riede, 2004; Cheung et al., 2005).

During 2008, 2 specimens of *B. filamentosum* were captured from the Araguaia River, State of Mato Grosso, Brazil, and numerous monogeneans were collected from their gills. Here, we describe 3 new species of *Demidospermus* Suriano, 1983.

## MATERIALS AND METHODS

Two adult specimens of *B. filamentosum* were collected from the Araguaia River (13°23'07.3"S, 50°39'58.1"W), State of Mato Grosso, Brazil, in June 2008. The female specimen measured 2.14 m in length and the male specimen measured 1.80 m. The gills were removed and placed in vials containing 5% formalin. Some parasites were stained with Gomori's trichrome and mounted in Canada balsam for study of structures and internal organs. Other specimens were mounted in Gray and Wess's medium (Humason, 1979) for study of sclerotized structures. Measurements, all in micrometers, are expressed as the mean, followed in parentheses by the range and number of specimens measured. The illustrations were made with the aid of a drawing tube mounted on a Hund Wetzlar H-600 phase contrast microscope. Type specimens were deposited in the Helminthological Collection of the Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, and in the Invertebrates Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil.

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## DESCRIPTIONS

### *Demidospermus ceccarellii* n. sp.

(Figs. 1–7)

*Description (based on 20 specimens: 10 stained with Gomori's trichrome, 10 mounted in Grey and Wess's medium):* Body 793 (575–967, n = 8) long, fusiform, maximum width 115 (74–146, n = 8) at level of gonads. Two terminal, 2 bilateral cephalic lobes. Eye spots 2, ocular granules present. Pharynx subspherical 51 (50–53, n = 8) in diameter. Testis elongated, 189 (141–223, n = 9) long, 49 (43–64, n = 9) wide. MCO 48 (46–50, n = 7) long, J-shaped, robust, base with short sclerotized margin. Accessory piece 50 (46–54, n = 8) long, slightly curved, robust, base slightly dilated. Vas deferens looping left intestinal cecum. Seminal vesicle fusiform. Prostatic reservoir not observed. Vaginal aperture sinistral, vaginal tube leading to seminal receptacle. Germarium elongated, 81 (50–120, n = 10) long, 40 (25–63, n = 10) wide. Vitellaria scattered throughout trunk, absent in region of reproductive organs. Peduncle moderately elongate, haptor subhexagonal 71 (55–114, n = 10) long, 91 (63–106, n = 10) wide. Anchors similar in shape, each with short shaft, elongated point, roots poorly defined. Ventral anchor 27 (27–28, n = 9) long, base 57 (54–58, n = 9) wide. Dorsal anchor 28 (27–32, n = 10) long, base 52 (50–55, n = 10) wide. Bars with dilated extremities. Ventral bar 71 (67–74, n = 10) long, slightly curved anteriorly. Dorsal bar 58 (49–65, n = 9) long, straight, irregular anterior border. All 14 hooks similar in shape and size, each with recurved point, delicate throughout, slightly erected blunt thumb, filamentous hook about 90% shank length, 15 (14–16, n = 8) long.

### Taxonomic summary

*Type host:* *Brachyplatystoma filamentosum* (Lichtenstein, 1819).

*Site of infection:* Gill lamellae.

