Neotropical Ichthyology, 5(3):285-292, 2007

A new species of the genus *Pimelodus* La Cépède, 1803 from the rio Iguaçu basin and a reappraisal of *Pimelodus ortmanni* Haseman, 1911 from the rio Paraná system, Brazil (Ostariophysi: Siluriformes: Pimelodidae)

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A new species, *Pimelodus britskii*, is described from the rio Iguaçu in the rio Paraná drainage, on the border of Paraná and Santa Catarina states, Brazil. Specimens of this species were wrongly included in the type series of *Pimelodus ortmanni*. *Pimelodus britskii* is distinguished from its congeners by color pattern, having circular dark brown blotches usually smaller than one orbital diameter, regularly and scattered along the trunk. Differs from *P. ortmanni* by the following characters: body depth at posterior cleithral process greater than head length; lips not prominent; and maxillary barbel reaching or surpassing vertical drawn through median of adipose fin. *Pimelodus britskii* represents the second species of the genus *Pimelodus* from the rio Iguaçu basin.

Pimelodus britskii nova espécie é descrita do rio Iguaçu na drenagem do rio Paraná na divisa dos estados do Paraná e Santa Catarina, Brasil. Exemplares dessa espécie foram erroneamente incluídos na série típica de *Pimelodus ortmanni*. *Pimelodus britskii* difere de suas congêneres pelo padrão de colorido, com máculas arredondadas, geralmente menores que o diâmetro do olho, dispersas regularmente no tronco. Difere de *P. ortmanni* pelos seguintes caracteres: altura do corpo no nível do processo cleitral posterior maior que o comprimento da cabeça; lábios não proeminentes; e barbilhão maxilar atingindo ou ultrapassando a linha vertical que passa pela região mediana da nadadeira adiposa. *Pimelodus britskii* representa uma segunda espécie do gênero *Pimelodus* na bacia do rio Iguaçu.

Key words: Freshwater fishes, Southern Brazil, Taxonomy, rio Iguaçu, *Pimelodus britskii*.

Introduction

The genus *Pimelodus* La Cépède is the most species-rich genus in the family Pimelodidae, including 26 species and ranging throughout the Neotropical region from Panamá to Argentina (Lundberg & Littmann, 2003; Ribeiro & Lucena, 2006a; Ribeiro & Lucena, 2006b). Eigenmann & Eigenmann (1890) who completed the first comprehensive revision of *Pimelodus*, identified 12 species and diagnosed the genus using the following: by possessing a vomer with teeth arranged in small patches; pterygoid and palatine regions edentulous; a frontal fontanel not extending posterior to the orbit; a broad posterior cleithral process not spiny and a dorsal fin with I,6 rays, the first of which is a spine. In essence this genus was also diagnosed by Britski *et al.* (1988) by the combination of the following external morphological characters: supraoccipital process large at its base, elongated distally and in contact with the predorsal plate; unbranched pectoral and dorsal fin rays strong and aculeate; frontal fontanel elongated, interrupted and horizontally aligned with the posterior margin of the orbit; and the base of the adipose fin greater than the base of the anal fin.

Lundberg *et al.* (1991) delimited the subfamily Pimelodinae, with the genus *Pimelodus* included in their "*Pimelodus* group" within the "*Calophysus-Pimelodus* clade", and described synapomorphies for this clade within the subfamily. The new species described herein is considered a member of the "*Pimelodus* group" because it shares the synapomorphies as proposed by Lundberg *et al.* (1991).

On the other hand, the continuing studies on pimelodid fishes from the rio Iguaçu drainage conducted by the authors and Renesto *et al.* (2000), revealed two sympatric species of *Pimelodus* coexisting within the basin. As a result of a mixed type series, Haseman (1911) produced a confusing original description for *P. ortmanni*, where the illustrated specimen had a different color pattern of the type. Examination of the holotype and paratypes of *P. ortmanni* and a new multivariate morphometric ordination obtained from additional fresh specimens collected at the type locality, reveals the presence of both sympatric species within the type series of *P. ortmanni*.

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Material and Methods

Institutional abbreviations in the lists of material examined follow Leviton *et al*. (1985) with the addition of: Laboratório de Ictiologia Sistemática do Departamento de Ecologia e Biologia Evolutiva da Universidade Federal de São Carlos (LISDEBE), Museu de Zoologia da Universidade Estadual de Londrina (MZUEL), and Núcleo de Pesquisa em Limnologia, Ictiologia e Aqüicultura, Maringá (NUP).

Counts were obtained for all fins as well as the gill-rakers and are presented as minimum-maximum ranges. Gill-rakers were counted on the first left branchial arch. The following measurements were taken point-to-point with a 0.05 mm precision caliper and are shown in Table 1: 1) standard length; 2) predorsal length (from tip of snout to anterior margin of dorsal fin); 3) dorsal-fin base length (from anterior to posterior margin of dorsal-fin base); 4) dorsal-fin to adipose-fin distance (from posterior margin of dorsal-fin base to anterior margin of adipose-fin base); 5) adipose-fin base length (from anterior to posterior margin of adipose-fin base); 6) adipose-fin to caudal-fin base distance (from posterior margin of adipose-fin base to middle of caudal-fin base); 7) pre-pelvic length (from tip of snout to anterior margin of pelvic-fin base); 8) pelvic-fin to anal-fin distance (anterior margin of pelvic-fin base to anterior margin of anal-fin base); 9) anal-fin base length (anterior to posterior margin of anal-fin base); 10) anal-fin to caudal-fin base distance (posterior margin of anal-fin base to middle of caudal-fin base); 11) caudal peduncle depth; 12) snout length (from tip of snout to anterior margin of eye); 13) orbital diameter (in the horizontal); 14) eye-operculum distance (posterior margin of eye to dorsal end of opercular opening); 15) first dorsal-fin ray to the first pelvic-fin ray distance; 16) first pelvic-fin ray to the last dorsal-fin ray distance; 17) last dorsal-fin ray to first anal-fin ray distance; 18) interorbital distance (between bony margins of orbits); 19) pectoral girdle width (across cleithra at base of pectoral spine); 20) head length (from the tip of snout to posterior margin of opercle). The following additional measurements appear within the species descriptions: 21) maxillary barbel length (from the base to tip of structure); 22) dorsal spine length (from base to tip of structure); 23) pectoral spine length (from base to tip of structure); 24) mouth width (between lateral extremities of mouth gap).

