Two new species of *Pseudopimelodus* Bleeker, 1858 (Siluriformes: Pseudopimelodidae) from the Magdalena Basin, Colombia

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The family Pseudopimelodidae is widely distributed in South America and includes 51 described species organized in seven genera. Only two of four species of the genus *Pseudopimelodus* have been recorded for the trans-Andean basins of Colombia, *Pseudopimelodus bufonius* and *P. schultzi*, whose similarity in external morphology make their identification difficult. We performed a phylogenetic analysis using a fragment of the Cytochrome C Oxidase subunit 1 gene (COI), and analyzed osteological and traditional morphometric characters to study *Pseudopimelodus* from the Colombian trans-Andean region. Results provided strong support for two clades phylogenetically related to *Pseudopimelodus,* that showed clear-cut molecular, osteological, and morphometric differences from previously described bumblebee catfishes. Based on these results, we describe two *Pseudopimelodus* species from the Magdalena-Cauca River Basin*: P. magnus* sp. nov. with 43 – 44 vertebrae, dorsal-fin spine with serrations on its anterior margin; lateral margin of transverse process of the fourth vertebra of the Weberian complex forming an acute angle in ventral view and *P. atricaudus* sp. nov. with 39 vertebrae, dorsal-fin spine smooth on its anterior margin and a dark, vertical band covering ¾ of the caudal fin with base of rays and tip of caudal-fin lobes hyaline.

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Abstract

The family Pseudopimelodidae is widely distributed in South America and includes 51 described species organized in seven genera. Only two of four species of the genus *Pseudopimelodus* have been recorded for the trans-Andean basins of Colombia, *Pseudopimelodus bufonius* and *P. schultzi*, whose similarity in external morphology make their identification difficult. We performed a phylogenetic analysis using a fragment of the Cytochrome C Oxidase subunit 1 gene (COI), and analyzed osteological and traditional morphometric characters to study *Pseudopimelodus* from the Colombian trans-Andean region. Results provided strong support for two clades phylogenetically related to *Pseudopimelodus,* that showed clear-cut molecular, osteological, and morphometric differences from previously described bumblebee catfishes. Based on these results, we describe two *Pseudopimelodus* species from the Magdalena-Cauca River Basin*: P. magnus* sp. nov. with 43 – 44 vertebrae, dorsal-fin spine with serrations on its anterior margin; lateral margin of transverse process of the fourth vertebra of the Weberian complex forming an acute angle in ventral view and *P. atricaudus* sp. nov. with 39 vertebrae, dorsal-fin spine smooth on its anterior margin and a dark, vertical band covering ¾ of the caudal fin with base of rays and tip of caudal-fin lobes hyaline.

Introduction

The order Siluriformes is a highly diverse group encompassing at least 3975 valid species (Fricke, Eschmeyer & Fong, 2020) and a growing number of new species are being described (Shibatta, 2016; Ruiz, 2016; Shibatta & Vari, 2017; Shibatta, 2019; Tobes et al., 2020). Within this order, Pseudopimelodidae (Bumblebee catfishes) is a small monophyletic family of Neotropical catfishes, broadly distributed across different river basins in South America, from the Atrato River in Colombia to the Río de la Plata in Argentina (Ferraris, 2007) and it is considered one of the least known families among the Neotropical freshwater catfishes (Shibatta, 2013).

Members of Pseudopimelodidae were originally included in family Pimelodidae; furthermore, Lundberg, Bornbusch & Mago-Leccia (1991) demonstrated its monophyly based on several synapomorphies, and its family rank was proposed by Shibatta (2003). These synapomorphies include: 1) lack of spike-like membranous wings of bone projecting beyond the palatine condyle on the lateral ethmoid; 2) a short metapterygoid, broader (at least twice) than long, deflected inward and usually subtended by a ridge or crest; 3) endopterygoid with a sharp anterolateral process and a comma-shaped ectopterygoid, both broad and loosely linked between the neurocranium, from near the lateral ethmoid-orbitosphenoid suture and the palatine; 4) third to seventh proximal radials of the dorsal fin wide and adjacent radials in full contact for their entire lengths (*Batrochoglanis*, *Cephalosilurus*, *Cruciglanis, Lophiosilurus*, and *Pseudopimelodus*) or only narrowly separated (*Microglanis*), and 5) absence of dorsal hypohyals.

In a phylogenetic analysis based on 440 characters and 87 taxa representing all extant catfish families, Diogo, Chardon & Vandewalle (2004) confirmed the above mentioned synapomorphies and described two additional features: 1) a markedly bifurcated mesethmoid and 2) a spoon-shaped autopalatine with a roundish, dorso-ventrally expanded posterior tip. Subsequent molecular studies based on mitochondrial and nuclear gene sequences (Hardman, 2005; Sullivan, Lundberg & Hardman, 2006; Lundberg, Sullivan & Hardman, 2011; Sullivan, Muriel-Cunha & Lundberg, 2013) showed that the family Pseudopimelodidae forms a well-supported monophyletic assemblage along with Heptapteridae, Pimelodidae, and *Phreatobius*.

In addition to the above-mentioned synapomorphies, five additional characters were proposed for the family Pseudopimelodidae (Shibatta & Vari, 2017).

Until very recently, six genera including at least 51 species were recognized in Pseudopimelodidae: *Batrochoglanis* Gill, 1858; *Cephalosilurus* Haseman, 1911; *Cruciglanis* Ortega-Lara & Lehmann, 2006*;* *Lophiosilurus* Steindachner, 1876; *Microglanis* Eigenmann, 1912*;* and *Pseudopimelodus* Bleeker, 1858 (Fricke, Eschmeyer & Fong, 2020). Shibatta & Vari (2017) described *Rhyacoglanis* from cis-Andean South America, comprising four new species and *Pseudopimelodus pulcher* Boulenger, 1887, from the Western Amazon Basin as the type species.

So far, records in Colombia include a total of six of the seven formally recognized genera of Pseudopimelodidae and only two of the four species of *Pseudopimelodus* (DoNascimiento et al., 2017). Although it was thought that the species *P. bufonius* (Valenciennes, 1840) and *P. schultzi* (Dahl, 1955) had overlapping distribution ranges in the Magdalena-Cauca River Basin, in a recently published checklist (DoNascimiento et al., 2017), the presence of *P. bufonius* was restricted to the Amazon, Orinoco and Caribbean basins, while the species *P. schultzi* was restricted to both the Magdalena-Cauca and Caribbean basins, including the Sinú River, type locality of this species.

In addition to the difficulties to define their distribution, a phylogeographic study revealed the presence of five separate evolutionary lineages of *Pseudopimelodus* in trans- and cis-Andean rivers of Colombia (Rangel-Medrano, Ortega-Lara & Marquez, 2020). Thus, to test the hypothesis that undescribed species are currently classified in Colombia under the names *P. schultzi* and *P. bufonius*, this study integrated molecular and morphological analyses, including osteology and external morphology, to address the taxonomic status of *Pseudopimelodus* species inhabiting the Magdalena-Cauca River Basin. Results identified two new species of the family Pseudopimelodidae from northwestern South America, both described in this study.

Material and Methods

Material studied

The material examined is deposited in museums and institutions as described below and institutional abbreviations used in the present study are listed in Sabaj (2019).

Pseudopimelodus bufonius: Guyana: Upper Essequibo River Basin: Takutu River: AUM 38248, 1, 72.3 mm SL; Rupunini River: AUM 38292, cleared and stained (C&S) specimen, 58.6 mm SL; AUM 48352, 1, 74.3 mm SL; Potaro-Siparuni: AUM 45384, 1, 87.6 mm SL. Colombia: Upper Amazon River Basin: Vaupés River: IMCN 8230, 5, 137.4 – 221.7 mm SL. Orinoco River Basin: Upper Meta River Drainage: Negro River: IMCN 8231, 13, 118.3 – 191.0 mm SL. Venezuela: Orinoco River Basin: Apure River Drainage: Bocono River: MCNG 5307, 4, 103.4 – 123.5 mm SL.

Pseudopimelodus schultzi: Colombia: Sinú River: IMCN 8241, 12 (2 C&S), 174 – 305 mm SL.

Pseudopimelodus mangurus: Argentina: Upper La Plata River Basin: Paraná River: IMCN 8441, 2, 117.7 – 137.9 mm SL.

Pseudopimelodus charus: Brazil: Sao Francisco river drainage: LBP10489, 1, 123.1 mm SL; LBP 11308, 1, 154.5 mm SL.

In addition, the morphological comparisons with *Pseudopimelodus charus* were based on the figure of Valenciennes published in Mees (1974).

Phylogenetic analyses

Phylogenetic analysis was conducted with MrBayes (MB) v3.2 (Ronquist et al., 2012) using COI haplotype sequences from *Pseudopimelodus* specimens (Table 1), belonging to lineages 1 and 5 described by Rangel-Medrano, Ortega-Lara & Márquez (2020). Haplotypes were compared with GenBank COI sequences of remaining members of the family Pseudopimelodidae (Table1), using HKY+G as the best-fit evolutionary model estimated in IQ-TREE software (Kalyaanamoorthy et al., 2017). Two Pimelodid species (*Pimelodus yuma* and *Pseudoplatystoma magdaleniatum*) were used as outgroups. Chain parameters included two independent Markov Chain Monte Carlo (MCMC) iterations for 20 million generations sampled every 1000 generations, discarding the first 25% sampled generations as burn-in; remaining parameters were left as default. Convergence of the MCMC was assessed based on the Potential Scale Reduction Factor which

should approach 1.0 as runs converge and considering the standard deviation of split frequencies which should approach 0. Trees were summarized according to their estimated posterior probability to produce a consensus tree, using the same burn-in as the MCMC. The final tree was visualized with the program FigTree v1.4.2 (Rambaut, 2014). Nodes were considered well supported with posterior probabilities ≥ 0.95 (Wilcox et al., 2002). Finally, following the DNA barcoding of freshwater fishes (Hubert et al., 2008), the pair-wise divergences of *Pseudopimelodus* haplotype sequences was estimated using the Kimura 2 parameter model in MEGA v6.06 (Tamura et al., 2013).

Morphological analyses

Measurements followed standard procedures of Shibatta & Vari (2017) using dial calipers to 0.1 mm on the left side of specimens. Standard length is expressed in mm. Except for subunits of the head which are expressed as percentages of head length, all measurements are expressed as percentages of standard length. Counts were made on the left side of the body when possible. Counts of dorsal, pectoral, pelvic, and anal fin rays, as well as principal and procurrent caudal-fin rays were taken from dried skeletons (DS), cleaned using dermestid beetles, C&S specimens following Taylor & Van Dyke (1985) and radiographs (RX) of paratypes. Vertebral counts include the five fused vertebrae of the Weberian apparatus and one single element of the compound caudal centrum (pleural 1 + ural 1 centrum). Length of the posterior process of cleithrum was measured from dorsal origin to its posterior end. Width of the pectoral-fin spine was measured at its base. Length of the Weberian complex was measured in ventral view, longitudinally from anterior to posterior mesial ends of centrum and was related to the length of the neurocranium, which was measured from the mesial anterior margin of the mesethmoid to posterior margin of the basioccipital. Osteological nomenclature follows Arratia (2003a, b).

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Results

Molecular analysis

Phylogenetic tree based on Bayesian Inference (Fig. 1), showed well-supported clades corresponding to samples here proposed as new species (*Pseudopimelodus magnus* and *P. atricaudus*). *Pseudopimelodus magnus* was recovered sister to *P. schultzi* from the Sinú River (H25 and H26) and both clades along with *P. bufonius* from the Orinoco, appear as the sister-clade to *P. bufonius*, *P. mangurus,* and *P. charus*. In contrast, *P. atricaudus* is sister to the remaining *Pseudopimelodus* species analyzed.