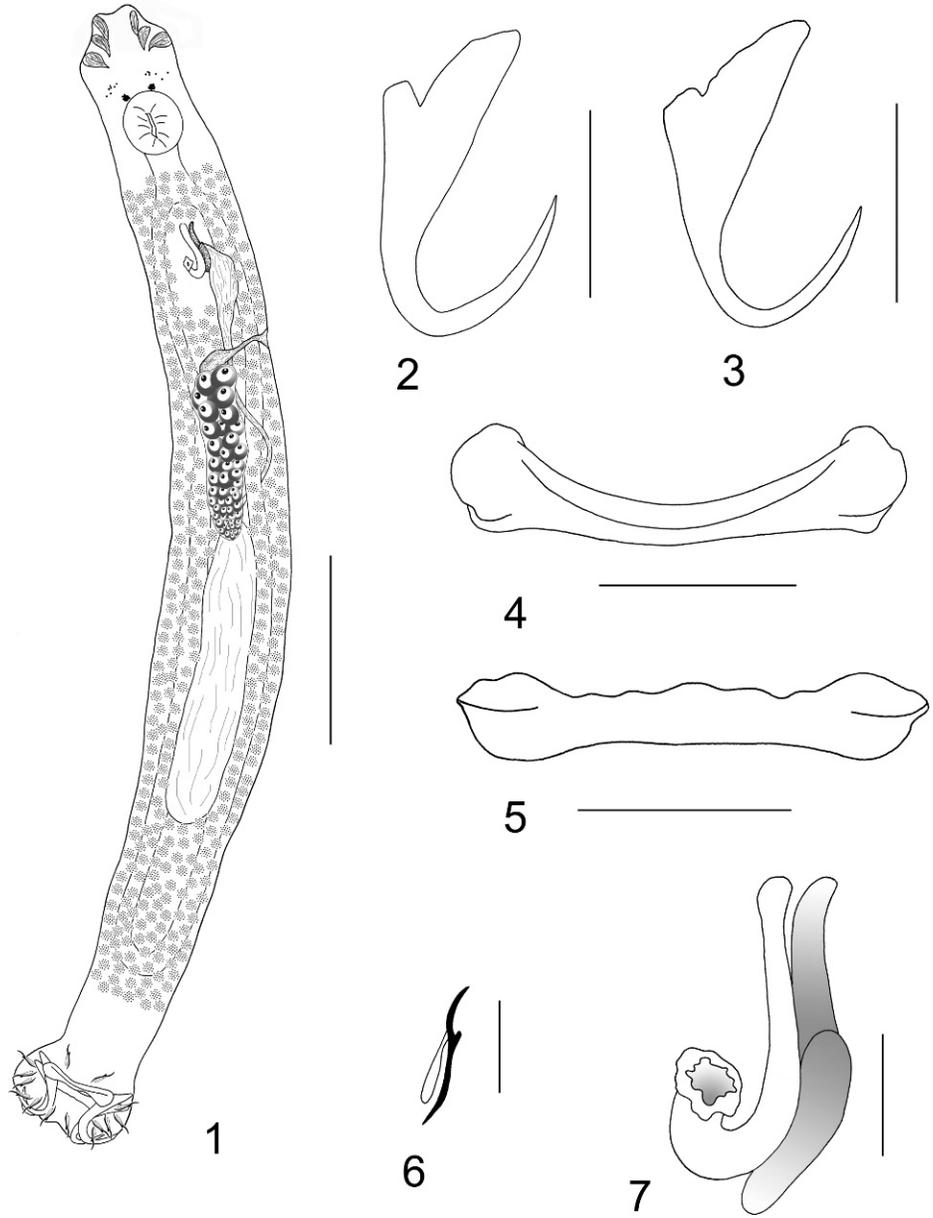
*Type locality:* Araguaia River, State of Mato Grosso (13°23'07.3"S, 50°39'58.1"W), Brazil.

*Specimens deposited:* Holotype CHIOC no. 37323. Paratypes CHIOC no. 37324 a–d, 37325 a–e, INPA no. 529 a–j.

*Etymology:* The name was chosen to honor Dr. Paulo Sérgio Ceccarelli (Instituto Chico Mendes de Conservação da Biodiversidade, Brazil) for his contribution to the knowledge of diseases in Brazilian freshwater fishes.

### Remarks

Currently, there are 16 nominal species of *Demidospermus* that parasitize catfish species from South America (Kritsky and Gutiérrez, 1998; França et al., 2003; Cohen and Kohn, 2008; Mendoza-Franco and Scholz, 2009; Ferrari-Hoeninghaus et al., 2010; Tavernari et al., 2010). *Demidospermus ceccarellii* n. sp. is similar to *D. luckyi* (Kritsky, Thatcher and Boeger, 1987), *D. centromochli* Mendoza-Franco and Scholz, 2009, *D. osteomystax* Ferrari-Hoeninghaus, Bellay, Takemoto and Pavanelli, 2010, and *D. paranaensis* Ferrari-Hoeninghaus, Bellay, Takemoto and Pavanelli,



