

***Pimelodus heraldoi* Azpelicueta, 2001, a junior synonym of *Pimelodus microstoma* Steindachner, 1877 (Siluriformes: Pimelodidae)**

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The examination of the holotype and 61 of the 64 paratypes of *Pimelodus heraldoi*, syntypes of *P. microstoma* and additional specimens from the upper rio Paraná showed that the former species is a junior synonym of the latter. Both species were originally described from the rio Mogi-Guaçu, upper rio Paraná.

O exame do holótipo e 61 dos 64 parátipos de *Pimelodus heraldoi*, dos sintipos de *P. microstoma* e de exemplares adicionais do alto rio Paraná, mostrou que a primeira espécie é um sinônimo júnior da segunda. Ambas foram descritas originalmente do rio Mogi-Guaçu, rio Paraná superior.

Key words: upper rio Paraná, Taxonomy, Fishes, Catfish.

Introduction

The catfish genus *Pimelodus* LaCépède, 1803, with 33 valid species and a cis- and trans- Andean distribution throughout freshwater drainages of the Neotropical Region from Panama to Argentina, is the largest in the family Pimelodidae (Lundberg & Littmann, 2003; Ferraris, 2007; Eschmeyer & Fricke, 2010).

Pimelodus heraldoi Azpelicueta, 2001 was described from the rio Mogi-Guaçu (type-locality), upper rio Paraná drainage. Azpelicueta (2001: 194) pointed out no exclusive characters to diagnose the new species, namely: (1) small dots irregularly placed (8-9 rows), most occurring in the anterior two-thirds of body, (2) the mouth with striated lips (see Azpelicueta, 2001: fig. 2), and (3) an enlarged posterior branch of the dorsal premaxillary process that articulates with the anterolateral margin of the mesethmoid;

(4) a right-angled posterolateral margin of the mesethmoid; (5) and a large pharyngobranchial 3 with a well-developed dorsal crest. Some morphometric characters addressing the differences between *P. heraldoi* and *P. fur* (Lütken, 1874) and *P. absconditus* Azpelicueta, 1995 were included in the diagnosis. *Pimelodus microstoma* Steindachner, 1877 was recently resurrected from synonymy with *P. fur* and its type-locality restricted to Irisanga, São Paulo State (rio Mogi-Guaçu drainage, upper rio Paraná) (Ribeiro & Lucena, 2007). The senior author studying the populations of *P. microstoma* found that the only character distinguishing it from *P. heraldoi* was the color pattern and that characteristic was included in an identification key for *Pimelodus* species from the upper portions of the Paraná drainage (Ribeiro & Lucena, 2007: 77). However, an in-depth analysis showed that there are no differences between *P. microstoma* and *P. heraldoi*.

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Material and Methods

The measurements are straight-line distances taken point-to-point with digital calipers and recorded to the nearest 0.1 mm, taken from the left side of the fish whenever possible. Measurements and counts follow Lundberg & McDade (1986) and Lundberg *et al.* (1991) with the modifications of Lundberg & Parisi (2002) and Ribeiro & Lucena (2006). Fin-ray counts include all rays. The two posteriormost anal-fin rays that are inserted at the same base were counted as separate rays. Gill rakers were counted on the first branchial arch (ceratobranchial and epibranchial). Osteological preparations were cleared and stained (c&s) for cartilage and bone using the method of Taylor & van Dyke (1985). Osteological terminology follows Lundberg & Luckenbill (2007).

Examined specimens belong to the American Museum of Natural History, New York (AMNH); Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP); Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP); and Naturhistorisches Museum, Vienna (NMW). In this study the Holotype, four lots of paratypes of *P. heraldoi* and two cited in the “Additional material” section of Azpelicueta (2001) (see Material examined and Note below) were examined.