The first 19 morphometric variables listed above were used in size-free canonical variates analysis with Statistical Analysis System (SAS) package following Reis *et al.* (1990). The new species where compared only with *P. maculatus* because the very similar osteology of both species, plus its congener of the rio Iguaçu, *P. ortmanni*. The sample of *Pimelodus maculatus* chosen for comparison includes six specimens from the rio de La Plata and ten specimens from rivers of rio Paraná basin.

Pimelodus ortmanni Haseman, 1911

Figs. 1 and 2

Pimelodus ortmanni (part) Hasemann, 1911: 379-380 (Type locality: rio Iguaçu, Porto União da Vitória, current União da Vitória, Paraná State, Brazil).

Pimelodus ortmanni: Gosline, 1945: 41 (ref.); Fowler, 1954: 558 (ref.); Severi & Cordeiro, 1994: 65 (rio Iguaçu, Porto União, rio Timbó, Pinhão, Paraná); Garavello *et al.*, 1997:76 (rio Iguaçu, reservatório de Segredo, Paraná); Renesto *et al.*, 2000: 810, fig. 1 (rio Iguaçu, Salto Caxias).

Diagnosis. This species can be distinguished from all other *Pimelodus*, except *P. fur* (Lütken, ex Reinhardt, 1874), *P. heraldoi* Azpelicueta, 2001, and *P. absconditus* Azpelicueta, 1995, by the color pattern composed of small, densely placed oval or circular dots on anterior region of trunk, becoming inconspicuous or disappearing on the caudal peduncle (*vs.* stripes along the body in *P. albicans* (Valenciennes, 1840), *P. albofasciatus* Mees, 1974, *P. ornatus* Kner, 1858 and *P. tetramerus* Ribeiro & Lucena, 2006; uniform gray coloration or with very weak dark dots on anterolateral region in *P. altissimus* Eigenmann & Pearson in Eigenmann & Allen, 1942, *P. argenteus* Perugia, 1891, *P. atrobrunneus* Vidal & Lucena, 1999, *P. blochii* Valenciennes in Cuvier & Valenciennes, 1840, *P. brevis* Marini, Nichols & La Monte, 1933, *P. jivaro* Eigenmann & Pearson in Eigenmann & Allen, 1942, *P. microstoma* Steindachner, 1876, *P. pohli* Ribeiro & Lucena, 2006 and *P. punctatus* (Meek & Hildebrand, 1913); dots scattered in the trunk in *P. coprophagus* Schultz, 1944, *P. grosskopfi* Dahl, 1961, *P. maculatus* La Cépède, 1803, *P. mysteriosus* Azpelicueta, 1998, *P. navarroi* Schultz, 1944, *P. paranaensis* Britski & Langeani, 1988, *P. pictus* Steindachner, 1876 and *P. platicirris* Borodin, 1927). Differs from *P. fur* by smaller maxillary barbell length (1.3-1.8 in SL *vs.* 0.9 to 1.1), greater snout length (2.1 to 2.4 in HL *vs*. 3.1 to 3.5), greater eye diameter (3.5 to 4.9 in HL *vs.* 5.2 to 6.6), greater eye-operculum distance (2.9 to 3.5 in HL *vs.* 4.8 to 5.1), greater interorbital distance (3.6 to 5.1 in HL *vs.* 5.5 to 7.6), greater mouth width (2.6 to 3.5 in HL *vs.* 5.0 to 5.3); from *P. heraldoi* by smaller predorsal length (2.7 to 2.9 in SL *vs.* 2.5 to 2.6), smaller caudal peduncle depth (12.2 to 15.0 in SL *vs*. 11.3-12.6), greater snout length (2.1 to 2.4 in HL *vs.* 2.9 to 3.3), greater eye diameter (3.5 to 4.9 in HL *vs*. 5.2 to 6.3), greater eye-operculum distance (2.9 to 3.5 in HL *vs.* 4.7-5.1), greater mouth width (2.6 to 3.5 in HL *vs.* 4.3 to 5.4); and from *P. absconditus* by smaller pre-dorsal length (2.7 to 2.9 in SL *vs.* 2.4 to 2.6 in SL), smaller pre-pelvic length (2.0 to 2.1 in SL *vs.* 1.8 to 2.0 in SL), smaller caudal peduncle depth (12.2 to 15.0 in SL *vs.* 9.8 to 11.9 in SL) and smaller pectoral girdle width (5.4 to 6.2 in SL *vs.* 4.8 to 5.4).

Description. Morphometric data presented in Table 1. Dorsal profile of head inclined, slightly convex from tip of snout to dorsal-fin origin; slightly concave or almost straight from dorsal-fin insertion to adipose-fin origin; inclined and straight at dorsal-fin base; concave at caudal peduncle. Dorsal fin slightly anterior to median vertical line of trunk. Body depth, anterior to dorsal-fin insertion, less than body width at posterior cleithral process. Shape of head roughly conical in dorsal view, wedge-like in lateral view. Predorsal plate anteriorly V-shaped, surpassing supraoccipital process. Large orbital diameter, 0.7 to 1.4 (mean 1.0) in interorbital distance. Origin of frontal fontanel between posterior nares, not reaching to vertical through posterior orbit; mouth inferior; inferior mandible shorter than superior, fleshy lips in both. Villiform teeth in premaxillary and

Fig. 1. Lateral view of *Pimelodus ortmanni*, FMNH 54240, holotype, 164.0 mm SL, rio Iguaçu, União da Vitória.