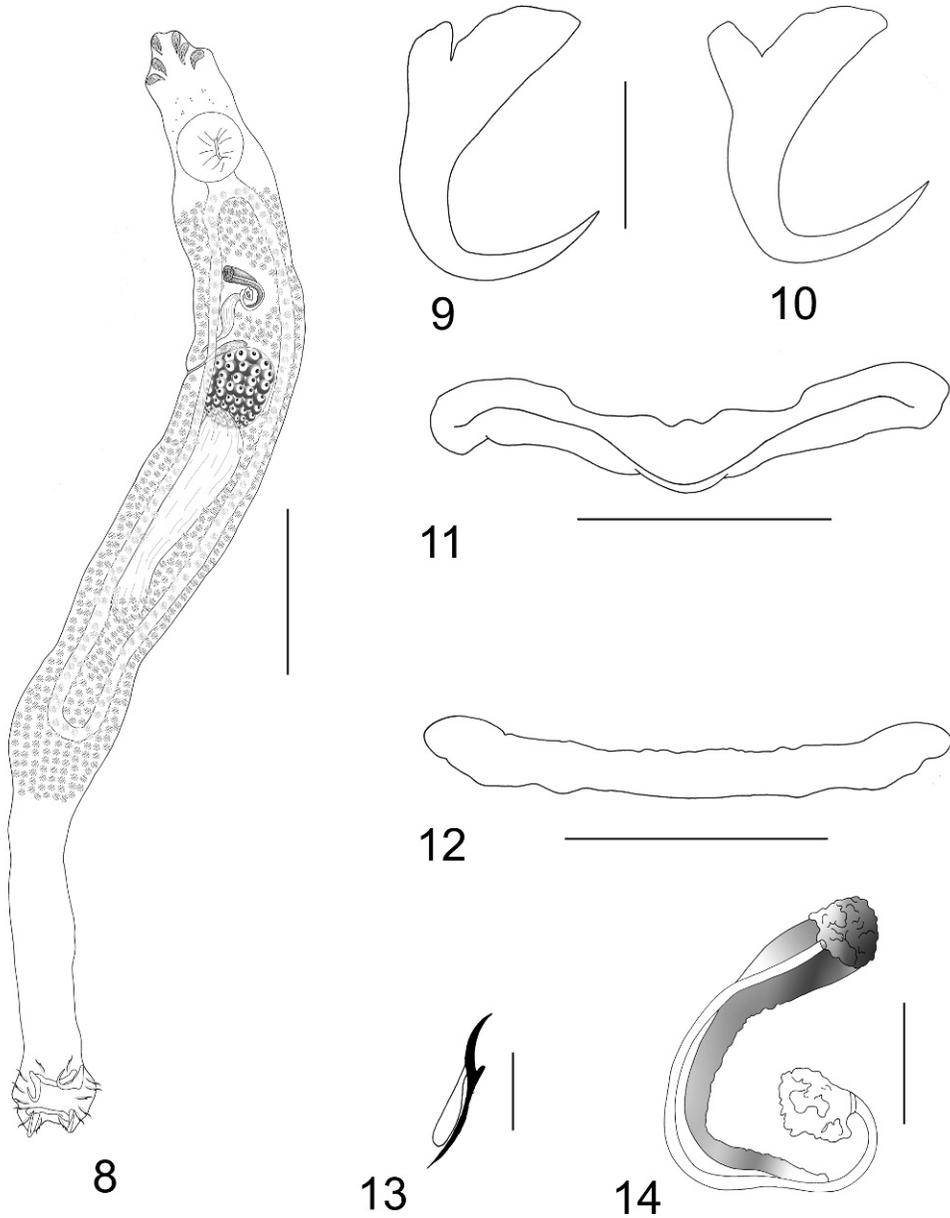
FIGURES 1–7. *Demidospermus ceccarellii* n. sp. (1) Holotype, ventral view. (2) Ventral anchor. (3) Dorsal anchor. (4) Ventral bar. (5) Dorsal bar. (6) Hook. (7) Male copulatory complex: copulatory organ and accessory piece. Figures are drawn to the following scales: 100  $\mu$ m (Fig. 1), 20  $\mu$ m (Figs. 2, 3), 30  $\mu$ m (Figs. 4, 5), 10  $\mu$ m (Fig. 6), and 15  $\mu$ m (Fig. 7).

2010, by possession of haptor hooks similar in shape and size. *Demidospermus ceccarellii* also has an MCO that is most similar to that of *D. centromochli*; however, it differs in having a J-shaped MCO with a robust base and a short sclerotized margin. In contrast, *D. centromochli* presents a sigmoidal tube, a base with a delicate margin, with 2 sclerotized flaps and an accessory piece like an elongated cone. Additionally, *D. ceccarellii* has an accessory piece that is slightly curved and robust, and a base that is slightly dilated.