Kimura 2 parameters genetic distance was relatively small for *P. atricaudus* (0.003 – 0.006), *P. magnus* (0.003 – 0.020), and *P. schultzi* (0.020), whereas was larger between *P. bufonius* samples (0.011 – 0.068). The smallest Kimura 2 parameters genetic distance was observed between *P. bufonius* from Orteguaza and *P. mangurus* (0.026), whereas the largest genetic distance was observed between *P. schultzi* and *P. atricaudus* (0.113).

***Pseudopimelodus magnus*, sp. nov.** (Fig. 2)

Pseudopimelodus bufonius [not Valenciennes, 1840]. — Steindachner, 1880: 59 [Cauca River; description]. — Miles, 1947: 64 [Magdalena River Basin; check list]. — Dahl, 1971: 54 [Magdalena River Basin; check list]. — Maldonado-Ocampo et al., 2005: 159 Fig. 150 [Magdalena-Cauca River basin; check list].

Pseudopimelodus schultzi [not Dahl, 1955]. — Ortega-Lara et al., 2006: 49 [upper Cauca Basin; check list]. — Ortega-Lara et al., 2011: 447 [fishery: Magdalena River Basin].

166 *Pseudopimelodus zungaro* [not Humboldt, 1833]. — Eigenmann & Eigenmann, 1890: 112 [Goiás,
167 Brazil]. — Eigenmann, 1922: 32 [in part, Magdalena-Cauca River Basin; identification key].
168
169 **Holotype.** CIUA 5142, 750 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in
170 Venecia, 6°39’47.6” N, 75°50’9” W, Feb 2018, Restrepo-Gómez A.M.
171 **Paratypes.** ANDES I210, 2, 232.9 – 248.5 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca
172 River in Venecia, 6°39’47.6” N, 75°50’9.5” W, Feb 2016, Restrepo-Gómez A.M. CIUA 5163, 1, 531.7
173 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Venecia, 6°39’47.6” N, 75°50’9”
174 W, Nov 2014, Olaya G. CP-UCO 3860, 1, 217.7 mm SL, Colombia, Antioquia, Magdalena River Basin,
175 Cauca River in Venecia, 6°39’47.6” N, 75°50’9” W, Nov 2015, Restrepo-Gómez A.M. CP-UCO 3861, 1
176 230.1 mm SL, Colombia, Bolívar, Magdalena River Basin, Cauca River in Achí, 8°34’8.1” N,
177 74°33’10.9” W, Oct 2015, Restrepo-Gómez A.M. CP-UCO 3862, 1, 177.9 mm SL, Colombia, Antioquia,
178 Magdalena River Basin, Cauca River in Venecia, 6°39’47.6” N, 75°50’9” W, Feb 2016, Restrepo-Gómez
179 A.M. ICN-MHN 24386, 1, 326.84 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in
180 Venecia, 6°39’47.6” N, 75°50’9.5” W, Dec 2015, Restrepo-Gómez A.M. IMCN 0060, 1, 106 mm SL,
181 Colombia, Valle del Cauca, Upper Cauca River Basin, Cauca River in Tuluá town, *ca* 4°6’55” N,
182 76°17’47” W, Nov 1995, Victoria P. IMCN 0285, 1, 228 mm SL, Colombia, Cauca, Upper Cauca River
183 Basin, Ovejas River in Suárez, *ca*. 2°57’41” N, 76°40’39” W, Nov 1995, Usma S. IMCN 2349, 2 DS,
184 157.4 – 408 mm SL, Colombia, Cauca, Upper Cauca River Basin, Cauca River in El Hormiguero,
185 Municipality of Puerto Tejada, *ca*. 3°18’05” N, 76°28’39” W, 5 Nov 2002, Ortega-Lara A. IMCN 3885,
186 2, 57.3 – 62.5 mm SL, Colombia, Valle del Cauca, Upper Cauca River Basin, La Vieja River in Cartago
187 town, *ca*. 4°45’48” N, 75°55’27” W, 31 Aug 2004, Ortega-Lara A. IMCN 8234, 6, 1 DS, 268.1 – 340 mm
188 SL, Colombia, Huila, Magdalena River Basin, Magdalena River in El Quimbo dam, Municipality of
189 Garzón, *ca*. 2°11’05” N, 75°39’44” W, 29 Aug 2015, Ortega-Lara A. IMCN 8239, 1 C&S, not measured,
190 Colombia, Cauca, Cauca River Basin, Cauca River in El Hormiguero, Municipality of Puerto tejada, *ca*.
191 3°18’25” N, 76°28’26” W, 1 Mar 2003, Ortega-Lara A. IMCN 8265, 1 DS, 213.7 mm SL, Colombia,

Antioquia, Magdalena River Basin, Cauca River in Venecia, 6°39’ 47.6” N, 75°50’9” W, Feb 2016, Restrepo-Gómez A.M. IMCN 8267, 1 DS, 193.3 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Venecia, 6°39’47.61” N, 75°50’9” W, Feb 2016, Restrepo-Gómez A.M. IMCN 8269, 1 RX, 217 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River, Valdivia stream in Puerto Valdivia, 7°17’17.7” N, 75°23’32.1” W, Feb 2015, Olaya G. IMCN 8270, 1 RX, 294.2 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Venecia, 6°39’47.61” N, 75°50’9” W, Apr 2015, Olaya G. IMCN 8939, 16, 171 – 475 mm SL, Colombia, Cauca, Upper Cauca River Basin, Cauca River in El Hormiguero, Municipality of Puerto Tejada, *ca*. 3°18’05” N, 76°28’39” W, 22 Dic 2011, Ortega-Lara A.

Non-type material

CIUA 405, 53.8 mm SL Colombia, Valle del Cauca, Cauca River Basin, La Vieja River, 4°41’9.8” N, 75°50’57.7” W, Aug 2006, Ochoa L., Montoya A.F. CIUA 512, 160 mm SL, Colombia, Antioquia, Cauca River Basin, Cauca River in Bolombolo, 5°58’01.3” N, 75°50’26.5” W, Aug 2006, Ochoa L., Montoya A.F.

Diagnosis. *Pseudopimelodus magnus* differs from its congeners by the total number of vertebrae (43 – 44, Fig. 3a *vs.* 39 in *P. atricaudus* Fig. 3b; 38 in *P. bufonius*; 38 – 40 in *P. mangurus*; 41 in *P. schultzi*) and by the deeply acute notch on lateral margins of transverse process of the fourth vertebra of the Weberian complex (Fig. 4a *vs*. shallowly concave in *P. atricaudus*, *P. bufonius*, *P. mangurus*, *P. schultzi*). It differs from *P. atricaudus* by the angle of < 90° formed by the medial junction of the posterior arm of the transverse process of the fourth vertebra (Figs. 4 and 5 *vs*. angle almost right). It differs from *P. atricaudus* and *P. mangurus* by length ratio of Weberian complex and neurocranium (32.1 – 36.3%, Fig. 5 *vs*. 46.9 – 55.5 in *P. atricaudus* and 42.7% in *P. mangurus*). It differs from *P. atricaudus*, *P. bufonius*, and *P. mangurus* by having shorter maxillary barbels, not surpassing the opercular margin (*vs*. reaching).

Additionally, *P. magnus* differs from the remaining species, except *P. atricaudus*, by the length of the posterior process of cleithrum (1.32 – 1.59 times the wide of the pectoral-fin spine base *vs*. 0.57 – 0.75 in *P. bufonius*, 2.22 – 2.76 in *P. schultzi*, 2.24 – 2.30 in *P. mangurus*). It differs from *P. bufonius*, *P. charus*, and *P. mangurus* by having a heart-shaped gas bladder (*vs*. dumbbell-shaped bladder; Fig. 6; Shibatta & Vari, 2017). It differs from *P. atricaudus* by having the anterior margin of the dorsal-fin spine serrated (*vs*. smooth). *Pseudopimelodus magnus* differs from congeners except *P. bufonius* and *P. schultzi* by having a narrow vertical dark band along the center of caudal fin, although in some specimens is hardly visible (*vs*. broad vertical dark band covering ≤ ½ caudal fin in *P. charus* and *P. mangurus* or ¾ of the caudal fin with base of rays and tip of caudal-fin lobes hyaline in *P. atricaudus*).

Description. Morphometric data in Table 2. Body depressed from snout tip to dorsal-fin origin; progressively compressed towards caudal-fin base. Snout rounded in dorsal view. Head trapezoidal, depressed, slightly longer than wide. Head covered by thick skin hiding fontanel and cranial roof bones. Eye small, covered by skin and positioned latero-dorsally. Prognathous jaw. Teeth small and villiform; premaxilla laterally projected backwards and reaching lateral process of lateral ethmoid. Anterior nostril tubular located lateroposteriorly to maxillary barbel base (Fig. 2). Posterior nostril equidistant from anterior nostril and eye. Maxillary barbel not reaching opercular margin. Mental barbel anteriorly inserted to gular apex. Inner mental barbel reaching gular apex. Outer mental barbel not reaching branchial opening. Gular fold V-shaped, with conspicuously pointed apex (Fig. 2). Branchiostegal membrane free from isthmus. Posterior process of vomer bifurcated. Posterior process of cleithrum triangular, its length 1.25 – 1.59 times width of pectoral-spine base. Vomer T-shaped, in contact with parasphenoid, mesethmoid, and lateral ethmoid. Posterior region of mesethmoid wider than base of parieto-supraoccipital process (Fig. 5a). Transverse process of fourth vertebra of Weberian complex forming an angle > 90° between anterior and lateral margins and < 90° between lateral and posterior margins, in ventral view (Fig. 4). Length of Weberian complex in relation to length of neurocranium 32.2 – 36.3%. Anterior fontanel elongated, not reaching transverse line through opening of infraorbital sensory canal in

sphenotic. Posterior fontanel small and oval-shaped, located at center of parieto-supraoccipital (Fig. 5a). Parieto-supraoccipital process with bifurcated tip in contact with supraneural (Fig. 5a). Heart-shaped gas bladder (Fig. 6). Lateral line complete, reaching caudal-fin base. Number of total vertebrae 43 – 44. Ribs 13. Axillary pore present. Dorsal-fin origin at anterior third of body. Posterior margin of fin convex. Dorsal-fin spine strongly ossified with distal end pointed, shorter than next branched ray and with serrations on anterior margin. Dorsal-fin rays I, 6. Adipose-fin origin anterior to anal-fin origin. Pectoral-fin spine serrated, covered by skin; anterior margin with 18 – 41 serrations of similar size and posterior margin with 17 – 27 larger serrations. Posterior edge of pectoral fin convex. Axillary pore present. Pectoral-fin rays I, 7. Posterior margin of pelvic fin rounded; origin inserted behind posterior end of dorsal-fin base. Pelvic-fin rays i, 5. Anal fin with posterior edge rounded and inserted below 20th vertebra. Anal-fin rays iii, 7. Caudal fin bifurcated, with pointed lobes, upper lobe slightly narrower and longer than ventral lobe. Caudal-fin rays i, 8, 7, i; dorsal procurrent rays 14; ventral procurrent rays 14.