Fig. 2. Lateral view of *Pimelodus ortmanni*, MZUSP 50052, 265.0 mm SL, rio Iguaçu, downstream from Salto Osório dam, Quedas do Iguaçu.

dentary tooth plates; premaxillary plate with semicircular anterior border, undivided at symphysis; dentary plate elongated, distally pointed, divided at symphysal region; maxillary barbel in adult specimens reaching anterior region of adipose fin, median portion in juvenile specimens. External mental barbel reaching but not surpassing pectoral fin insertion; in juveniles, reaching vertical through dorsal-fin origin; internal mental barbel reaching opercular membrane, sometimes surpassing it, never reaching pectoral-fin origin; ventral profile convex from inferior mouth to anal-fin base, concave on caudal peduncle. Body depth always shorter than head length. Caudal peduncle shallow. Pectoral fin reaching vertical through third or fourth ray of dorsal fin in juvenile specimens. Pelvic fin beginning at vertical through last ray of dorsal fin, not surpassing adipose-fin origin when adpressed. Adipose fin elongated, its length similar to head length; anal fin triangular in lateral view, posterior margin concave. Caudal fin bifurcate, upper lobe longer than lower. Posterior cleithral process nearly triangular, short, not reaching vertical through dorsal-fin origin, sometimes reaching vertical through median predorsal plate. Unbranched dorsal-fin ray pointed, anterior margin completely smooth, small and pointed hooks posteroventrally in posterior margin; large hooks covering its superior third on distal region. Anterior margin of pectoral-fin spine smooth, small and pointed hooks on almost entire distal region of posterior margin; hooks absent in base. Dorsal fin rays II,6 (only one specimen II,7); pectoral fin I,8-10; pelvic fin i,5; anal fin i-iv,8-10; caudal fin i,7,8,i. Gill-rakers 19-25 on the first left branchial arch.

Color in alcohol. Dorsal region light gray, ventral region light brown; dark brown oval blotches in series of six to ten, shorter than orbital diameter, neatly positioned in sequence along flanks of body, spots inconspicuous or absent on caudal peduncle; small dark brown dots on parietal, supraoccipital, infraorbital and opercular regions; five dark brown blotches in posterior region of cleithral process; dark brown dots on rays of dorsal fin; inconspicuous gray horizontal line in upper half of dorsal fin; two or three irregular series of small dark dots or ligth adipose fin. Pectoral, pelvic, and anal fin sometimes light gray for almost one-third of fin; pectoral fin completely gray; pelvic fin grayish on base and on distal third; dark dots only on upper lobe of caudal fin, dark brown line crossing three branched rays of lower lobe.

Distribution. Broadly distributed throughout the rio Iguaçu basin (Fig. 3).

***Pimelodus britskii*, new species**

Figs. 4 and 5

Pimelodus ortmanni (part) Haseman, 1911: 379-380 (rio Iguaçu, Porto União da Vitória, current União da Vitória, Paraná State, Brazil); Severi & Cordeiro, 1994: 65 (figure); Azpelicueta, 1995:75 (reference); Nakatani *et al.*, 2001: 277 (diagnosis; figure).

Pimelodus sp.: Garavello *et al.*, 1997:76 (rio Iguaçu, Salto Segredo dam); Renesto *et al.*, 2000: 810, fig. 2 (rio Iguaçu, Salto Caxias).

Holotype. FMNH 105098, (ex FMNH 54241 and CM 2858) 297.0 mm SL, rio Iguaçu, Porto União da Vitória, (current União da Vitória), Paraná, Brazil, 27 Dec 1908, J. D. Haseman.

Paratypes. Brazil: Paraná: FMNH 105099 (ex FMNH 54241 and CM 2857), 1, 275.0 mm SL, rio Iguaçu, Porto União da Vitória (União da Vitória), 27 Dec 1908, J. D. Haseman; LISDEBE 1965, 10, 9.4-21.3 mm SL, Candoi, rio Cavernoso, tributary of rio Iguaçu, upriver of Salto Santiago dam, near 10 km west from Candoi city, 20-26 Sep 1998, J. C. Garavello & A. S. Soares; MZUEL 4725, 3, 273-300 mm SL, rio Iguaçu, UHE Nei Braga, Salto Segredo, 13-14 Nov 2001, M. L. Orsi; MZUSP 50037, 37, not measured, rio Iguaçu, downriver of Salto Osório dam at Quedas do Iguaçu, 30 Oct-6 Nov 1989, J. C. Garavello *et al.*; MZUSP 50038, 91 (19, 86.9-221.3 mm SL), rio Iguaçu, downriver of Salto Osório dam at Quedas do Iguaçu, 30 Oct-6 Nov 1989, J. C. Garavello *et al.*; MZUSP 50039, 119, not measured, rio Iguaçu, downriver of Salto Osório dam at Quedas do Iguaçu, 14-17 Jan 1990, J. C. Garavello *et al.*; MZUSP 50040, 29, not measured, rio Iguaçu, União da Vitória, 6 Mar 1979, Surhema collectors; MZUSP 50042, 15 (1, 94.9 mm SL), rio Iguaçu, downriver of Salto Santiago dam between Laranjeiras and Chopinzinho, 5-10 Nov 1990, J.C. Garavello *et al.*; MZUSP 50043, 4, not measured, rio Iguaçu, Porto Lupion, 1979/1980, Surhema collectors; MZUSP 50046, 1, not measured, rio Iguaçu, downriver of Salto Osório dam at Quedas do Iguaçu, 13-15 Nov 1980, Surhema collectors. Santa Catarina: MZUSP 50044, 11 (5, 186.6-204.9 mm SL), rio Timbó, rio Iguaçu tributary at Colônia São Pedro, Porto União, 20-21 Nov 1986, J.C. Garavello *et al.*; MZUSP 50045, 5, not measured, rio Timbó, rio Iguaçu tributary at Colônia São Pedro, Porto União, 19-20 Nov 1986, J.C. Garavello *et al.*; MZUSP 50047, 7 (1, 245.0 mm SL), rio Timbó, rio Iguaçu tributary at Colônia São Pedro, Porto União; MZUSP 50041, 17, not measured, rio Timbó, tributary of rio Iguaçu at Colônia São Pedro, 18-19 Nov 1980, J.C. Garavello *et al*.