***Demidospermus brachyplatystomae* n. sp.**  
(Figs. 8–14)

*Description (based on 13 specimens: 5 stained with Gomori's trichrome, 8 mounted in Grey and Wess's medium):* Body 1,333 (1,197–1,454, n = 5) long, fusiform; maximum width 177 (143–200, n = 5) long, at gonads level. Two terminal, 2 bilateral cephalic lobes. Eye spots absent, ocular granules scattered. Pharynx sub-spherical, 90 (72–99, n = 5) in diameter. Testis elongated, 288 (265–294, n = 5) long, 100 (88–123,

n = 5) wide. MCO 67 (45–78, n = 8) long, thin, coiled, forming an incomplete ring; base with a long and irregular sclerotized margin. Accessory piece 69 (51–101, n = 8) long, curved, distal portion wider. Vas deferens looping left of intestinal cecum. Seminal vesicle fusiform. Prostatic reservoir not observed. Vaginal aperture sinistral, vaginal tube leading seminal receptacle. Germarium ovate 247 (176–294, n = 5) long, 107 (88–118, n = 5) wide. Vitellaria scattered throughout trunk, absent in region of reproductive organs. Peduncle elongate, haptor sub-hexagonal 65 (60–72, n = 5) long, 102 (90–114, n = 5) wide. Anchors similar in shape; each with robust, short shaft, elongated point, defined roots. Ventral anchor 42 (38–44, n = 7) long, base 25 (23–29, n = 7) wide. Dorsal anchor 41 (38–44, n = 8) long, base 25 (23–27, n = 8) wide. Ventral bar 66 (63–73, n = 7) long, slightly curved with small prominence on anteriomedian region. Dorsal bar 69 (61–82, n = 6) long, straight, elongated, ends slightly curved anteriorly. All 14 hooks similar in shape and size, each with recurved point, delicate throughout, slightly erected blunt thumb, filamentous hook about 90% shank length, 18 (17–21, n = 11) long.



FIGURES 8–14. *Demidospermus brachyplatystomae* n. sp. (8) Holotype, dorsal view. (9) Ventral anchor. (10) Dorsal anchor. (11) Ventral bar. (12) Dorsal bar. (13) Hook. (14) Male copulatory complex: copulatory organ and accessory piece. Figures are drawn to the following scales: 150  $\mu$ m (Fig. 8), 20  $\mu$ m (Figs. 9, 10), 30  $\mu$ m (Figs. 11, 12), 10  $\mu$ m (Fig. 13), and 30  $\mu$ m (Fig. 14).

**Taxonomic summary**

*Type host:* *Brachyplatystoma filamentosum* (Lichtenstein, 1819).

*Site of infection:* Gill lamellae.

*Type locality:* Araguaia River, State of Mato Grosso (13°23'07.3"S, 50°39'58.1"W), Brazil.

*Specimens deposited:* Holotype CHIOC no. 37320. Paratypes CHIOC no. 37321 a–b, 37322 a–d, INPA no. 530 a–g.

*Etymology:* The specific name refers to generic name of the host species.