Color in life and alcohol. Background of body of variable color from yellow to light brown with four vertical dark bands (Fig. 7). First predorsal band partially cojoined with subdorsal band at level of upper corner of branchial margin. Subdorsal band connected dorsally with sub-adipose band, almost reaching anal-fin base. Dark band on caudal-fin base, completely fused or separated from sub-adipose band in dorsal region. In some specimens, bands less evident and faint. Region between bands with small, scattered and irregularly-shaped spots. Body covered by bright yellow mucus. Pectoral, ventral, and dorsal fins reddish with two transverse dark bands, at base and last-third of each fin. Adipose-fin of same color as body, occasionally covered by sub-adipose band in middle region. Caudal fin pale brown with or without narrow dark band along the center of caudal fin. Color in alcohol (Fig. 2) similar to live coloration, except regions lacking superficial mucus, becoming darker (grey to brown).

Distribution. Magdalena River, from upper sector at El Quimbo dam to the confluence with the Gualí River in Honda town. Cauca River throughout the entire basin (Fig. 8).

Etymology. The specific name *magnus* is from the Latin, meaning "great" and refers to the fact that is the largest species of *Pseudopimelodus* described so far (see Shibatta, 2003; Ortega-Lara, 2012; de Oliveira et al., 2015; Vicentin, Silva-Ferreira & Rondón-Suarez, 2019).

***Pseudopimelodus atricaudus*, sp. nov.** (Fig. 9)

*Pseudopimelodus schultz*i [not Dahl, 1955]. — Ortega-Lara & Lehmann, 2006: 155 [Magdalena Basin; comparative material]. — Mojica et al. 2006: 33 [middle Magdalena basin; check list]. — Villa-Navarro et al., 2006: 15 [upper Magdalena basin; check list].

Pseudopimelodus cf. *bufonius* [not Valenciennes, 1840): — Jiménez-Segura & Ortega-Lara, 2011: 545 [Magdalena River Basin; fisheries].

Holotype. CIUA 5141, 143.7 mm SL, Colombia, Sucre, Magdalena River Basin, Cauca River in Guaranda, 8°19'04.6" N, 74°31'56.9" W, Feb 2018, Restrepo-Gómez A.M.

Paratypes. ANDES I211, 1, 185.3 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Barrio Chino, Caucasia, 8°00'35.2" N, 75°00'0" W, Dec 2015, Restrepo-Gómez A.M. ANDES I212, 1, 203.5 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Paloma, Caucasia, 7°59'31.7" N, 74°58´35.6" W, Dec 2015, Restrepo-Gómez A.M. CIUA 5159, 1, 241.0 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Barrio Chino, Caucasia, 08°00'35.3" N, 75°0'00" W, Dec 2015, Restrepo-Gómez A.M. CIUA 5160, 1, 190.0 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in La Ilusión, Caucasia, 8°1'50" N, 75°0'0.9" W, Dec 2015, Restrepo-Gómez A.M. CIUA 5161, 1, 205.0 mm SL, Colombia, Bolívar, Magdalena River Basin, Cauca River in Punta Cartagena, Pinillos, 8°53'37.3" N, 74°28'28.4" W, Feb 2014, Olaya G. CIUA 5162, 1, 250.0 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Venecia, 6°39'47.6" N, 75°50'9" W, Dec 2015, Olaya G. CP-UCO 3857, 3, 131.8 –198.9 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Barrio Chino,

Caucasia, 8°0’35.3” N, 75°0’0” W, Dec 2015, Restrepo-Gómez A.M. CP-UCO 3858, 3, 153.8 – 192.6 mm SL, Colombia, Bolívar, Magdalena River Basin, Cauca River in Punta Cartagena, Pinillos, 8°53’37.3” N, 74°28’28.4” W, Jan 2015, Olaya G. CP-UCO 3859, 1, 109.0 mm SL, Colombia, Bolívar, Magdalena River Basin, Caribona River in Montecristo, 8°19’6.1” N, 74°31’7.9” W, Dec 2015, Restrepo-Gómez A.M. CZUT-IC 1785, 2, 136 – 178 mm SL, Colombia, Tolima, Magdalena River Basin, Magdalena River in Honda, 5°14’05” N, 74°43’43” W, 15 Jan 2005. ICN-MHN 24387, 1, 147.9 mm SL, Colombia, Bolívar, Magdalena River Basin, Cauca River in Punta Cartagena, Pinillos, 8°53’37.3” N, 74°28’28.4” W, Jan 2015, Olaya G. IMCN 0324, 2, 139.7 – 185.3 mm SL, Colombia, Santander, Magdalena River Basin, Magdalena River in Puerto Wilches, *ca*. 7°19’39” N, 73°54’41” W, 27 Jun 1996, Aldana J. IMCN 4196, 1 C&S, 6, 90.08 – 210.3 mm SL, Colombia, Bolivar, Magdalena River Basin, Magdalena River in Hatillo de la Loba, Oct 2006, Ardila C. IMCN 8232, 3, 153.8 – 180.4 mm SL, Colombia, Tolima, Magdalena River in Honda, *ca*. 5°14’05” N, 74°43’43” W, 12 Jan 2007, Ortega-Lara A. IMCN 8233, 6, 99.4 – 275.0 mm SL, Colombia, Córdoba, San Jorge River in La Balsa, Corregimiento La Apartada, *ca*. 8°01’40” N, 75°23’04” W, 20 Jan 2016, Vallecilla-Valencia V., Ortega-Lara A. IMCN 8237, 7, 202 – 225 mm SL, Colombia, Santander, Magdalena River Basin, Magdalena River in Barrancabermeja, 7°01’56” N, 73°52’35” W, 26 Sep 2011, Ortega-Lara A. IMCN 8238, 1, 62.6 mm SL, Colombia, Bolívar, Magdalena River Basin, Yanacue stream in the Yanacue town, 7°18’14” N, 74°01’16” W, 15 Aug 2010, Ortega-Lara A. IMCN 8266, 1 DS, 203.5 mm SL, Colombia, Antioquia, Magdalena River Basin, Cauca River in Barrio Chino, Caucasia, 8°0’35.3” N, 75°0’0” W, Dec 2015, Restrepo-Gómez A.M. IMCN 8268, 1 DS, 160 mm SL, Colombia, Bolívar, Magdalena River Basin, Cauca River in San Jacinto del Cauca, 8°12’7.5” N, 74°45’15.5” W, Dec 2015, Restrepo-Gómez A.M. IMCN 8271, 1, 198.6 mm SL, Colombia, Bolívar, Magdalena River Basin, Cauca River in Punta Cartagena, Pinillos, 8°53’37.4” N, 74°28´28.5” W, Apr 2015, Olaya G.

Non-type material.

CIUA 366, 95 mm SL, Colombia, Cesar, Magdalena River Basin, Tucuy River in Becerril, 9°41’35” N, 73°27’42.1” W, May 2006, Montoya A.F. CIUA 367, 120 mm SL, Colombia, Cesar, Magdalena River

Basin, Maracas River in Becerril, 9°44’46.2” N, 73°10’38” W, May 2006, Montoya A.F. CIUA 528 3, 210 – 245 mm SL, Colombia, Valle del Cauca, Cauca River Basin, in Río Frío, 4°07’52.4” N, 76°16’22.1” W, Jan 2007, Ochoa L., Ospina J.G. CIUA 840, 8 DS, Colombia, Antioquia, Magdalena River Basin, Magdalena River in Puerto Berrío, 6°30’27.8” N, 74°23’49.3” W, Aug 2006, Cano J.M. CIUA 841, 7 DS, Colombia, Antioquia, Magdalena River Basin, Magdalena River in Puerto Berrío, 6°30’27.8” N, 74°23’49.2” W, Aug 2006, Cano J.M. CIUA 1151, 4, 135 – 160 mm SL, Colombia, Antioquia, Magdalena River Basin, Magdalena River in Puerto Berrío, 6°30’27.8” N, 74°23’49.3” W, Aug 2009, Jiménez L.F. CIUA 2029, 2, 81.2 – 82.1 mm SL, Colombia, Santander, Magdalena River Basin, Sogamoso River in Betulia, 7°05’14.2” N, 73°23’52” W, Jan 2011, Pelayo P. CIUA 2987, 195 mm SL, Colombia, Santander, Magdalena River Basin in El Llanito floodplain lake, 7°10’12.2” N, 73°51’43.8” W, Aug 2010, Carvajal J.D., Hernández A. CIUA 3240, 250, 200 mm SL, Colombia, Antioquia, Magdalena River Basin, Magdalena River in Puerto Berrío, 6°30’27.8” N, 74°23’49.3” W, Jun 2013, Jiménez L.F. CIUA 3291, 2, 145 – 190 mm SL, Colombia, Antioquia, Magdalena River Basin, Magdalena River in Puerto Berrío, 6°30’27.8” N, 74°23’49.2” W, Jun 2013, Jiménez L.F. CIUA 3668, 190 mm SL, Colombia, Antioquia, Magdalena River Basin, Magdalena River in Puerto Berrío, 6°29’50” N, 74°23’53” W, Aug 2014, Jiménez L.F. CIUA 4797, 190 mm SL, Colombia, Antioquia, Magdalena River Basin, Magdalena River in Puerto Berrío, 6°29’50” N, 74°23’53” W, May 2015, Londoño J.

Diagnosis. *Pseudopimelodus atricaudus* (Fig. 9) differs from the other *Pseudopimelodus* species by having a dark band covering ¾ of the caudal fin with base of rays and tip of caudal-fin lobes hyaline (*vs*. narrow vertical dark band along the center of caudal fin in *P. bufonius*, *P. magnus*, and *P. schultzi,* although in some specimens is hardly visible; base of rays hyaline and broad band covering ≤ ½ caudal fin in *P. charus* and *P. mangurus*), anterior margin of the dorsal-fin spine smooth (*vs*. serrated; Fig. 10). *Pseudopimelodus atricaudus* differs from other *Pseudopimelodus* species except *P. mangurus* by having a total of 39 vertebrae (*vs*. 38 in *P. bufonius*; 43 – 44 in *P. magnus*, Fig. 3; 41 in *P. schultzi*). It differs from *P. magnus* by having a shallowly concave lateral margin of the transverse process of the fourth vertebra

of the Weberian complex (Fig. 4 *vs*. deeply acute notch). Junction of the posterior margin of the transverse process of the fourth vertebra at angle approaching 90° (*vs.* < 90°; Figs. 4 and 5). It differs from *P. magnus*, *P. bufonius*, and *P. mangurus* by having a longer Weberian complex in relation to the length of the neurocranium (46.9 – 55.5%, Fig. 5 *vs.* 32.1 – 36.3% in *P. magnus*, 33.5% in *P. bufonius,* and 42.7% in *P. mangurus*). It differs from *P. bufonius* and *P. mangurus* by having shorter maxillary barbels, not surpassing the opercular margin (*vs*. surpassing). It differs from other *Pseudopimelodus* species except *P. magnus* by the length of the posterior process of cleithrum (1.25 – 1.62 times the width of the pectoral-fin spine base *vs*. 0.57 – 0.75 in *P. bufonius*, 2.22 – 2.76 in *P. schultzi*, 2.24 – 2.30 in *P. mangurus*). It differs from other *Pseudopimelodus* species except *P. magnus* and *P. schultzi* by having a heart-shaped gas bladder (*vs*. dumbbell-shaped; Fig. 6).

Description. Morphometric data in Table 3. Body depressed from snout to dorsal-fin origin; progressively compressed towards caudal-fin base. Snout rounded in dorsal view. Head as long as wide and covered by thick skin hiding fontanel and cranial roof bones. Eye small, covered by skin and positioned latero-dorsally. Prognathous jaw. Teeth small and villiform. Premaxilla laterally projected backwards, surpassing lateral process of lateral ethmoid. Anterior nostril tubular, located lateroposteriorly to maxillary barbel base (Figs. 8 and 10). Distance from anterior nostril to eye greater than distance to posterior nostril. Maxillary barbel reaching opercular margin. Mental barbel inserted anterior to gular apex. Inner mental barbel surpassing gular apex. Outer mental barbel surpassing branchial opening. Gular fold V-shaped, with rounded apex (Fig. 8). Branchiostegal membrane free from isthmus. Posterior process of cleithrum triangular, 1.25 – 1.62 of width of pectoral-fin spine base.