Diagnosis. *Pimelodus britskii* differs from its congeners, in its color pattern having circular dark brown blotches usually smaller than one orbital diameter regularly scattered along the trunk (*vs.* irregular series of dots in *P. coprophagus*, *P. grosskopfi*, *P. paranaensis*, *P. navarroi*, and *P. pictus*; small, densely placed oval or circular dots on anterior region of trunk, becoming inconspicuous or disappearing on caudal

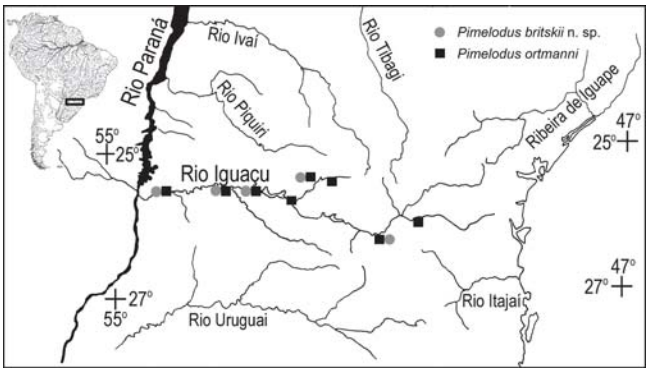

Fig. 3. Geographical distribution of *Pimelodus ortmanni* and *Pimelodus britskii* from Rio Iguaçu. Each symbol may represent more than one sample.

Fig. 4. Lateral view of *Pimelodus britskii*, FMNH 105098, holotype, 297.0 mm SL, rio Iguaçu, União da Vitória.

Fig. 5. Lateral view of *Pimelodus britskii*, MZUSP 50037, paratype 262.0 mm SL, rio Iguaçu, downstream from Salto Osório dam at Quedas do Iguaçu.

Table 1. Morphometrics of *Pimelodus britskii* (n=25) and *Pimelodus ortmanni* (n=18) from rio Iguaçu basin. Items 1-19 as ratio of the standard length, 20-24 as ratio of the head length. Min. = minimum, Max. = maximum, SD = Standard deviation.

	Pimelodus ortmanni				*Pimelodus britskii*			
	Holotype	Min-Max.	Mean	SD	Holotype	Min-Max.	Mean	SD
1. Standard length								
2. Pre-dorsal length	2.7	2.7-2.9	2.8	0.045	2.8	2.3-2.6	2.4	0.075
3. Dorsal-fin base length	7.3	6.0-6.7	6.4	0.193	8.5	6.4-7.4	6.8	0.269
4. Dorsal-fin to adipose-fin distance	5.4	5.4-9.1	7.0	0.888	6.8	5.8-9.1	7.0	0.824
5. Adipose-fin base length	4.9	3.7-5.0	4.2	0.311	5.9	4.3-5.7	5.0	0.270
6. Adipose-fin to caudal-fin base distance	7.0	6.2-7.3	6.9	0.367	9.1	5.8-7.4	6.6	0.408
7. Pre-pelvic length	2.0	2.0-2.1	2.1	0.043	2.4	1.9-2.0	1.9	0.039
8. Pelvic-fin to anal-fin distance	4.4	3.8-4.4	4.1	0.206	4.8	3.8-4.9	4.5	0.274
9. Anal-fin base length	10.1	9.0-11.7	9.8	0.619	11.9	8.4-10.8	9.4	0.644
10. Anal-fin to caudal-fin base distance	4.9	5.0-5.4	5.2	0.140	6.7	4.6-6.0	5.2	0.254
11. Caudal peduncle depth	15.0	12.2-14.7	13.0	0.708	13.5	9.7-14.2	12.3	1.231
12. First dorsal-fin ray to first pelvic-fin distance	4.2	3.5-4.4	3.8	0.227	4.5	3.2-4.2	3.7	0.273
13. First pelvic-fin ray to last dorsal-fin ray distance	6.0	4.2-6.1	5.0	0.468	5.8	3.9-6.0	5.0	0.609
14. Last dorsal-fin ray to first anal-fin ray distance	3.4	3.2-3.7	3.4	0.134	4.0	3.1-4.1	3.6	0.252
15. Pectoral girdle width	6.1	5.4-6.2	5.8	0.230	6.2	4.7-5.7	5.1	0.179
16. Maxillary barbel length	-	1.3-1.8	1.5	0.153	-	0.8-1.6	1.2	0.252
17. Dorsal spine length	-	4.9-5.9	5.3	0.319	-	4.3-5.0	4.7	0.192
18. Pectoral spine length	-	5.0-6.1	5.5	0.287	-	4.2-5.0	4.6	0.178
19. Head length	3.9	3.7-4.5	4.0	0.184	4.2	3.4-3.6	3.5	0.077
20. Snout length	2.3	1.9-2.4	2.2	0.107	2.1	2.0-2.4	2.2	0.117
21. Eye diameter	4.7	3.5-4.9	4.1	0.376	7.6	3.7-5.7	4.5	0.640
22. Eye-operculum distance	2.9	2.9-3.5	3.2	0.159	2.5	2.7-3.2	2.9	0.112
23. Interorbital distance	3.9	3.6-5.2	4.2	0.368	3.3	3.2-4.5	3.9	0.367
24. Mouth width	-	2.6-3.5	3.2	0.236	-	2.4-3.2	2.8	0.176

peduncle in *P. absconditus*, *P. fur*, *P. heraldoi*, and *P. ortmanni*, stripes along the body in *P. albicans*, *P. albofasciatus*, *P. ornatus*, and *P. tetramerus*; uniform gray coloration or with very weak dark dots on anterolateral region in *P. altissimus*, *P. argenteus*, *P. atrobrunneus*, *P. blochii*, *P. brevis*, *P. jivaro*, *P. microstoma*, *P. pohli*, and *P. punctatus*; blotches larger than one orbital diameter in the trunk in *P. maculatus*, *P. mysteriosus*, and *P. platicirris*). *Pimelodus britskii* also differs from *P. ortmanni* in having body depth at posterior cleithral process greater than head length (*vs.* depth always shorter than head length); lips not prominent (*vs.* fleshy and prominent lips circumscribing mouth opening); and maxillary barbel reaching or surpassing vertical drawn through median of adipose fin (*vs.* maxillary barbel reaching but not surpassing vertical drawn through median of adipose fin).