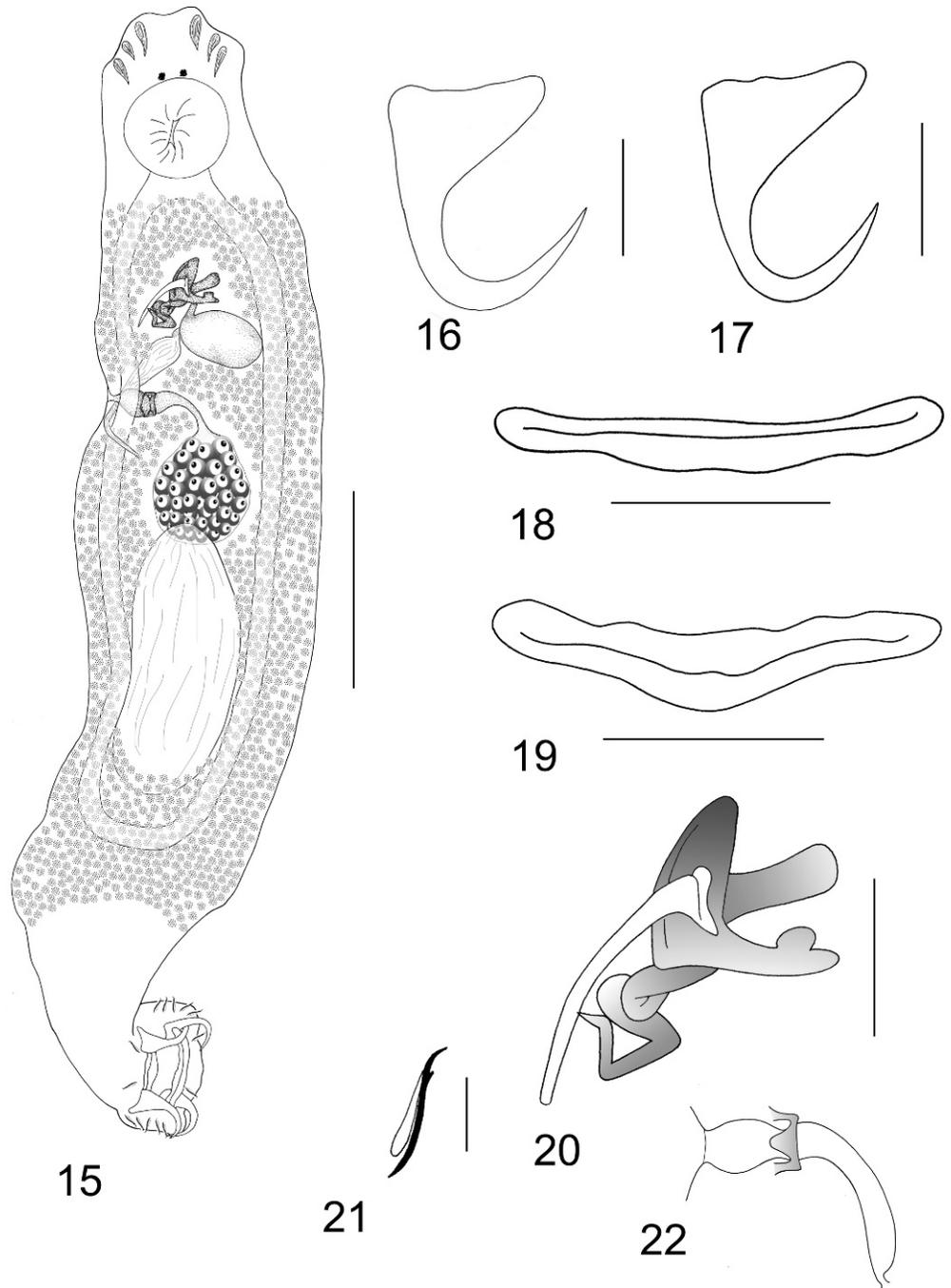
**Remarks**

Among all *Demidospermus* species with similar hooks, *D. brachyplatystomae* n. sp. differs from *D. ceccarellii* and *D. centromochli* in having a thin, coiled MCO, forming an incomplete ring, a base with a long and irregular sclerotized thin margin (MCO-like sigmoidal tube, a base with a delicate margin and 2 sclerotized flaps in *D. centromochli*). Additionally, *D. brachyplatystomae* has a curved accessory piece with wider distal portion. In contrast to *D. ceccarellii*, *D. brachyplatystomae* n. sp. possesses

a slightly curved ventral bar with small prominence on the anteromedian region (*D. ceccarellii* has bars with dilated extremities).

***Demidospermus araguaiaensis* n. sp.**  
(Figs. 15–22)

*Description (based on 3 specimens: 1 specimen stained with Gomori's trichrome, 2 mounted in Grey and Wess's medium):* Body 1,098 (1,055–1,140, n = 2) long, fusiform; maximum width 257 (228–285, n = 2) at gonads level. Two terminal, 2 bilateral cephalic lobes. Eye spots 2. Pharynx sub-spherical, 65 (60–69, n = 2) in diameter. Testis ovate, 418 (388–448, n = 2) long, 100 (94–105, n = 2) wide. MCO 100 (99–101, n = 2) long, thin base directly coupled to accessory piece, 81 (75–87, n = 3) long. Accessory piece, articulated, sinuous shaped in distal portion. Vas deferens looping left of intestinal cecum. Seminal vesicle fusiform. Ovate prostatic reservoir. Vaginal aperture sinistral, sclerotized; vaginal vestibule bulb shaped, vaginal tube leading to seminal receptacle. Germarium ovate 125 (120–129, n = 2) long, 72 (54–89, n = 2) wide. Vitellaria scattered throughout trunk, absent in region of reproductive organs. Peduncle short; haptor sub-hexagonal 97



FIGURES 15–22. *Demidospermus araguaiaensis* n. sp. (15) Holotype, dorsal view. (16) Ventral anchor. (17) Dorsal anchor. (18) Ventral bar. (19) Dorsal bar. (20) Male copulatory complex: copulatory organ and accessory piece. (21) Hook. (22) Vagina. Figures drawn to the following scales: 150  $\mu$ m (Fig. 15), 25  $\mu$ m (Figs. 16, 17), 40  $\mu$ m (Figs. 18, 19), 10  $\mu$ m (Fig. 20), and 50  $\mu$ m (Fig. 21).