Vomer T-shaped, with bifurcated posterior process (Fig. 4b) and in contact with parasphenoid, mesethmoid, and lateral ethmoid. Posterior region of mesethmoid wider than base of parieto-supraoccipital process. Lateral margin of transverse process of fourth vertebra of Weberian complex smoothly-concave joining posteriorly to vertebral centra at right angle. Length of Weberian complex in relation to length of neurocranium 32.2 – 36.3%. Anterior fontanel elongated, reaching a transverse line through anterolateral

process of lateral ethmoid (Fig. 5b). Posterior fontanel small and oval-shaped, located at center of parieto-supraoccipital (Fig. 5b). Parieto-supraoccipital process rectangular, slightly wider at base, with bifurcated tip in contact with supraneural (Fig. 5b). Heart-shaped gas bladder (Fig. 6). Lateral line complete, reaching caudal-fin base. Total number of vertebrae 39. Dorsal-fin origin at anterior third of body, posterior margin straight, dorsal-fin spine strongly ossified, of equal length to first branched ray. Anterior margin of dorsal-fin spine smooth with its distal end pointed. Dorsal-fin rays I, 6. Adipose-fin origin at level of anal fin origin. Pectoral-fin spine with serrations and covered by skin, anterior and posterior margins with 17 – 19 and 13 – 17 serrations, respectively. Serrations on posterior margin slightly larger than those on anterior margin. Posterior edge of pectoral fin straight. Axillary pore present. Pectoral-fin rays I, 7. Pelvic fin emarginated, inserted behind end of dorsal-fin base. Pelvic-fin rays i, 5. Anal fin with rounded posterior edge and inserted below 17th vertebra. Anal-fin rays v, 7. Caudal-fin bifurcated, with pointed lobes, upper lobe slightly narrower and longer than ventral lobe. Caudal-fin rays i, 8, 7, i; dorsal procurrent rays 17; ventral procurrent rays 17.

Color in life and alcohol. Body covered by yellowish mucus with four irregularly-shaped dark bands on pre-dorsal, subdorsal, sub-adipose region, and caudal-fin base, clearly visible in juveniles (Fig. 11), but faint in adult specimens. Pre-dorsal and subdorsal bands not joined. Remaining bands variably joined at different levels without defined pattern. Body with small dark and scattered spots and belly whitish. Dorsal and anal fins brown with posterior margin pale. Caudal-fin base hyaline, dark brown on its posterior three-quarters. Pectoral and pelvic fins reddish with dark band at base. Color in alcohol similar to color in life.

Distribution. It is found on the Magdalena River below 200 m asl from the confluence of the Guali River in the city of Honda and in the middle and lower basins of the Cauca River, close to the mouth (Fig. 8).

Etymology. The specific name *atricaudus* is from the Latin, “ater” (black) and “cauda” (tail) and refers to the diagnostic black caudal fin.

400

401 **Discussion**

402 Molecular and morphological approaches were used in this study to test the hypothesis that undescribed
403 species of *Pseudopimelodus* occur in Colombia. Available COI sequences allowed phylogenetic
404 comparisons of samples studied here with members of all *Pseudopimelodus* species and other genera of
405 Pseudopimelodidae. In contrast to the remaining *Pseudopimelodus* species, some osteological features
406 remained unaddressed in *P. charus,* due to the lack of skelotonized specimens, although we could analyze
407 its external morphology and coloration patterns.
408 This study provides evidence of two new species of *Pseudopimelodus* from the Magdalena-Cauca River
409 Basin, which due to similarities in the external morphology and lack of adequate taxonomic studies, were
410 formerly identified as *P. bufonius* or *P. schultzi* (see synonymy of new species). *Pseudopimelodus*
411 *magnus* shows a well-supported sister group relationship with *P. schultzi,* whereas *P. atricaudus* is the
412 sister group to all *Pseudopimelodus* species. Additionally, the genetic distances in *Pseudopimelodus*
413 species (see section molecular analyses) are concordant with intraspecific variation reported in
414 Siluriformes (Hubert et al., 2008), except for *P. bufonius* from the Orinoco River Basin that showed larger
415 genetic distances from its conspecifics from the Vaupés and Orteguaza rivers. A recent study indicates
416 that *P. atricaudus* (lineage 1) diverged from *P. magnus* (lineage 5) about 16 mya, resulting from the uplift
417 of the Antioqueño Plateau (Rangel-Medrano, Ortega-Lara & Márquez, 2020).
418 The new *Pseudopimelodus* species present three synapomorphies (thick skin on pectoral-fin spine, tip of
419 pectoral-fin spine bifurcated and, small pseudotympanum opening) for the clade [*Cruciglanis*,
420 *Pseudopimelodus*] *Rhyacoglanis*] and two synapomorphies for *Pseudopimelodus* (triangular
421 mesacoracoid and a short posterior cleithral process) previously reported by Shibatta & Vari (2017).
422 Additionally, juveniles of *P. atricaudus* shows clearly visible bands while adult specimens exhibit faint or
423 no bands with small dark and scattered spots, supporting one of the synapomorphies of
424 Pseudopimelodidae.

425 However, the findings of heart-haped gas bladder in the two new species described herein, *P. mangurus*,
426 and *P. schultzi*, do not provide support to the dumbbell-shaped gas bladder (Birindelli, Shibatta, 2011) as
427 synapomorphy of the clade [*Cruciglanis*, *Pseudopimelodus*] *Rhyacoglanis*] (Shibatta & Vari, 2017).
428 Compared with Shibatta & Vari (2017), this study also found a wider range of number of vertebrae (38 –
429 44 *vs*. 41 – 42), partial fusion between predorsal and subdorsal bands (*vs*. absent), and short maxillary
430 barbels, falling short of vertical through dorsal-fin origin, although they are shorter in *P. magnus* and do
431 not reach the opercular margin in *P. atricaudus*.
432 Moreover, the anteriorly smooth dorsal-fin spine in *P. atricaudus* contrasts with the anteriorly serrated
433 dorsal-fin spine described in *Pseudopimelodus* and *Rhyacoglanis* (Shibatta & Vari, 2017). This character,
434 along with the pigmentation pattern of the caudal fin, represent autapomorphies for *P. atricaudus*. The
435 largest body size and the highest number of vertebrae allow the discrimination of *P. magnus* from
436 congeners, including *P. mangurus*, the longest *Pseudopimelodus* species known until now (see Shibatta,
437 2003). Likewise, the angles formed, in ventral view, between anterior and lateral margins of transverse
438 process of the fourth vertebra of the Weberian complex also provided a diagnostic trait for *P. magnus*.
439 *Pseudopimelodus* now includes six species (*P. atricaudus*, *P. bufonius*, *P. charus*, *P. magnus*, *P.*
440 *mangurus*, *P. schultzi*), although this number is expected to increase, given the high genetic divergence
441 observed among its members (Rangel-Medrano, Ortega-Lara & Márquez, 2020). The high genetic
442 divergence observed among specimens from the Sinú River (type locality of *P. schultzi*) and other
443 *Pseudopimelodus*, suggests that *P. schultzi* is restricted to only the Caribbean river basin and therefore its
444 presence in the Magdalena-Cauca River Basin must be questioned. These results contribute to redefine
445 the geographical distribution of *Pseudopimelodus* in northwestern South America and may support
446 further studies in phylogenetics, fisheries, reproduction, and population genetics to eventually elucidate
447 the basic biology of these species and their conservation status.
448
449 **Conclusions**

Based on molecular and morphological analyses, this study describes two new species of *Pseudopimelodus* Bleeker, 1858 (Siluriformes: Pseudopimelodidae) from the Magdalena-Cauca River Basin, Colombia. These results show the taxonomical complexity of *Pseudopimelodus* in an area where the presence of only two of four members of this genus have been recorded. Thus, further taxonomic as well as phylogenetic studies of *Pseudopimelodus* are needed to clarify the status of divergent lineages currently included in this genus.

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References

Arratia G. 2003a. Catfish head skeleton - an overview. In: Arratia G, Kapoor BG, Chardon M, Diogo R, editors. Catfishes. *Enfield: Science Publishers, Inc*. p.3 – 46.

Arratia G. 2003b. The Siluriform postcranial skeleton - an overview. In: Arratia G, Kapoor BG, Chardon M, Diogo R, editors. Catfishes. *Enfield: Science Publishers, Inc*. p.121 – 157.

Birindelli JLO, Shibatta OA. 2011. Morphology of the gas bladder in bumblebee catfishes (Siluriformes, Pseudopimelodidae). *Journal of Morphology* 272(7):890 – 96 DOI 10.1002/jmor.1096.

475 Dahl G. 1971. Los peces del norte de Colombia. Ministerio de Agricultura, Instituto de Desarrollo de los
476 Recursos Naturales Renovables (INDERENA). *Talleres Litografía Arco*. Bogotá D.C., Colombia.
477 391 p.
478 de Carvalho DC, Oliveira DAA, Pompeu PS, Gontijo-Leal C, Oliveira CO, Hanner R. 2011. Deep barcode
479 divergence in Brazilian freshwater fishes: the case of the São Francisco River Basin. *Mitochondrial*
480 *DNA* 22:sup1, 80 – 86 DOI 10.3109/19401736.2011.588214
481 Diogo RM, Chardon M, Vandewalle P. 2004. Osteology and myology of the cephalic region and pectoral
482 girdle of *Batrochoglanis raninus*, with a discussion on the synapomorphies and phylogenetic
483 relationships of the Pseudopimelodinae and Pimelodidae (Teleostei: Siluriformes). *Animal*
484 *Biology* 54(3): 261 – 280 DOI 10.1163/1570756042484728.
485 DoNascimiento C, Herrera-Collazos EE, Herrera GA, Ortega-Lara A, Villa-Navarro FA, Usma Oviedo
486 JS, Maldonado Ocampo JA. 2017. Checklist of the freshwater fishes of Colombia: a Darwin Core
487 alternative to the updating problem. *Zookeys* 708:25 – 138 DOI 10.3897/zookeys.708.13897.
488 Eigenmann CH, Eigenmann RS. 1890. A revision of the South American Nematognathi or cat-fishes.
489 *Occasional Papers of the California Academy of Sciences* 1: 1 – 508.
490 Eigenmann CH. 1922. The fishes of Western South America. Part 1. The freshwater fishes of
491 Northwestern South America. Including Colombia, Panamá, and the pacific slopes of Ecuador
492 and Perú, together with and appendix upon the fishes of the Rio Meta in Colombia. *Memoirs of*
493 *the Carnegie Museum* 9 (1): 1 – 346.
494 Ferraris CJ, Jr. 2007. Checklist of catfishes, recent and fossil (Osteichthyes: Siluriformes), and catalogue
495 of Siluriformes primary types. *Zootaxa* 1418:1 – 628 DOI 10.11646/zootaxa.1418.1.1.
496 Fricke R, Eschmeyer WN, Fong JD. 2020. Species by family/subfamily. Available at:
497 http://researcharchive.calacademy.org/research/ichthyology/catalog/SpeciesByFamily.asp.
498 Electronic version accessed 08-04-2020.
499 Hardman M. 2005. The phylogenetic relationships among non-Diplomystid catfishes as inferred from
500 mitochondrial cytochrome b sequences; the search for the ictalurid sister taxon (Otophysi:

501 Siluriformes). *Molecular Phylogenetics and Evolution* 37:700 – 720 DOI
502 10.1016/j.ympev.2005.04.029.
503 Hubert N, Hanner R, Holm E, Mandrak NE, Taylor E, Burridge M, Watkinson D, Dumont P, Curry A,
504 Bentzen P, Zhang J, April J, Bernatchez L. 2008. Identifying Canadian freshwater fishes through
505 DNA barcodes. *PLoS One* 3(6): e2490 DOI 10.1371/journal.pone.0002490.
506 Jiménez-Segura LF, Ortega-Lara A. *Pseudopimelodus* cf. *bufonius* (Valenciennes 1840). Chapter 7. Pp.
507 544 – 546. in: Lasso CA, Agudelo Córdoba E, Jiménez-Segura LF, Ramírez-Gil H, Morales-
508 Betancourt M, Ajiaco-Martínez RE, de Paula Gutiérrez F, Usma Oviedo JS, Muñoz Torres SE,
509 Sanabria Ochoa AI (Eds). 2011. I. Catálogo de los recursos pesqueros continentales de Colombia.
510 Serie Editorial Recursos Hidrobiológicos y Pesqueros Continentales de Colombia. *Instituto de*
511 *Investigación de los Recursos Biológicos Alexander von Humboldt (IAvH)*. Bogotá, D.C.,
512 Colombia, 715p.
513 Kalyaanamoorthy S, Minh BQ, Wong TKF, Von Haeseler A, Jermiin LS. 2017. ModelFinder: Fast model
514 selection for accurate phylogenetic estimates. *Nature Methods* 14:587 – 589 DOI
515 10.1038/nmeth.4285.
516 Lundberg JG, Bornbusch AH, Mago-Leccia F. 1991. *Gladioglanis conquistador* n. sp. from Ecuador,
517 with diagnoses of the subfamilies Rhamdiinae Bleeker and Pseudopimelodinae n. subf.
518 (Siluriformes: Pimelodidae). *Copeia* 1991(1):190 – 209 DOI 10.2307/1446263.
519 Lundberg JG, Sullivan JP, Hardman M. 2011. Phylogenetics of the South American catfish family
520 Pimelodidae (Teleostei: Siluriformes) using nuclear and mitochondrial gene sequences.
521 *Proceedings of the Academy of Natural Sciences of Philadelphia* 161:153 – 189 DOI
522 10.1635/053.161.0110.
523 Maldonado-Ocampo JA, Ortega-Lara A, Usma OJS, Galvis VG, Villa-Navarro FA, Vásquez GL, Prada-
524 Pedreros S, Ardila RC. 2005. Peces de los Andes de Colombia. Instituto de Investigación de
525 Recursos Biológicos Alexander Von Humboldt. Bogotá, D.C. - Colombia. 346 p DOI
526 10.1590/S1679-62252006000300011.

Mees GF. 1974. The Auchenipteridae and Pimelodidae of Suriname (Pisces, Nematognathi). *Zoologische Verhandelingen*. Leiden. 132:1-256, Pls. 1-15.

Miles C. 1947. Los peces del río Magdalena (A Field Book of Magdalena Fishes). Doctoral Thesis dissertation. Facultad de Filosofía y Letras, Pontificia Universidad Católica Javeriana. Bogotá, D.C., Colombia. 214p.

Mojica JI, Galvis G, Arbeláez F, Sánchez-Duarte P, Castellanos C, Villa-Navarro FA. 2006. Peces del valle medio del Río Magdalena, Colombia. *Biota Colombiana* 7:23 – 38.

Ortega-Lara A, Lehmann P. 2006. *Cruciglanis*, a new genus of Pseudopimelodid catfish (Ostariophysi: Siluriformes) with description of a new species from the Colombian Pacific coast. *Neotropical Ichthyology* 4:147 – 156 DOI 10.1590/S1679-62252006000200002.

Ortega-Lara A, Usma JS, Bonilla PA, Santos NL. 2006. Peces de la cuenca alta del río Cauca, Colombia. *Biota Colombian*a 7:39 – 54 DOI:10.21068/bc.v7i1.164.

Ortega-Lara A, Rivas TS, Rincón CE. *Pseudopimelodus schultzi* (Dahl 1955). Chapter 7. Pp. 547 – 550. In: Lasso CA, Agudelo Córdoba E, Jiménez-Segura LF, Ramírez-Gil H, Morales-Betancourt M, Ajiaco-Martínez RE, de Paula Gutiérrez F, Usma Oviedo JS, Muñoz Torres SE, Sanabria Ochoa AI. (Eds). 2011. I. Catálogo de los recursos pesqueros continentales de Colombia. Serie Editorial Recursos Hidrobiológicos y Pesqueros Continentales de Colombia. *Instituto de Investigación de los Recursos Biológicos Alexander von Humboldt (IAvH)*. Bogotá, D.C., Colombia, 715p.

Rambaut A. 2014. FigTree Version 1.4.2. Available at http://tree.bio.ed.ac.uk/software/figtree/

Rangel-Medrano JD, Ortega-Lara A, Márquez EJ. 2020. Ancient genetic divergence in bumblebee catfish of the genus Pseudopimelodus (Pseudopimelodidae: Siluriformes) from northwestern South America. *PeerJ* 8:e9028 DOI 10.7717/peerj.9028.

Ronquist F, Teslenko M, Van Der Mark P, Ayres DL, Darling A, Hohna S, Larget B, Liu L, Suchard MA, Huelsenbeck JP. 2012. Mrbayes 3.2: Efficient Bayesian phylogenetic inference and model choice across a large model space. *Systematic Biology* 61:539 – 542 DOI 10.1093/sysbio/sys029.

552 Sabaj M.H. 2019. Standard symbolic codes for institutional resource collections in herpetology
553 and ichthyology: An Online Reference. Version 7.1 (21 March 2019). Electronically
554 accessible at http://www.asih.org. *American Society of Ichthyologists and Herpetologists,*
555 Washington, DC.
556 Shibatta OA. 2003. Family Pseudopimelodidae (Bumblebee catfishes, dwarf marbled catfishes). Pp. 401 –
557 405. In: Reis, R. E., S. O. Kullander & C. J. Ferraris, Jr. (Eds.). Check List of the Freshwater
558 Fishes of South and Central America. Porto Alegre, *Edipucrs*, 729p DOI 10.1643/OT-04-142.
559 Shibatta OA. 2016. A new species of bumblebee catfish of the genus *Microglanis* (Siluriformes:
560 Pseudopimelodidae) from the Upper Rio Paraguay Basin, Brazil. *Neotropical Ichthyology* 14:1 –
561 7 DOI 10.1590/1982-0224-20160031.
562 Shibatta OA, Vari RP. 2017. A new genus of Neotropical rheophilic catfishes, with four new species
563 (Teleostei: Siluriformes: Pseudopimelodidae). *Neotropical Ichthyology* 15(2), 1 – 30 DOI
564 10.1590/1982-0224-20160132.
565 Shibatta OA. 2019. New species of bumblebee catfish of the genus *Batrochoglanis* Gill, 1858
566 (Siluriformes: Pseudopimelodidae) from the Aripuanã River basin, Mato Grosso, Brazil. *Zootaxa*
567 4674(2):243 – 263 DOI 10.11646/zootaxa.4674.2.6.
568 Steindachner F. 1880. Zur Fisch-fauna des Cauca und der Flüsse bei Guayaquil. *Denkschriften der*
569 *Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften in*
570 *Wien* 42, 55 – 104, Pp. 1 – 9.
571 Sullivan JP, Lundberg JG, Hardman M. 2006. A phylogenetic analysis of the major groups of catfishes
572 (Teleostei: Siluriformes) using rag1 and rag2 nuclear gene sequences. *Molecular Phylogenetics*
573 *and Evolution* 41:636 – 662 DOI 10.1016/j.ympev.2006.05.044.
574 Sullivan JP, Muriel-Cunha J, Lundberg JG. 2013. Phylogenetic relationships and molecular dating of the
575 major groups of catfishes of the Neotropical superfamily Pimelodoidea (Teleostei: Siluriformes).

576 *Proceedings of the Academy of Natural Sciences of Philadelphia* 162:89 – 110 DOI
577 10.1635/053.162.0106.
578 Tamura K, Stecher G, Peterson D, Filipski A, Kumar S. 2013. MEGA6: molecular evolutionary genetics
579 analysis version 6.0. *Molecular Biology and Evolution* 30(12):2725 – 9 DOI
580 10.1093/molbev/mst197.
581 Taylor WR, Van Dyke GC. 1985. Revised procedures for staining and clearing small fishes and other
582 vertebrates for bone and cartilage study. *Cybium* 9:107 – 119.
583 Tobes I, Falconí-López A, Valdiviezo-Rivera J, Provenzano-Rizzi F. 2020. A new species of *Microglanis*
584 (Siluriformes: Pseudopimelodidae) from the Pacific slope of Ecuador. *Neotropical Ichthyology*
585 18(2):1 – 19 DOI 10.1590/1982-0224-2019-0023.
586 Villa-Navarro FA, Zúñiga-Upegui PT, Castro-Roa D, García-Melo JE, García-Melo LJ, Herreda-Yara
587 ME. 2006. Peces del alto Magdalena, cuenca del río Magdalena, Colombia. *Biota Colombiana* 7:
588 3 – 22 DOI 10.21068/bc.v7i1.162.
589 Wilcox TP, Zwickl DJ, Heath TA, Hillis DM. 2002. Phylogenetic relationships of the dwarf boas and a
590 comparison of Bayesian and bootstrap measures of phylogenetic support. *Molecular Phylogenetic*
591 *and Evolution* 25:361 – 371 DOI 10.1016/S1055-7903(02)00244-0.
592

Table 1(on next page)

List of COI sequences of species of Pimelodoidea used for phylogenetic analysis.

[1]Rangel-Medrano, Ortega-Lara & Márquez (2020); [2]Oliveira, pers comm; [3]de Carvalho et al., 2011.

1

Species	Geography	GenBank accession	Sample size
Pseudopimelodus atricaudus H1[1]	Cauca River lower sector	MH553571	1
Pseudopimelodus atricaudus H8[1]	Cauca River lower sector	MH553578, MH800618- MH800636	20
Pseudopimelodus atricaudus H11[1]	Cauca River lower sector	MH553581	1
Pseudopimelodus atricaudus H21[1]	Magdalena River lower sector	MH553591	1
Pseudopimelodus magnus H12[1]	Cauca River middle sector	MH553582	1
Pseudopimelodus magnus H13[1]	Cauca River middle sector	MH553583	1
Pseudopimelodus magnus H14[1]	Cauca River middle sector	MH553584	1
Pseudopimelodus magnus H16[1]	Cauca River middle sector	MH553586	1
Pseudopimelodus magnus H17[1]	Magdalena River upper sector	MH553587, MH800728- MH800730	4
Pseudopimelodus magnus H18[1]	Cauca River middle sector	MH553588, MH800711- MH800714	5
Pseudopimelodus magnus H19[1]	Cauca River middle sector	MH553589	1
Pseudopimelodus magnus H20[1]	Cauca River middle sector	MH553590	1
Pseudopimelodus magnus H23[1]	Cauca River upper sector	MH553593	1
Pseudopimelodus magnus H24[1]	Cauca River upper sector	MH553594	1
Pseudopimelodus schultzi H25[1]	Sinú River	MH553595	1
Pseudopimelodus schultzi H26[1]	Sinú River	MH553596	1
Pseudopimelodus bufonius H27[1]	Vaupés River	MH800834	1
Pseudopimelodus bufonius H28[1]	Orteguaza River	MH553598, MH800832	2
Pseudopimelodus bufonius H33[1]	Orinoco River	MH553603	1
Pseudopimelodus mangurus[2]	Paranapanema River	EU179816	1
Pseudopimelodus charus[2]	São Francisco River	EU179815	1
Cruciglanis sp. AOL81[1]	Mira River	MH553609	1
Cruciglanis pacifici AOL094[1]	Anchicayá River	MH553607	1
Rhyachoglanis annulatus AOL097-98[1]	Meta River	MH553605-06	2
Rhyachoglanis pulcher[2]	---	EU179812	1
Cephalosilurus apurensis[2]	Orinoco River	EU179818	1
Batrochoglanis raninus[2]	Aquarium	EU179809	1
Lophiosilurus alexandri[3]	São Francisco River	HM405152	1
Microglanis sp. AOL095[1]	Acacias River	MH553604	1
Pimelodus yuma [1]	Cauca River lower sector	MH553610	1
Pseudoplatystoma magdaleniatum[1]	Cauca River lower sector	MH553611	1

Table 2(on next page)

Morphometric data of *Pseudopimelodus magnus* (32 specimens).