Description. Morphometric data presented in Table 1. Dorsal profile inclined from tip of snout to dorsal fin origin, slightly concave to almost straight between dorsal and adipose fin, concave at caudal peduncle region. Dorsal fin anterior to vertical through midline of body; predorsal length 2.3 to 2.6 (mean 2.4) times in SL. Body depth anterior to dorsal fin greater than its width at the posterior cleithral process. Head outline nearly trapezoidal in dorsal view, wedge-like in lateral view. Predorsal plate V-shaped, anterolaterally surpassing supraoccipital bone; predorsal plate and supraoccipital process conspicuously covered by skin. Orbit large, 1.1 times in interorbital distance; frontal fontanel origin between posterior nares not reaching vertical through posterior margin of orbit; mouth inferior, lower mandible shorter than superior; lips thin. Villiform teeth in premaxillary and dentary tooth plates; premaxillary tooth plates undivided at symphysis, semicircular margins, slightly curved posteriorly. Dentary tooth plate elongate, distally pointed, divided at symphysal region. Teeth absent in vomer and ectopterygoid bones; gill rakers long, slender. Barbels narrow, elongate; maxillary barbel reaching or surpassing vertical drawn through median of adipose fin, it may reach fork of caudal fin in juveniles; external mental barbel generally reaching pectoral fin, sometimes reaching pelvic-fin origin; ventral profile slightly convex from mouth to end of anal fin, concave at caudal peduncle. Body depth at posterior cleithral process greater than head length. Pectoral fin typically reaching vertical through base of fourth dorsal-fin ray, occasionally reaching only base of third dorsal-fin ray; pelvic fin reaching vertical through origin of adipose fin when depressed. Anal fin nearly triangular, slightly concave along distal margin; anal fin shorter than head length. Caudal fin bifurcated, upper lobe longer than lower. Cleithral process short, nearly triangular, not reaching vertical through origin of dorsal fin, occasionally reaching vertical through median predorsal plate. Unbranched dorsal-fin ray elongated, anterior margin smooth, posterior margin covered with hooks at 2/3 of distal region. Unbranched pectoral-fin ray elongated, aculeate, small hooks on anterior margin of its base; retrorse hooks on approximate one third of distal region of posterior margin. Dorsal fin rays II,6; pectoral fin I,9-10; pelvic fin i,5; anal fin iii, v, 7-10; caudal fin i,7,8,i. Gill-rakers 20-24 on first left branchial arch.

Color in alcohol. Dorsal region grayish, ventral region light brown; dark brown blotches, usually smaller than one orbital diameter, widely separated, arranged in three (rarely four) longitudinal series in trunk; dark brown dots in snout, opercle, infraorbital, parietal and supraoccipital regions. One series of small dark brown dots above and below lateral line, dorsal surface of body, in juveniles; series typically absent in adults. Eyes dark. One to three dark brown circular blotches on posterior cleithral process; dark brown dots on dorsal fin rays and membranes; pectoral, pelvic, anal, and adipose fins uni-

formly grayish; dark brown dots rarely in adipose fin; dark dots on both lobes of caudal fin; brown pigment sometimes dotting only upper lobe.

Distribution. Distributed broadly throughout the rio Iguaçu basin (Fig. 3).

Etymology. The name *Pimelodus britskii* is given in honor of the eminent ichthyologist Dr. Heraldo Antonio Britski, of Museu de Zoologia da Universidade de São Paulo, in recognition for his significant contributions to Neotropical systematic ichthyology.

Morphometric analysis. The size-free canonical variate analysis readily discriminated populations of *P. ortmanni*, *P. britskii* from rio Iguaçu and *P. maculatus* from the río de La Plata and rio Paraná basins (Fig. 6), previously diagnosed on the basis of its color pattern. The eigenvalues and their loadings appear in Table 2. The first canonical axis (CAN1) readily separates all three species, while the second canonical axis (CAN2) distinguishes the specimens of *P. britskii* from the samples of *P. ortmanni* and *P. maculatus*, which have similar scores on CAN2. *Pimelodus maculatus* has a greater caudal peduncle depth, pectoral girdle width, interorbital and predorsal distance than does *P. ortmanni*. *Pimelodus ortmanni* has a larger distance between the bases of the anal and caudal fins, adipose fin length and distance from dorsal to adipose fin. The sample of *P. britskii* was discriminated from *P. ortmanni* and *P. maculatus* on CAN1 and CAN2. *Pimelodus ortmanni* was discriminated from *P. britskii* by a longer dorsal-fin base length and greater distance between the terminus of dorsal-fin and anal-fin origin; there are also differences in adipose-fin length. *Pimelodus britskii* has a larger distance between the orbit and opercular opening, predorsal distance and snout length (Table 2).

Discussion

Because of the absence of a phylogenetically-based diagnosis of *Pimelodus*, the inclusion of *Pimelodus britskii* in this genus is based on several plesiomorphic characters like the presence of a foramen with two openings for the passage of the maxillary ramus (dorsalis) and mandibular ramus (ventralis) of the trigeminal nerve as described by Lundberg & Parisi (2002).