(81–111, n = 3) long, 148 (144–150, n = 3) wide. Anchors similar in shape, each with short shaft, elongated point, but no defined roots. Ventral anchor 50 (46–52, n = 6) long, base 34 (31–37, n = 6) wide. Dorsal anchor 53 (50–58, n = 3) long, base 36 (34–37, n = 3) wide. Ventral bar 78 (78–79, n = 3) long, slightly curved. Dorsal bar 92 (90–95, n = 3) long, slightly curved with small prominence on anteromedian region. All 14 hooks similar in shape and size, each with recurved point, delicate throughout, blunt thumb slightly erected, filamentous hook about 90% shank length, 21 (17–27, n = 13) long.

**Taxonomic summary**

*Type host:* *Brachyplatystoma filamentosum* (Lichtenstein, 1819).  
*Site of infection:* Gill lamellae.  
*Type locality:* Araguaia River, State of Mato Grosso (13°23'07.3"S, 50°39'58.1"W), Brazil.

*Specimens deposited:* Holotype CHIOC no. 37326. Paratypes CHIOC no. 37327, INPA no. 531.

*Etymology:* The specific name *araguaiaensis* refers to the type-locality.

**Remarks**

*Demidospermus araguaiaensis* n. sp. differs from its congeners by the presence of a thin MCO with base directly coupled to an accessory piece. Accessory piece, articulated, is sinuous shaped in the distal portion. Among all *Demidospermus* species with similar hooks, only *D. araguaiaensis* presents a sclerotized vaginal aperture. In addition, the new species does not have defined anchor roots, whereas *D. ceccarellii* and *D. brachyplatystomae* possess defined ones. Finally, among the 3 new species proposed here, only *D. araguaiaensis* n. sp. showed a prostatic reservoir.

## DISCUSSION

Species of *Demidospermus* are restricted to neotropical freshwater siluriformes. Kritsky and Gutiérrez (1998) amended the original diagnosis of *Demidospermus* made by Suriano (1983) and proposed 5 new species collected from Argentinean pimelodid fishes. In addition, *Omothecium* Kritsky, Thatcher and Boeger, 1987 and *Parampochleithrium* Suriano and Incorvaia, 1995 were synonymized with *Demidospermus* by Kritsky and Gutiérrez (1998).

*Demidospermus* contained only species known as parasites in Argentinean pimelodids, until the report by Kritsky and Gutiérrez (1998). *Demidospermus luckyi* was the first *Demidospermus* species recorded in Brazil (Kritsky et al., 1987). França et al. (2003) proposed 2 new species, *D. mandi* França, Isaac, Pavanelli, and Takemoto, 2003 and *D. labrosi* França, Isaac, Pavanelli, and Takemoto, 2003, from fishes of the upper Parana River. Cohen and Kohn (2008) recorded 8 previously known *Demidospermus* species in fishes from the reservoir of the Itaipu Hydroelectric Power Station, Paraná, and 4 of these species were recorded for the first time in Brazil. In addition, *D. labrosi* was synonymized with *D. cornicinus* and *D. mandi* with *D. leptosynophallus*.

Recently, 2 new species of *Demidospermus* were described: *D. osteomystax* Tavernani, Takemoto, Figueiredo, and Pavanelli, 2010 on the gills of *Loricariichthys platymetopon* Isbrücker et Nijssen, 1979 and *D. paranaensis* Ferrari-Hoeninghaus, Bellay, Takemoto, and Pavanelli, 2010 on the gills of *Auchenipterus osteomystax* Miranda Ribeiro, 1918, both of the Upper Paraná River food plain, Brazil (Ferrari-Hoeninghaus, 2010; Tavernani et al., 2010).

Currently, *Demidospermus* species are distributed in fishes from 12 siluriform genera (Cohen and Kohn, 2008; Mendoza-Franco and Scholz, 2009). As siluriforms are very speciose in the neotropics, new records and new *Demidospermus* species will certainly be described in other species and localities in this region.

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