1

	Holotype	Max	Min	Mean	SD
Standard length (mm)	750	531.7	168	279.4	86
Percentages of standard length					
Head length	23.3	32.1	23.3	30.0	1.4
Pre-dorsal distance	30.0	36.8	30.0	34.5	1.2
Pre-pectoral distance	24.0	27.6	23.7	25.2	1.0
Pre-pelvic distance	41.3	58.8	41.3	53.2	2.9
Distance between pectoral-fin origin and dorsal-fin origin	21.3	25.2	21.3	22.8	1.0
Distance between pectoral-fin origin and pelvic-fin origin	22.0	35.7	22.0	31.4	2.5
Distance between dorsal-fin origin and pelvic-fin origin	26.7	30.7	23.8	26.7	1.8
Dorsal-fin base length	8.4	14.1	8.4	12.5	1.0
Distance between adipose-fin origin and pelvic-fin origin	24.7	33.9	24.7	28.8	2.0
Distance between pelvic-fin origin and anal-fin origin	19.7	27.9	19.7	25.4	1.6
Distance between anal-fin origin and adipose-fin origin	19.3	19.3	13.1	15.7	1.4
Adipose-fin base length	9.8	14.7	9.8	13.0	1.2
Anal-fin base length	13.6	13.6	7.9	9.8	1.1
Pectoral-fin base length	18.7	27.8	18.7	25.5	1.7
Pelvic-fin base length	14.0	19.2	11.8	14.4	1.7
Percentages of head length					
Orbital diameter	5.6	9.1	4.6	6.0	1.1
Snout length	41.7	41.7	24.5	33.6	2.8
Distance between maxillary barbels	53.1	53.1	39.6	46.2	2.6
Distance between anterior most mesial point of snout and left anterior nostril	11.6	18.8	9.3	14.0	2.6
Distance between maxillary barbel and eye	14.0	19.1	13.3	15.8	1.3
Distance between anterior nostrils	29.2	29.2	19.7	24.0	2.0
Distance between posterior nostrils	34.5	34.5	23.0	27.2	2.3
Distance between anterior and posterior nostrils	7.0	8.9	5.0	7.2	0.9
Distance between posterior nostril to eye	9.0	9.0	4.4	7.1	1.0
Interorbital distance	49.6	49.6	34.3	41.1	2.7
Mouth width	73.2	82.7	60.1	71.9	5.9
Distance between outer mental barbels	42.4	46.9	34.0	39.1	2.9
Distance between inner mental barbels	23.3	24.5	16.3	21.0	2.2

2

Table 3(on next page)

Morphometric data of *Pseudopimelodus atricaudus* (41 specimens).

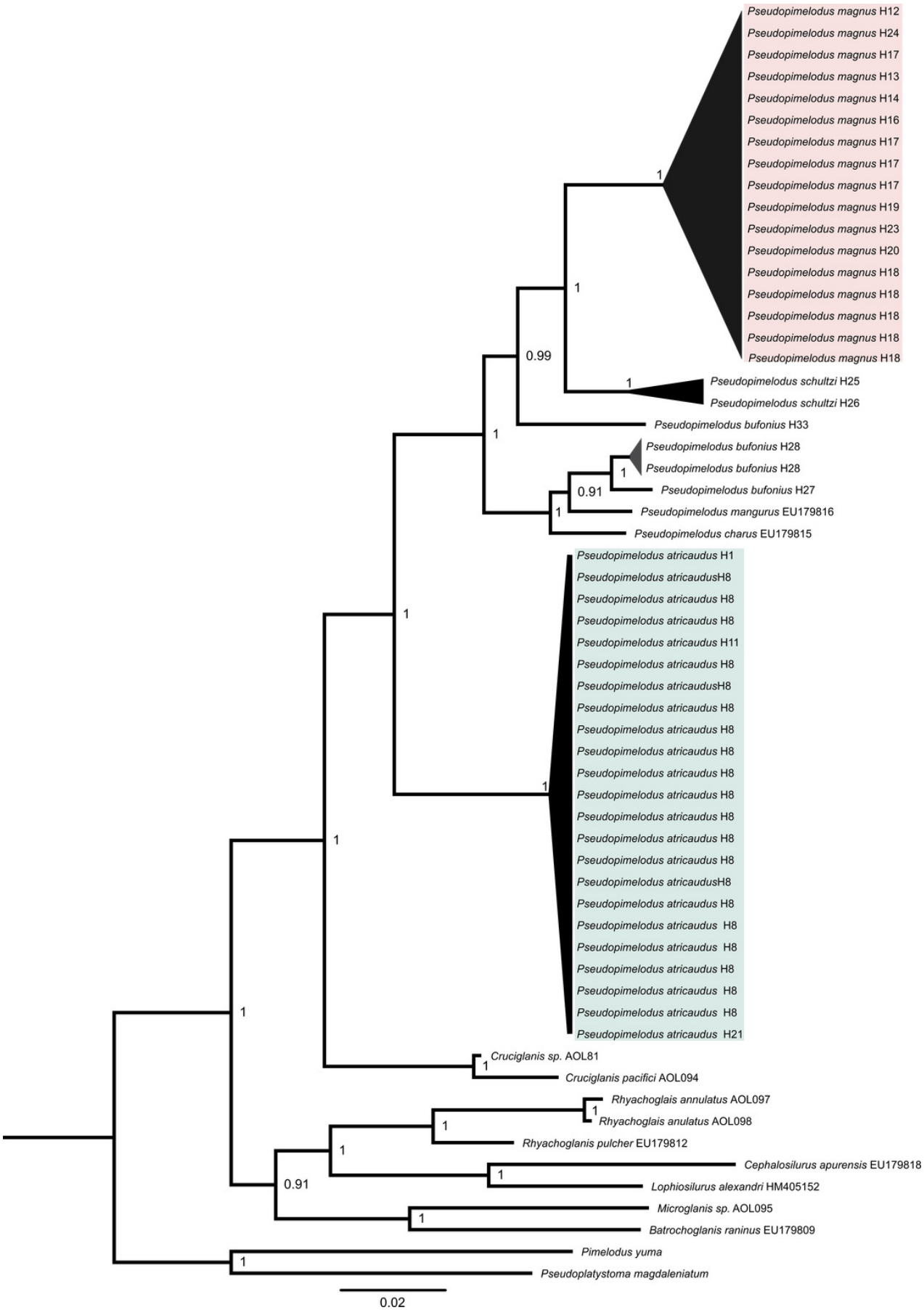
1

	Holotype	Max	Min	Mean	SD
Standard length (mm)	143.7	278.3	87.7	173	38.7
Percentages of standard length					
Head length	30.1	33.4	26.3	29.9	1.8
Pre-dorsal distance	37.5	40.6	35.2	37.6	1.5
Pre-pectoral distance	29.5	30.8	24.6	26.8	1.6
Pre-pelvic distance	52.9	59.6	51.3	54.9	2.2
Distance between pectoral-fin origin and dorsal-fin origin	23.9	27.4	21.6	24.7	1.2
Distance between pectoral-fin origin and pelvic-fin origin	25.6	37.7	25.6	32.3	2.5
Distance between dorsal-fin origin and pelvic-fin origin	25.7	30.5	21.6	26.5	2.1
Dorsal-fin base length	14.8	16.9	13.1	14.8	0.8
Distance between adipose-fin origin and pelvic-fin origin	24.8	36.8	24.1	29.1	2.4
Distance between pelvic-fin origin and anal-fin origin	23.4	30.5	21.8	24.7	1.7
Distance between anal-fin origin and adipose-fin origin	17.9	19.0	14.4	16.9	1.2
Adipose-fin base length	17.8	17.8	11.9	15.1	1.6
Anal-fin base length	11.7	13.3	9.5	10.8	0.9
Pectoral-fin base length	23.7	32.1	20.4	25.5	3.1
Pelvic-fin base length	17.2	23.3	13.4	17.6	2.2
Percentages of head length					
Orbital diameter	8.2	11.1	5.6	8.3	1.3
Snout length	36.8	40.4	20.7	30.8	4.8
Distance between maxillary barbels	45.3	56.5	42.2	48.9	3.3
Distance between anteriormost mesial point of snout and anterior nostril	9.5	16.0	6.5	10.1	2.5
Distance between maxillary barbel and eye	11.3	18.1	10.9	14.3	1.6
Distance between anterior nostrils	26.9	30.5	20.9	25.8	2.3
Distance between posterior nostrils	30.2	33.5	21.3	28.6	2.7
Distance between anterior and posterior nostrils	7.1	9.4	4.2	7.0	1.0
Distance between posterior nostril to eye	6.9	10.5	6.4	8.6	1.2
Interorbital distance	43.0	49.4	34.5	43.2	3.9
Mouth width	67.2	93.7	60.8	77.2	7.6
Distance between outer mental barbels	47.8	51.2	38.6	44.4	2.9
Distance between inner mental barbels	25.1	31.7	18.7	25.4	2.5

2

Figure 1

Bayesian phylogenetic tree based on partial sequences of COI gene, showing the phylogenetic position of *Pseudopimelodus magnus* and *P. atricaudus* within Pseudopimelodidae.


Pseudopimelodus magnus H12
Pseudopimelodus magnus H24
Pseudopimelodus magnus H17
Pseudopimelodus magnus H13
Pseudopimelodus magnus H14
Pseudopimelodus magnus H16
Pseudopimelodus magnus H17
Pseudopimelodus magnus H17
Pseudopimelodus magnus H17
Pseudopimelodus magnus H19
Pseudopimelodus magnus H23
Pseudopimelodus magnus H20
Pseudopimelodus magnus H18
Pseudopimelodus magnus H18
Pseudopimelodus magnus H18
Pseudopimelodus magnus H18
Pseudopimelodus magnus H18
Pseudopimelodus schultzi H25
Pseudopimelodus schultzi H26
Pseudopimelodus bufonius H33
Pseudopimelodus bufonius H28
Pseudopimelodus bufonius H28
Pseudopimelodus bufonius H27
Pseudopimelodus mangurus EU179816
Pseudopimelodus charus EU179815
Pseudopimelodus atricaudus H1
Pseudopimelodus atricaudusH8
Pseudopimelodus atricaudus H8
Pseudopimelodus atricaudus H8
Pseudopimelodus atricaudus H11
Pseudopimelodus atricaudus H8
Pseudopimelodus atricaudusH8
Pseudopimelodus atricaudus H8
Pseudopimelodus atricaudus H8
Pseudopimelodus atricaudus H8
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Pseudopimelodus atricaudus H8
Pseudopimelodus atricaudus H8
Pseudopimelodus atricaudus H8
Pseudopimelodus atricaudus H21
Cruciglanis sp. AOL81
Cruciglanis pacifici AOL094
Rhyachoglais annulatus AOL097
Rhyachoglais anulatus AOL098
Rhyachoglanis pulcher EU179812
Cephalosilurus apurensis EU179818
Lophiosilurus alexandri HM405152
Microglanis sp. AOL095
Batrochoglanis raninus EU179809
Pimelodus yuma
Pseudoplatystoma magdaleniatum
1
0.99
0.91
0.02

Figure 2

Pseudopimelodus magnus, holotype, CIUA 5142, 750 mm SL, Colombia, Antioquia, Magdalena River basin, Cauca River in Venecia.

a, b, c: dorsal, lateral, and ventral view, respectively. Scale bar = 5 cm. Photography: Giovany Olaya Betancur. Photographic edition: Mauricio Urrego Tobón.

a
b
c

Figure 3

Dried skeletons of *Pseudopimelodus magnus,* paratype, IMCN 8265, 213.7 mm SL (a) and *P. atricaudus,* paratype, IMCN 8266, 203.5 mm SL (b).