Haseman (1911) skillfully recognized *Pimelodus ortmanni* when he splits that species from *Pimelodus maculatus*, a species described from the major rio Paraná hydrographic system at La Plata. In that article, he recognized the high degree of endemism of the rio Iguaçu ichthyofauna and discussed how it might be acquired in isolation.

However, during a recent visit to the Field Museum of Natural History to study the type series of *Pimelodus ortmanni*, we discovered that Haseman (1911) had described that species from a mixed type series containing two species. The specimen FMNH 54240 (ex-CM 2856) was designated as the holotype of *P. ortmanni*, while the specimen FMNH 54241 (ex-CM 2857; now FMNH 105099) was figured.

Haseman (1911) incorrectly attributed the differences in color pattern observed within the type series of *Pimelodus ortmanni* to variation during ontogenetic development. Our examination of the *P. ortmanni* type series and the additional fresh material revealed that each species maintains a characteristic color pattern throughout ontogeny. The elements of Haseman's type series now included in *Pimelodus britskii* (FMNH 105098 and 105099), and the additional material of young specimens of this species examined herein, all possess a color pattern with a series of three dark brown blotches on the flanks. Specimens assigned to *P. ortmanni* all have the contrasting condition of four or five series of dark brown blotches.

The samples of *Pimelodus britskii* and *P. ortmanni* analysed confirms that two species are present in the type-material originally described by Haseman under the name *P. ortmanni*. Furthermore, Renesto *et al.* (2000) presented an enzymatic study from internal organs that revealed differences between *P. ortmanni* and *P. britskii*. The presence of two species in the type series, with variation in the color pattern, may explain why the original description of *Pimelodus ortmanni* is so imprecise. Because the figure of *P. ortmanni* is more informative than the description, subsequent authors have been misled in the identification of *Pimelodus ortmanni* Haseman (see Severi & Cordeiro, 1994: 65; Azpelicueta, 1995: 75; Nakatani *et al.,* 2001: 277).

It is important to recognize that the color pattern of *Pimelodus britskii* from rio Iguaçu is an important external diagnostic character for the new species, even given the large diversity of blotches, dots and stripes present in congeners from the rio Paraná-Paraguay basin. On the other hand, *P. maculatus* and *P. platicirris*, have fairly similar color patterns

Table 2. First two size-free canonical variate axes (CAN1 and CAN2) from the analysis of combined samples of *P. britskii*, *P. ortmanni*, and *P. maculatus* from rio Iguaçu and río de La Plata basins (Total = 59 specimens).

	CAN1	*P*	CAN2	*P*
Standard length	0.370	0.0020	0.008	0.9510
Pre-dorsal length	-0.624	0.0001	0.531	0.0001
Dorsal-fin base length	0.076	0.5460	-0.716	0.0001
Dorsal-fin to adipose-fin distance	0.508	0.0001	0.322	0.0090
Adipose-fin base length	0.509	0.0001	-0.620	0.0001
Adipose-fin to caudal-fin base distance	0.402	0.0009	0.276	0.0258
Pre-pelvic length	-0.139	0.2710	0.142	0.2590
Pelvic-fin to anal-fin distance	0.454	0.0001	-0.420	0.0005
Anal-fin base length	0.120	0.3390	0.057	0.6515
Anal-fin to caudal fin base distance	0.817	0.0001	0.267	0.0316
Caudal peduncle depth	-0.734	0.0001	-0.269	0.0305
First dorsal-fin to first pelvic-fin distance	-0.295	0.0170	-0.125	0.3210
First pelvic-fin ray to last dorsal-fin ray distance	-0.311	0.0120	-0.260	0.0360
Last dorsal-fin ray to the first anal-fin ray distance	0.220	0.0780	-0.650	0.0001
Pectoral girdle width	-0.726	0.0001	0.288	0.0200
Snout length	-0.358	0.0034	0.508	0.0001
Eye diameter	0.248	0.0465	-0.256	0.0399
Eye-operculum distance	-0.509	0.0001	0.709	0.0001
Interorbital distance	-0.644	0.0001	0.408	0.0007
Eigenvalues	22.702		6.133	
Proportion	0.787		0.213	

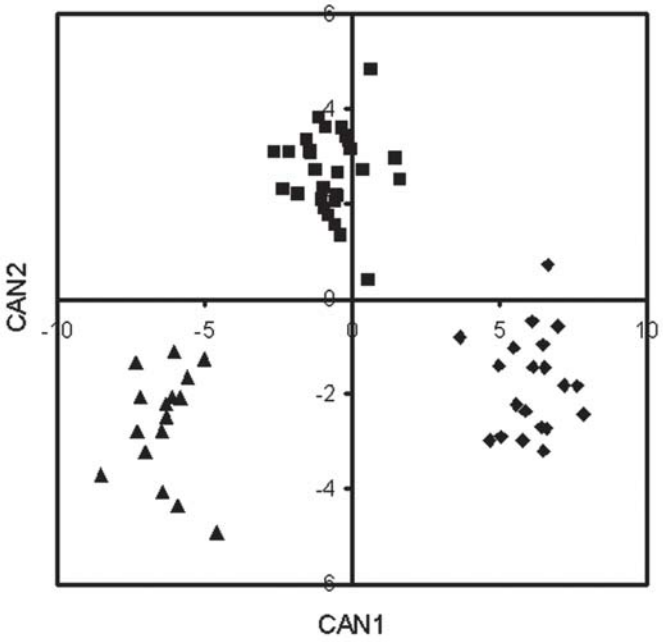

Fig. 6. Scatter plot resulting from the size-free canonical variate analysis of *P. britskii* (squares), *P. ortmanni* (diamonds) and *P. maculatus* (triangles).