Results

As mentioned in Introduction, Azpelicueta pointed out 8-9 irregular rows of dark dots on sides of the body in *P. heraldoi*. An examination of a series of specimens of *P. heraldoi* showed a wider range, with 6-9 irregular rows of dark dots on sides of the body (sometimes very weak or absent, *e.g.*, MZUSP 105395), more evident on the anterolateral region of the body. A similar pattern is demonstrated by *P. microstoma* (see Figs. 1b-c and Ribeiro & Lucena, 2007: fig. 3). The other character mentioned previously by Azpelicueta (2001), presence of striated lips in *P. heraldoi*, is likewise present in *P. microstoma*.

We also examined the bone characters given by Azpelicueta (2001) to look for any difference between *P. heraldoi* and *P. microstoma*. The two unique characters absent in the c&s specimen of *P. microstoma* examined and pointed out by Azpelicueta as diagnostic for *P. heraldoi*, but not exclusive, is an enlarged posterior branch of the dorsal premaxillary process which articulates [completely] with the anterolateral margin of the mesethmoid and a large pharyngobranchial 3 with a well-developed dorsal crest. Nevertheless, one c&s specimen of *P. heraldoi* (MZUSP 105395, 111.0 mm SL) collected with the holotype showed some differences with respect to these characters. The posterior branch of the dorsal premaxillary process is not as enlarged as that shown by Azpelicueta (2001: figs. 3a-c) and does not completely articulate with the mesethmoid. On the contrary, it is short, slender and only partially articulates with the mesethmoid. Besides that, the pharyngobranchial 3 of the right side has two crests, one on the anterior region

and other on a middle region of the dorsal margin of the bone. In the pharyngobranchial 3 of the left side a crest is present on the anterior margin of the bone in a position similar to that shown for *P. heraldoi*, illustrated by Azpelicueta (2001: fig. 5a). With respect to this bone, a juvenile c&s specimen of *P. microstoma* (MZUSP 23077, 65.0 mm SL) shows that the pharyngobranchial 3 bone of the left side has a small crest, while the crest is absent on the right side.

The morphometric data were calculated and compared between the syntypes of *P. microstoma* and the types of *P. heraldoi*. The only difference found is on body width (18.2 and 18.4, in syntypes of *P. microstoma* vs. 16.5-17.9, in types of *P. heraldoi*). This difference may be due to the poor condition of the syntypes of *P. microstoma* (see Morris & Sabaj, 2010 for images of the syntypes). The morphometric data did not show any other differences when comparing types of *P. heraldoi*, syntypes of *P. microstoma* and a population of the former species from the upper rio Paraná drainage (Table 1).

Note about “Additional material” of Azpelicueta (2001)

We found some mistakes regarding the additional material used by Azpelicueta (2001). It is important to mention them for future taxonomic studies of the genus. The lot MZUSP 22713 included as *P. heraldoi* (collected with the holotype) had the same catalog number as the holotype. Therefore, another catalog number, MZUSP 105395, was given to the 21 specimens. In addition, two lots cited in the same section (MZUSP 22489 and MZUSP 22559) contain mixed specimens that are representatives of the species *P. heraldoi* (now *P. microstoma*) and *P. platycirris* Borodin, 1927. The lot MZUSP 22489 was split to: MZUSP 22489, with nine specimens of *P. heraldoi*, and MZUSP 105677, with 25 specimens of *P. platycirris*. The lot MZUSP 22559 has 101 specimens (FRVR pers. obser.) and not 74 as mentioned by Azpelicueta (2001). This discrepancy was probably by division of the lot into two jars. The lot MZUSP 22559 has 70 specimens of *P. heraldoi* and 16 of *P. platycirris*, plus 15 specimens on loan not reviewed.

Discussion

This study allowed us to conclude that there is a wide variation in the color pattern of *P. microstoma*. We found specimens with no dots; specimens with dots restricted to the anterior region of the body, and specimens with dots reaching to gently beyond the half of the body (Fig. 1). This variation includes the pattern displayed by the holotype of *P. heraldoi* (Fig. 1a and Azpelicueta, 2001: fig. 1), where the spots are small and arranged in larger number of rows. This seems to be a rare pattern to the species (see specimen figured in Graça & Pavanelli, 2007:155). With the recognition of the variability in the color pattern of *P. microstoma*, it is possible that the species is more widely distributed than actually reported.