Scale bar = 1 cm. Photography: Anderson Cardona Ruiz. Photographic edition: Mauricio Urrego Tobón.

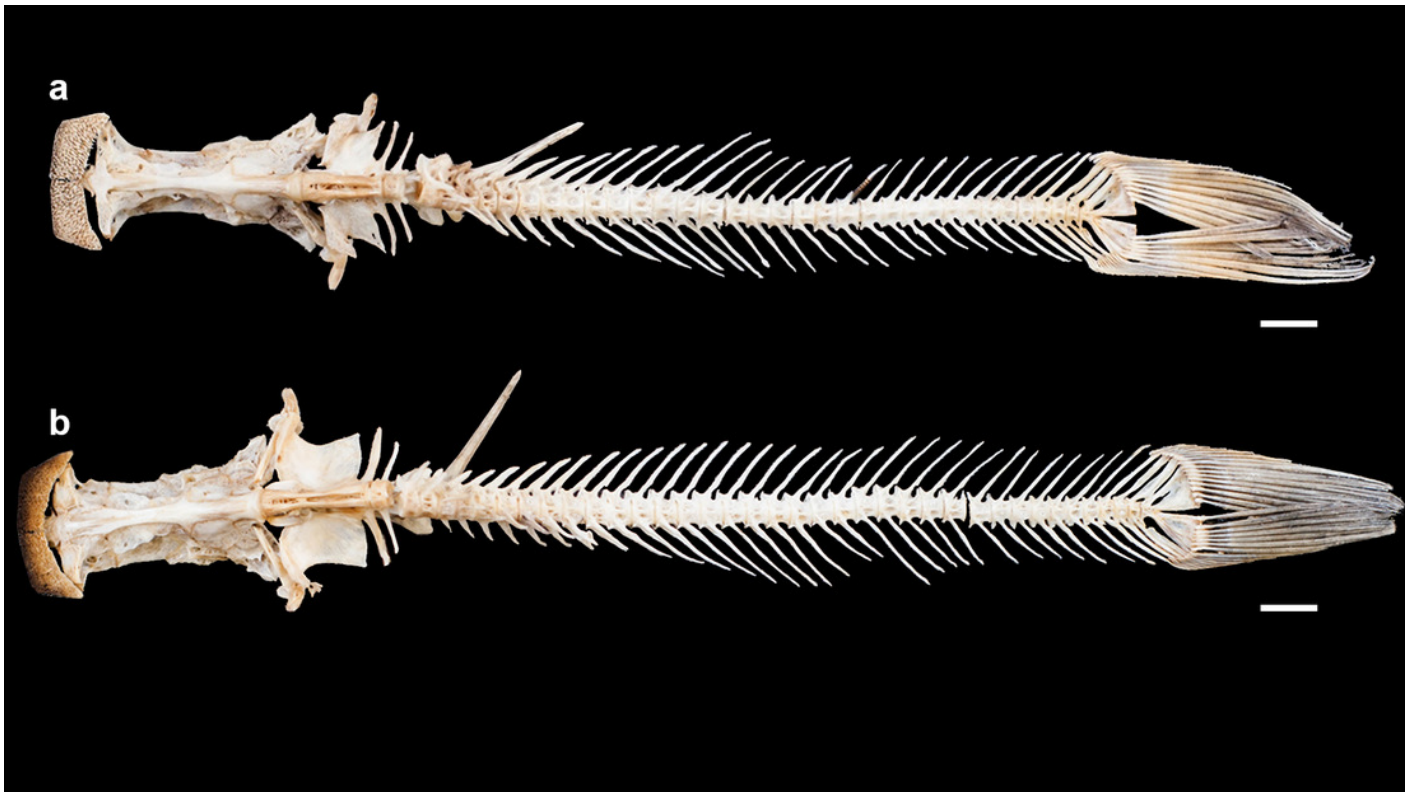


Figure 4

Neurocranium and Weberian complex in ventral view of *Pseudopimelodus magnus,* paratype, IMCN 8265, 213.7 mm SL (a) and *P. atricaudus,* paratype, IMCN 8266, 203.5 mm SL (b).

TP4: transverse process of fourth vertebra, TP5: transverse process of fifth vertebra. Scale bar: 1 cm. Photography: Anderson Cardona Ruiz. Photographic edition: Mauricio Urrego Tobón.

**Note: Auto Gamma Correction was used for the image. This only affects the reviewing manuscript. See original source image if needed for review.*

Figure 5

Neurocranium and Weberian complex in dorsal view of *Pseudopimelodus magnus,* paratype, IMCN 8265, 213.7 mm SL (a) and *P. atricaudus,* paratype, IMCN 8266, 203.5 mm SL (b).

Mes: mesethmoid; PP-SO: parieto-supraoccipital; TP4: transverse process of fourth vertebra; TP5: transverse process of fifth vertebra. Scale bar: 1 cm. Photography: Anderson Cardona Ruiz. Photographic edition: Mauricio Urrego Tobón.

**Note: Auto Gamma Correction was used for the image. This only affects the reviewing manuscript. See original source image if needed for review.*

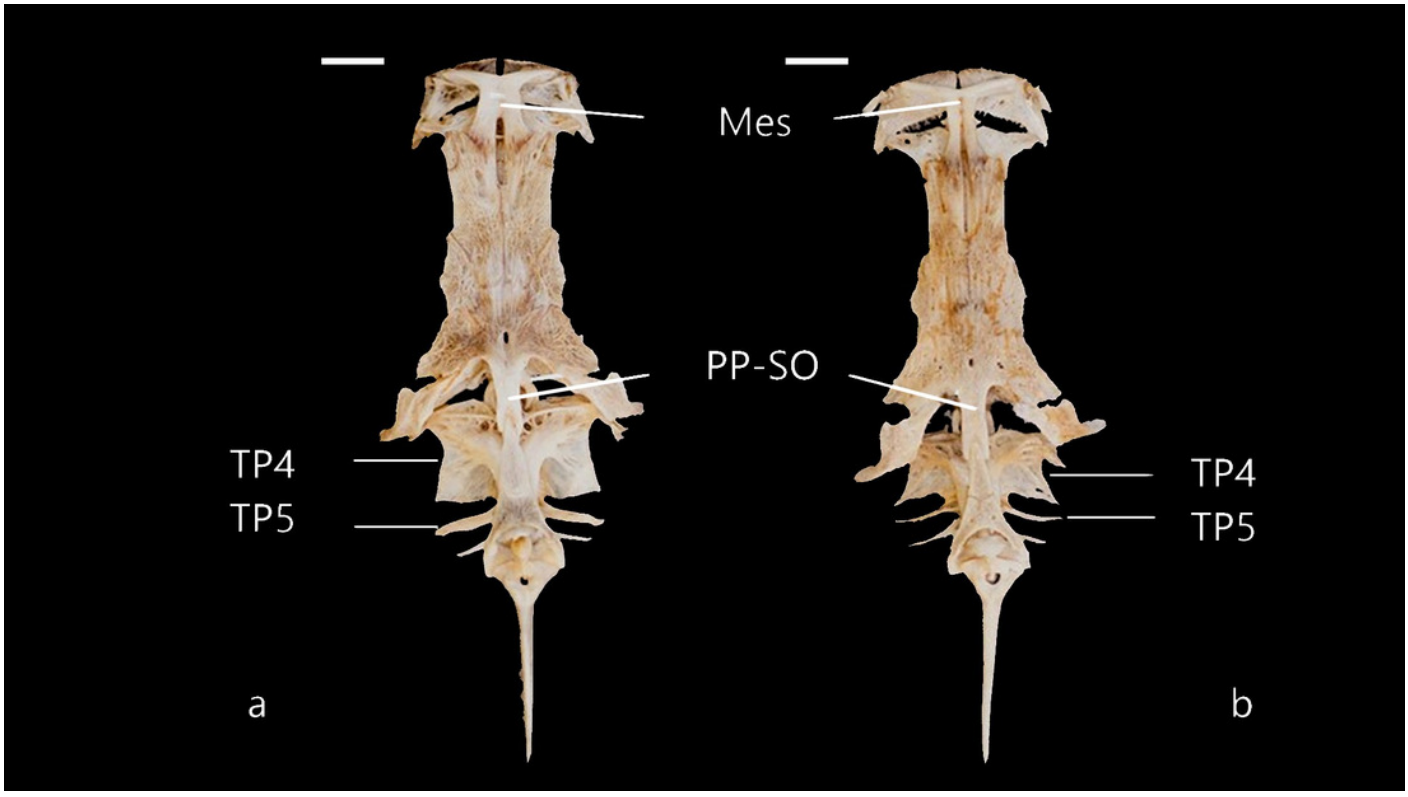


Figure 6

Gas bladder in ventral view of *Pseudopimelodus magnus*, IMCN 8939, 361 mm SL (a), *P. atricaudus*, IMCN 4196, 104.1 mm SL (b) and *P. bufonius*, Vaupés IMCN 8230, 137.4 mm SL (c).

Figure 7

Live individuals of *Pseudopimelodus magnus* from Colombia, Antioquia, Magdalena River basin, Cauca River in Venecia.

a. Specimen not collected, showing alternative coloration pattern. b. holotype. Scale bar: 5 cm. Photography: Ana M. Restrepo Gómez. Photographic edition: Mauricio Urrego Tobón.

**Note: Auto Gamma Correction was used for the image. This only affects the reviewing manuscript. See original source image if needed for review.*

Figure 8

Map of the Magdalena-Cauca River Basin showing the geographic distribution of *Pseudopimelodus magnus* (circles) and *P. atricaudus* (stars).