to *P. britskii*. They differ in the size of blotches which are generally larger than one orbital diameter in *P. maculatus* and *P. platicirris* and usually smaller than orbital diameter in *P. britskii*. Borodin (1927) considered *P. platicirris* to be similar to *P. ortmanni* in color pattern but differing from it by a longer adipose fin length, greater body depth and longer posterior cleithral process of the pectoral fin. However, the holotype of *P. platicirris*, the unique specimen examined by Borodin, also differs from *P. ortmanni* by the greater pre-dorsal length (2.4 *vs.* 2.7-2.9 in SL), greater adipose-fin to caudal-fin base distance (4.7 *vs.* 6.2-7.3 in SL), greater pre-pelvic length (1.9 *vs.* 2.0-2.1 in SL), greater pelvic-fin to anal-fin distance (2.3 *vs.* 3.8-4.4 in SL), smaller anal-fin to caudal-fin base distance (6.2 *vs.* 4.9-5.4 in SL), greater caudal peduncle depth (10.2 *vs.* 12.2-15.0), greater maxillary barbel length (1.2 *vs.* 1.3-1.8 in SL). *Pimelodus platicirris* differs from *P. britskii* by the greater adipose-fin to caudal-fin base distance (4.7 *vs.* 5.8-9.1), greater pelvic-fin to anal–fin distance (2.3 *vs.* 4.1-4.9) and smaller anal-fin to caudal-fin base distance (6.2 *vs.* 4.6-6.7).

The ten known *Pimelodus* species from the Paraná-Paraguay river basin include six with a color pattern of blotches or dots on the flanks, but with significant variation from one to another. The species *P. absconditus*, *P. heraldoi* and *P. ortmanni* are similar in color pattern, having small and numerous oval dark brown dots concentrated at the anterior part of the trunk, fading gradually at the posterior region of the caudal peduncle. This color pattern is also found in *P. fur* from the rio São Francisco basin. *Pimelodus paranensis* has a unique pattern of several small dark brown circular blotches on the trunk. *Pimelodus albicans* has three conspicuous dark brown stripes on the trunk and *P. argenteus*, *P. brevis* and *P. atrobrunneus* lack blotches or stripes on the trunk. *Pimelodus ornatus*, which has two large black stripes on the trunk and a dark brown spot on the dorsal fin is perhaps the most distinctive species of the genus occurring in the Paraná-Paraguay basin.

The dental plate of vomer possessed by some individuals of *Pimelodus britskii* is also present in *P. paranensis* and *P. absconditus* as noted by Britski & Langeani (1988) and Azpelicueta (1995).

Our analysis suggests that *Pimelodus britskii* is endemic to the rio Iguaçu basin. The examination of a large number of specimens deposited in Brazilian museums (see list of additional material), including those from the rio Paraná basin, did not reveal any *P. britskii* outside of the rio Iguaçu limits. The old origin of the Iguaçu Falls, as discussed by Garavello (2005), may have isolated the rio Iguaçu from the remaining drainages of the rio Paraná and may perhaps explain the endemicity of *Pimelodus britskii* and *Pimelodus ortmanni*.

Material examined: *Pimelodus absconditus*: Argentina: Missiones: MLP 8785, 2, 81.9-113.3 mm SL, rio Uruguay en Puerto Nis, San Isidro, paratypes of *Pimelodus absconditus* Azpelicueta, 1995; Brazil: Mato Grosso: NUP 904, 12, 35.2-134.4 mm SL, reservatório Manso, Chapada dos Guimarães; NUP 2228, 7, 94.6-162.8 mm SL, reservatório Manso, Chapada dos Guimarães; Mato Grosso do Sul: MZUEL 3402, 5, 91.3-126.6 mm SL, rio Miranda, Bonito. *Pimelodus altissimus*: Brazil: Amazonas: MZUSP 57390, 1, 131.7 mm SL, rio Amazonas, just below rio Negro. *Pimelodus argenteus*: Brazil: Mato Grosso: NUP 991, 7, 107.1-151.7 mm SL, reservatório Manso, Chapada dos Guimarães; Mato Grosso do Sul: MZUEL 3401, 1, 155.2 mm SL, rio Miranda, Bonito; MZUEL 3403, 8, 143.6-201.5 mm SL, rio Paraguai, Porto da Manga, Corumbá; MZUEL 3404, 10, 125.3-212.0 mm SL, rio Miranda, Bonito; MZUEL 3498, 9, 133.3-175.6 mm SL, rio Paraguai, Porto da Manga, Corumbá. *Pimelodus atrobrunneus*: Brazil: Rio Grande do Sul: MZUEL 3600, 2, 135.9-142.5 mm SL; rio Uruguai, Machadinho. *Pimelodus blochii*: Brazil: Mato Grosso: MZUSP 53745, 1, 134.0 mm SL, rio Araguaia, near aldeia Fontora. *Pimelodus heraldoi*: Brazil: São Paulo: MZUSP 22713, 1, 175.0 mm SL, Pirassununga, rio Mogi-Guaçu, Emas, holotype of *Pimelodus heraldoi* Azpelicueta, 2001; Paraná: MZUEL 966, 4, 81.8-105.4 mm SL, rio Tibagi, Londrina; MZUEL 1530, 4, 129.8-182.5 mm SL, rio Iapó, Tibagi. *Pimelodus fur*: Brazil: Minas Gerais: MZUSP 39748, 4, 89.7-156.4 mm SL, rio São Francisco and tributaries, UHE Formoso Project área; LISDEBE 1147, 4, 118.8-135.5 mm SL, São Francisco River, Três Marias dam, Morada Nova. *Pimelodus maculatus*: Brazil: Rio Grande do Sul: MCP 13075, 1, not measured, Roque Gonzales, rio Ijui, tributary of rio Uruguay; MCP 13211, 2, not measured, Pirapó, rio Ijui-Mirim, tributary of rio Ijui; MCP 13223, 1, not measured, Pirapó, rio Ijui-Mirim, tributary of rio Ijui; MCP 13281, 6, mm SL, Pirapó, rio Ijui-Mirim, tributary of rio Ijui. São Paulo: LISDEBE 1141, 10, 173.0-309.4 mm SL, rio Paraná; LISDEBE 1142, 2, 94.2-116.0 mm SL, Argentina, Buenos Aires, río de La Plata, Balneario municipal, Beriso; LISDEBE 1143, 1, 141 mm SL, Arroyo La Guardia, at 100 m from mouth at La Plata River, Punta Hora, Ensenacha; LISDEBE 1144, 3, 95.4-102.4 mm SL, Boca Cerrada, Punta Lara. *Pimelodus mysteriosus*: Argentina: Posadas, MZUEL 3598, 1, 152 mm SL; rio Paraná; Brazil: Mato Grosso do Sul: MZUEL 3400, 1, 130.4 mm SL, rio Miranda, Bonito; MZUEL 3607, 1, 143.8 mm SL, rio Miranda, Bonito; Mato Grosso: NUP 1973, 2, 120.0-120.5mm SL, reservatório Manso, Chapada dos Guimarães; NUP 2229, 5, 57.7-98.5 mm SL, reservatório Manso, Chapada dos Guimarães. *Pimelodus ornatus*: Brazil: Mato Grosso: NUP 3606, 9, 76.5-265.0 mm SL, reservatório Manso, Chapada dos Guimarães; NUP 1045, 7, 77.21-266.2 mm SL, reservatório Manso, afluente do rio Paraguai, Chapada dos Guimarães; Mato Grosso do Sul, MZUEL 3606, 1, 236.9 mm SL, rio Aquidauana, Aquidauana; Paraná: MZUEL 3605, 1, 334.5mm SL; rio Tibagi, Jataizinho; São Paulo: MZUEL