The variations observed in mesethmoid and

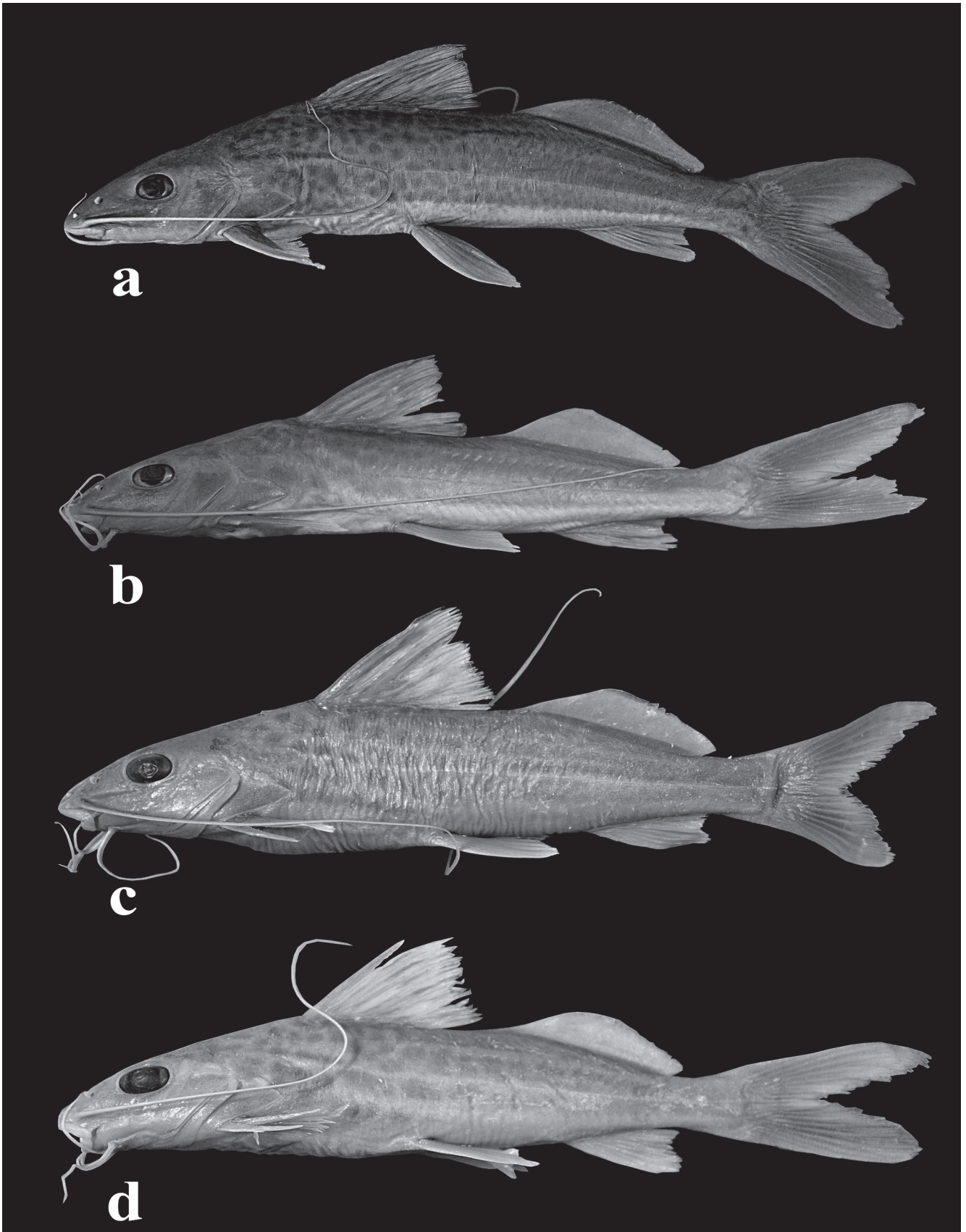


Fig. 1. Lateral view of *Pimelodus heraldoi*, (a) holotype, MZUSP 22713, 179.0 mm SL; and (b) MZUSP 105395, 121.5 mm SL; *P. microstoma*, (c) MZUSP 23077, 107.7 mm SL; and (d) MZUSP 23077, 91.6 mm SL.