3405, 2, 216.3-287.8 mm SL, rio Paraná, Porto Primavera; MZUEL 2816, 1, 281.1 mm SL, rio Paraná, tributário de Rosana, Rosana. *Pimelodus ortmanni*: Brazil: Paraná, FMNH 54240 (ex CM 2856), rio Iguaçu, Porto União da Vitória (União da Vitória), 164.0 mm SL, holotype of *Pimelodus ortmanni*; FMNH 54241 (ex CM 2859 (2 specimens) and CM 2860 (one of two – one specimen missing)), rio Iguaçu, Porto União da Vitória (União da Vitória), 3, 92.2-171.8 mm SL, paratype of *Pimelodus ortmanni*; MZUSP 50051, 4, not measured, rio Iguaçu, downriver of Salto Osório dam, Quedas do Iguaçu; MZUSP 50052, 33 (9 measured, 136.9-261.0 mm SL), rio Iguaçu, downriver of Salto Osório dam, Quedas do Iguaçu; MZUSP 50053, 22 (9 measured, 143.0-217.4 mm SL), rio Iguaçu, downstream of Salto Osório dam, Quedas do Iguaçu; MZUSP 50054, 7, not measured, rio Iguaçu, Porto Lupion; MZUSP 50055, 4, not measured, rio Iguaçu, Porto Lupion; MZUSP 50056, 48, not measured, rio Iguaçu, downriver of Salto Santiago dam, Laranjeiras do Sul; MZUSP 50057, 25, not measured, rescue at turbines of hydroelectric dam of Segredo; NUP 1672, 25, not measured, rio Iguaçu, near the transition area of rio Covó and Segredo dam, Mangueirinha; NUP 2870, 1, not measured, rio Iguaçu, Segredo dam, downstream of old rio Iratim mouth, Pinhão and Palmas border; NUP 14784, 1, not measured, rio Iguaçu, Segredo dam, Pinhão, transition area between rio São Pedro and Segredo dam; NUP 40746, 1, not measured, rio Iguaçu, Segredo dam, Pinhão, transition area of rio Floresta and Segredo dam. Santa Catarina: MZUSP 50048, 6, not measured, rio Timbó, rio Iguaçu tributary at Colônia São Pedro, Porto União; MZUSP 50049, 1, not measured, rio Timbó, rio Iguaçu tributary at Colônia São Pedro, Porto União; MZUSP 50050, 1, not measured, rio Canoinhas, km 219 from Mafra to Itaiópolis road. *Pimelodus paranaensis*: Brazil: São Paulo: MZUSP 23089, 235 mm SL, rio Paraná, Ilha Solteira (ensecadeira), holotype of *Pimelodus paranaensis* Britski & Langeani, 1988; Minas Gerais: LISDEBE 1145, 2, 206.5-248.8 mm SL, rio Grande, UHE Volta Grande, Volta Grande dam; LISDEBE 1146, 1, 267.10 mm SL, rio Grande, Volta Grande reservoir near dam. *Pimelodus platicirris*: Brazil: São Paulo: AMNH 08628, 1, 173.25 mm SL, rio Mogi-Guaçu, holotype of *Pimelodus platicirris* Borodin, 1927. *Pimelodus tetramerus*: Brazil: Mato Grosso: MZUSP 60425, 1, 182.75 mm SL, rio Arinos, fazenda Fervedoro, Nova Mutum.

Acknowledgments

The authors are indebted to Mary Anne Rogers of FMNH, Melanie M. J. Stiassny of AMNH, Osvaldo T. Oyakawa of MZUSP, Carlos A. Lucena of MCP, and Karin M. Grosser from MCN for loan of specimens and helpful assistance with type material; to Carla S. Pavanelli of NUP and Maria M. Azpelicueta of MLP for donation of specimens. We are also grateful to Barry Chernoff and Marcelo Carvalho at FMNH and AMNH respectively, for their kind assistance during a visit to those museums. Brian Sidlauskas and Flavio A. Bockmann read the manuscript and offered useful suggestions. Augusto S. Abe and Alexandre K. de Oliveira helped with photos. Jose L. Birindelli helped with the map. The authors are grateful to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for the continuing research grants and financial support, and to ACSI Project (NSF DEB-0315963) for funding support to this publication.

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Submitted December 2006
Accepted May 2007