Table 1. Measurements and counts of specimens of *P. microstoma* and *P. heraldoi*. H = holotype.

	<i>P. microstoma</i>					<i>P. heraldoi</i>			
	Syntypes		Paraná Population (n = 15)			H	Paratypes (n = 6)		
	NMW 45824.01	NMW 45824.02	low	high	mean	low	high	mean	
Standard length (mm)	140.0	125.8	88.2	149.2	109.0	179.5	90.6	171.5	122.7
	Percents of standard length								
Predorsal length	37.5	38.8	37.1	40.8	38.7	38.8	37.4	38.6	37.9
Preal length	71.9	73.4	72.2	77.0	74.7	73.8	73.1	75.8	74.4
Head length	26.3	27.3	26.7	28.6	27.5	26.8	26.0	27.7	27.0
Caudal-peduncle length	15.1	13.2	13.4	17.5	15.5	15.5	14.8	15.8	15.1
Caudal-peduncle depth	9.0	9.1	8.4	9.8	9.1	9.0	7.9	9.0	8.5
Adipose-fin length	28.9	27.5	24.6	30.2	28.2	27.5	27.9	30.0	28.7
Adipose-fin height	6.0	6.6	5.8	7.7	7.0	6.3	5.7	6.6	6.1
End of dorsal-fin base to origin of adipose-fin distance	13.6	12.4	8.6	14.6	11.0	12.6	12.0	13.2	12.6
Anal-fin base	12.4	11.1	11.1	13.8	12.2	12.5	10.0	12.1	11.3
Anal-fin length	14.4	15.0	15.0	16.4	15.9	16.4	14.2	15.7	14.7
Pelvic-fin length	15.6	16.9	15.0	17.9	16.6	17.5	14.9	16.0	15.3
Dorsal-fin length	22.1	22.7	21.9	24.6	23.0	21.9	21.0	23.0	21.7
Urogenital papilla to anal-fin origin distance	13.6	16.6	11.7	15.3	13.9	13.5	13.4	15.3	14.5
Dorsal-spine length	20.4	20.9	18.6	21.6	20.3	20.1	19.8	24.6	20.9
Pectoral-spine length	16.6	17.9	15.6	18.2	16.9	16.2	15.7	16.7	16.4
Body depth	23.9	22.3	19.5	26.9	23.1	22.7	20.4	25.7	22.5
Body width	18.2	18.4	16.2	19.5	17.8	17.4	16.5	17.9	17.0
Posterior cleithral process length	11.2	11.9	11.2	12.8	12.0	11.4	10.9	12.0	11.3
	Percents of head length								
Head depth	66.8	73.2	58.2	74.5	67.0	66.1	61.3	71.8	64.5
Interorbital width	22.6	22.4	20.3	24.7	21.8	26.8	18.9	26.4	21.6
Snout length	46.7	45.5	43.4	48.3	45.9	49.4	43.2	49.3	45.8
Internarial length	17.7	16.6	15.4	19.4	17.1	17.0	15.9	18.1	16.9
Anterior internarial width	12.2	12.0	10.7	13.3	12.1	13.6	11.4	12.8	12.0
Posterior internarial width	20.9	19.8	18.1	22.9	20.8	20.6	20.6	22.9	21.7
Horizontal eye diameter	26.1	27.1	24.2	29.5	27.7	21.9	23.6	29.5	27.2
Mouth width	25.5	29.2	28.4	36.4	31.7	31.5	26.3	34.7	30.0
Supraoccipital width	18.5	20.7	18.3	23.2	20.6	22.3	17.3	21.6	19.5
Supraoccipital length	36.4	35.3	30.7	36.8	33.2	37.8	30.3	35.5	33.3
	Counts								
	syntypes		low	high	mode	H	low	high	mode
Dorsal-fin rays	6	6	6	6	6	6	6	6	6
Pectoral-fin rays	10	10	9	11	10	10	10	11	10
Anal-fin rays	14	13	14	15	14	13	13	15	15
Principal caudal-fin rays	17	17	17	17	17	17	17	17	17
Gill rakers on the first branchial arch	20	19	17	21	19	19	18	22	19

pharyngobranchial 3, including different states in the same specimen, lead us to reject them as diagnostic for the species. The same applies to the morphometric data (Table 1), as they did not show significant differences when comparing the types of *P. heraldoi*, specimens from upper rio Paraná and syntypes of *P. microstoma*. The difference in body width between the syntypes of *P. microstoma* and the types of *P. heraldoi* may be a consequence of the poor condition of the syntypes of *P. microstoma*.

Based on the results obtained herein, we conclude that *P. heraldoi* is not distinct from *P. microstoma*, and a junior synonym of the latter.

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Material examined: *Pimelodus absconditus*: MCP 18919, c&s, 120.0 mm SL, rio Uruguay. *Pimelodus heraldoi*: MZUSP 22713, holotype, 179.0 mm SL, Brazil, rio Mogi-Guaçu, rio Paraná; MZUSP 22712, paratypes, 29, 72.4-151.3 mm SL, Pirassununga, rio Mogi-Guaçu, Emas; MZUSP 38915, paratypes, 7, 104.6-116.1 mm SL, Brazil, rio Paranaíba; MZUSP 22695, paratypes, 7, not measured, Pirassununga, rio Mogi-Guaçu, Cachoeira de Emas; MZUSP 22696, paratypes, 18, 90.5-171.5 mm SL, c&s 89.0 mm SL, rio Mogi-Guaçu. Additional material of Azpelicueta (2001): MZUSP 22559, 70 of 101, not measured, Pirassununga, rio Mogi-Guaçu, Emas; MZUSP 22489, 9, not measured, Pirassununga, rio Mogi-Guaçu; MZUSP 22603, 2, not measured, rio Paraíba do Sul; MZUSP 105395, 21, not measured, 1 c&s, 111.0 mm SL, rio Mogi-Guaçu. *Pimelodus maculatus*: MZUSP 1188, 1, 211.7 mm SL, rio Itaquí; MZUSP 44776, 2, 82.9-128.2 mm SL, rio de La Plata; MZUSP 24456, 1, 61.8 mm SL, ilha Solteira, rio Paraná. *Pimelodus microstoma*: NMW 45823, syntype, photograph, Orissanga, upper rio Paraná; NMW 45824, 2 syntypes, 140.0-125.8 mm SL, Orissanga, upper rio Paraná; MZUSP 22443, 15, 88.2-149.2 mm SL, Porto Cabral, rio Paraná; MZUSP 23144, 4, 89.8-102.5 mm SL, rio Tietê; MZUSP 23077, 35, 91.1-107.5 mm SL, c&s 65.0 mm SL, rio Paraná; MZUSP 23204, 42, 108.1-122.6 mm SL, rio Paraná;

MZUSP 54567, 1, not measured, Ilha Solteira, rio Paraná. *Pimelodus paranaensis*: MZUSP 23089, holotype, 235.0 mm SL, rio Paraná; MZUSP 24454, 1, 121.4 mm SL, rio Paraná; MZUSP 284+31, 1, 99.3 mm SL, rio Paraná; MZUSP 28432, 1, 71.1 mm SL, rio Paraná; MZUSP 28434, 1, 70.4 mm SL, Brazil, rio Paraná. *Pimelodus platycirris*: AMNH 8628, 1, 190.0 mm SL, photograph, rio Mogi-Guaçu; MZUSP 105677, not measured, Pirassununga, rio Mogi-Guaçu; MZUSP 22716, 76, 108.6-170.0 mm SL, rio Mogi-Guaçu; MZUSP 79838, 26, 111.8-140.3 mm SL, rio Mogi-Guaçu; MZUSP 58655, 4, 128.5-200.9, rio Mogi-Guaçu.

Literature Cited

- Azpelicueta, M. de las. 2001. A new species of *Pimelodus* (Siluriformes: Pimelodidae) from the upper Paraná basin, Brazil. *Ichthyological Explorations of Freshwaters*, 12(3): 193-200.
- Eschmeyer, W. N. & R. Fricke (Eds.). 2010. Catalog of Fishes electronic version (15 January 2010). Available at: <http://research.calacademy.org/ichthyology/catalog/fishcatmain.asp>. Accessed May 10, 2010.
- Ferraris, C. J., Jr. 2007. Checklist of catfishes, recent and fossil (Osteichthyes: Siluriformes), and catalogue of siluriform primary types. *Zootaxa*, 1418: 1-628.
- Graça, W. J. & C. S. Pavanelli. 2007. Peixes da planície de inundação do alto rio Paraná e áreas adjacentes. Maringá, Editora da Universidade Estadual de Maringá, 241p.
- Lundberg, J. G. & M. W. Littmann. 2003. Family Pimelodidae (Longwhiskered catfishes). Pp. 432-446. In: Reis, E. R., S. O. Kullander & C. J. Ferraris, Jr. (Eds.). *Check List of the Freshwater Fishes of South and Central America*. Porto Alegre, Edipucrs, 729p.
- Lundberg, J. G. & K. Luckenbill. 2007. *Pimelodus maculatus*: dry skeleton images. Available at: <http://catfishbone.acnatsci.org/Pimelodidae/Pimelodus/maculatus/dry.skeleton.html>. Accessed August 20, 2009.
- Lundberg, J. G., F. Mago-Leccia & P. Nass. 1991. *Exallodontus aguanai*, a new genus and species of Pimelodidae (Pisces: Siluriformes) from deep river channels of South America, and delimitation of the subfamily Pimelodinae. *Proceedings of the Biological Society of Washington*, 104(4): 840-869.
- Lundberg, J. G. & L. A. McDade. 1986. On the South American catfish *Brachyrhamdia imitator* Myers (Siluriformes, Pimelodidae), with phylogenetic evidence for a large intrafamilial lineage. *Notulae Naturae*, 463: 1-24.
- Lundberg, J. G. & B. M. Parisi. 2002. *Propimelodus* new genus, and redescription of *Pimelodus eigenmanni* van der Stigchel 1946, a long-recognized yet poorly-known South American catfish (Pimelodidae: Siluriformes). *Proceedings of the Academy of Natural Science*, 152: 75-88.
- Morris, P. J. & M. H. Sabaj. 2010. ACSImagebase: A digital archive of catfish images compiled by participants in the All Catfish Species Inventory. Available at: <http://acsi.acnatsci.org/base>. Accessed March 24, 2010.
- Ribeiro, F. R. V. & C. A. S. Lucena. 2006. A new species of *Pimelodus* LaCépède, 1803 (Siluriformes: Pimelodidae) from the rio São Francisco drainage, Brazil. *Neotropical Ichthyology*, 4(4): 411-418.
- Ribeiro, F. R. V. & C. A. S. Lucena. 2007. *Pimelodus microstoma* Steindachner, 1877, a valid species of pimelodid catfish (Siluriformes: Pimelodidae) from the upper rio Paraná drainage. *Neotropical Ichthyology*, 5(1): 75-78.
- Taylor, W. R. & G. C. van Dyke. 1985. Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. *Cybio*, 9: 107-119.

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