Red symbols denote type locality, black symbols denote additional collection sites. Map image layer by NOAA National Centers for Environmental Information (NCEI)

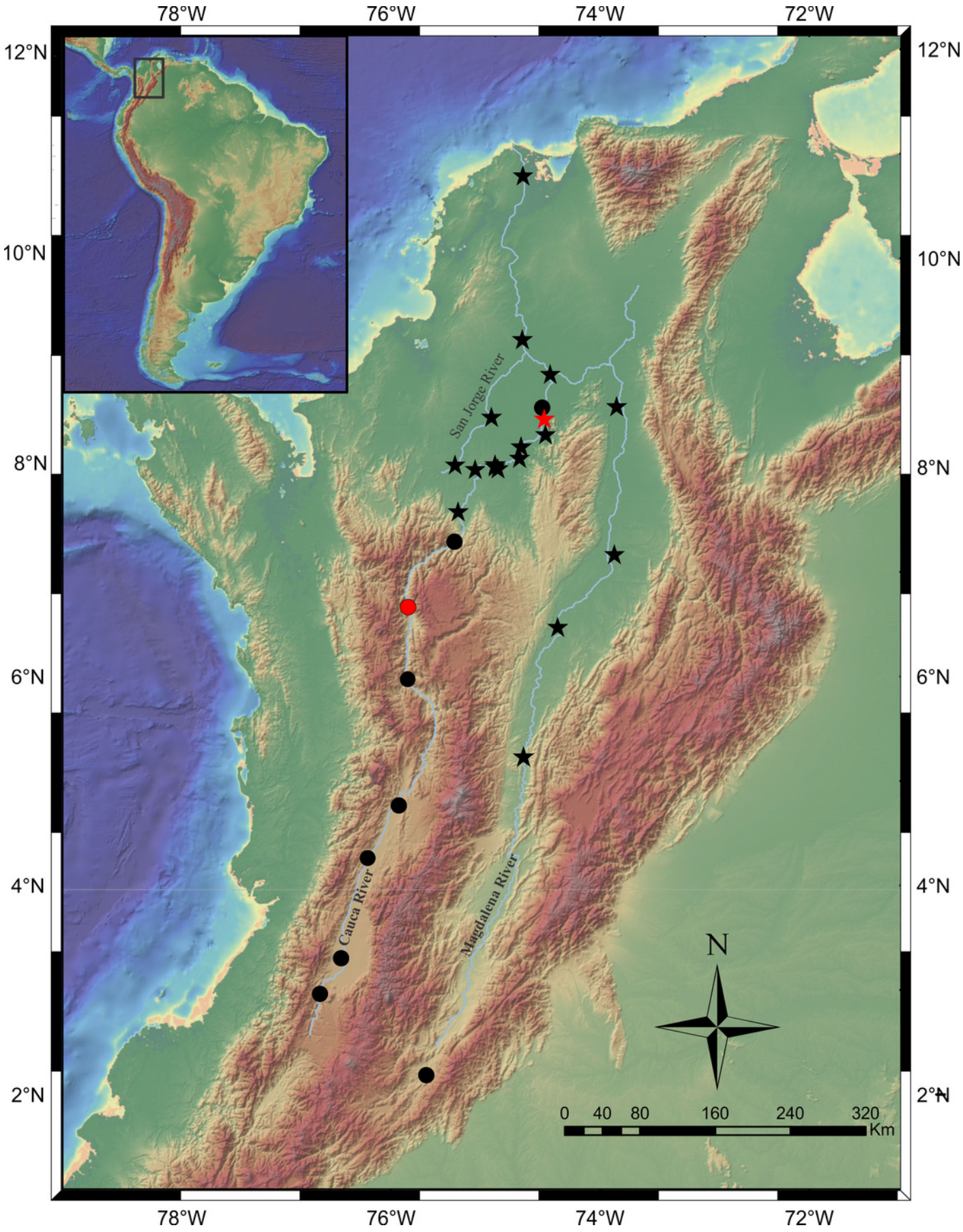

78°W
76°W
74°W
72°W
12°N
10°N
8°N
6°N
4°N
2°N
San Jorge River
Cauca River
Magdalena River
N
0 40 80 160 240 320
Km

Figure 9

Pseudopimelodus atricaudus, holotype, CIUA 5141, 143.7 mm SL, Colombia, Sucre, Magdalena River basin, Cauca River in Guaranda.

a, b, c: dorsal, lateral, and ventral view, respectively. Scale bar = 1 cm. Photography: Giovany Olaya Betancur. Photographic edition: Mauricio Urrego Tobón.

**Note: Auto Gamma Correction was used for the image. This only affects the reviewing manuscript. See original source image if needed for review.*

a
b
c

Figure 10

Dorsal-fin spine of *Pseudopimelodus magnus,* paratype, IMCN 8265, 213.7 mm SL (a) and *P. atricaudus,* paratype, IMCN 8266, 203.5 mm SL (b).

Scale bar: 1 cm. Photography: Anderson Cardona Ruiz. Photographic edition: Mauricio Urrego Tobón.

**Note: Auto Gamma Correction was used for the image. This only affects the reviewing manuscript. See original source image if needed for review.*

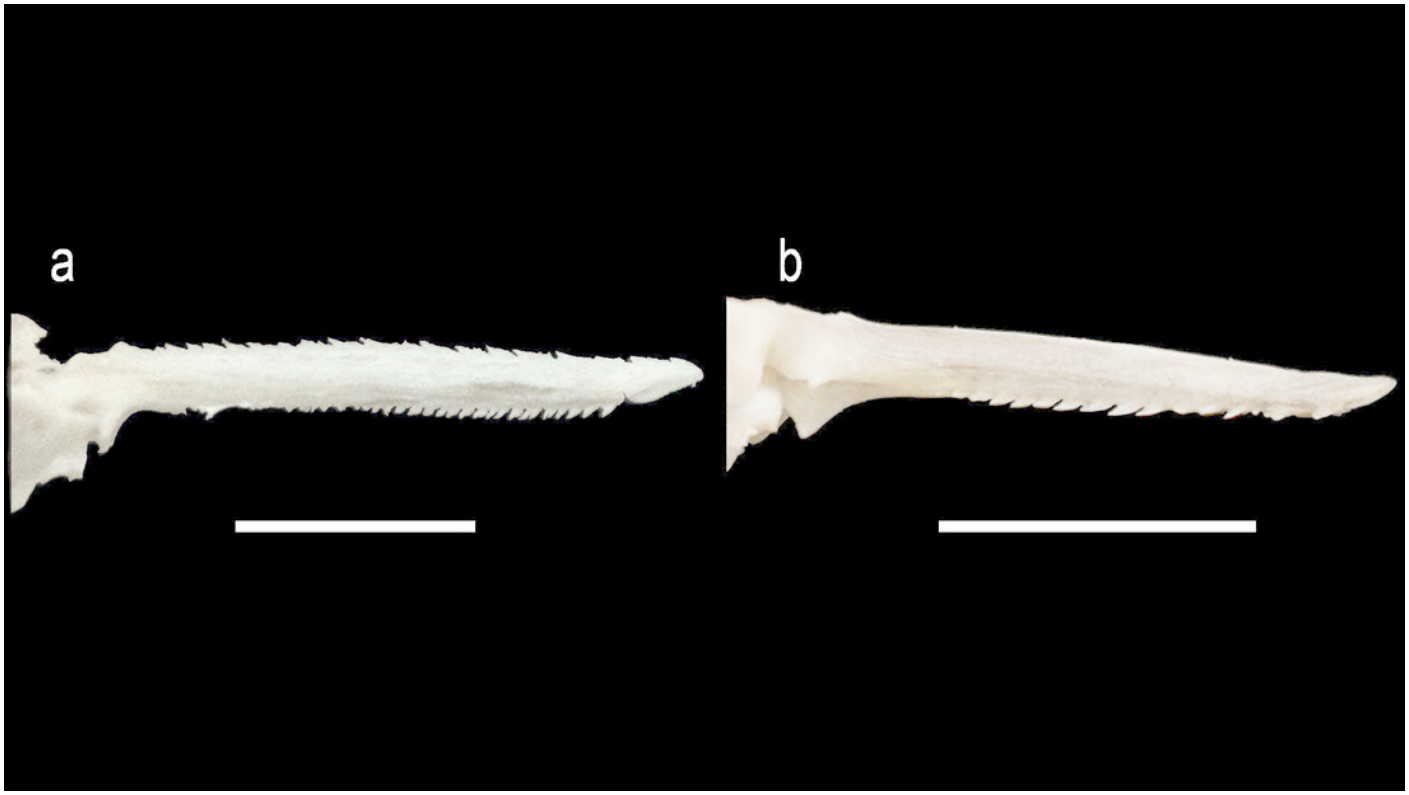
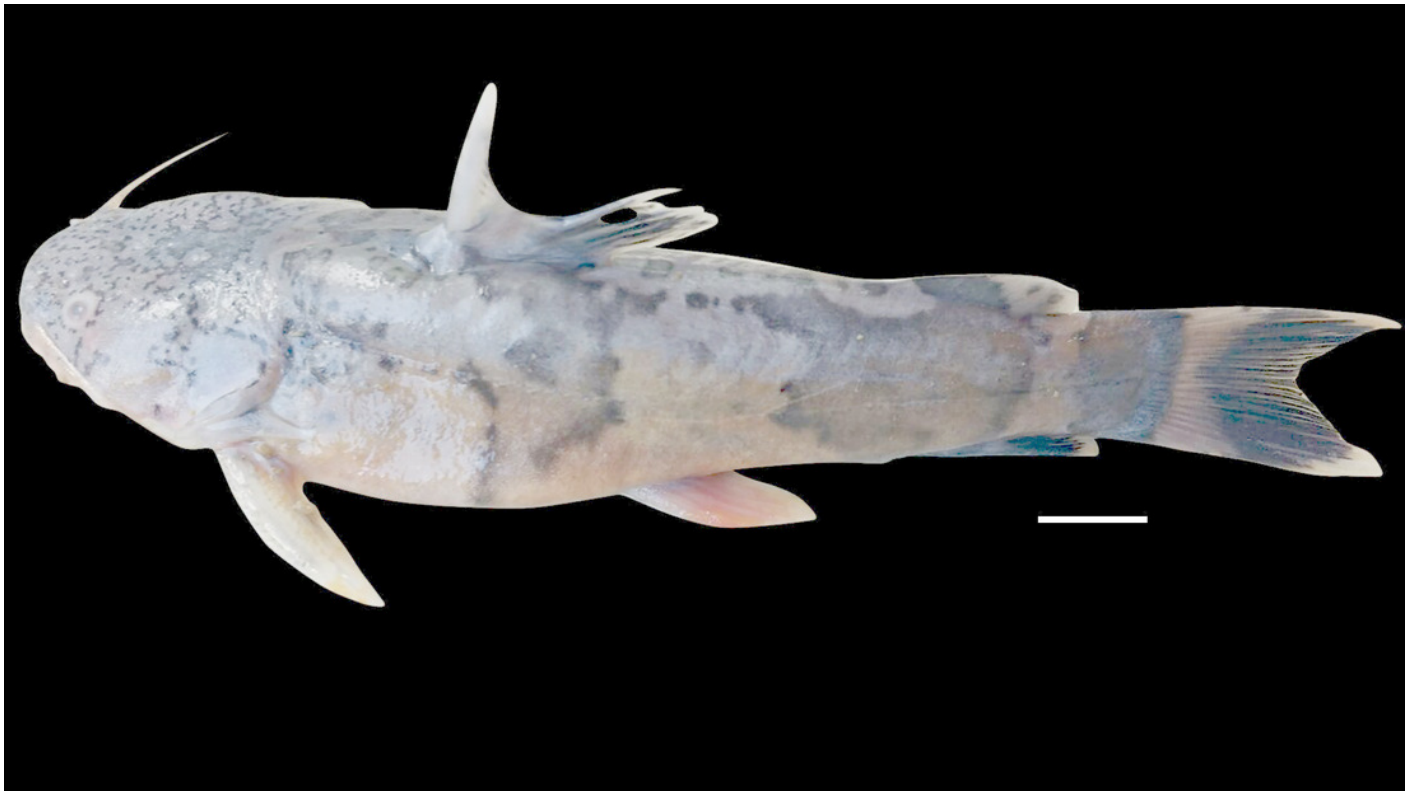


Figure 11

Juvenile live individual of *Pseudopimelodus atricaudus* (not collected) from Colombia, Sucre, Cauca River in Guaranda.

Scale bar: 1 cm. Photography: Ana M. Restrepo Gómez. Photographic edition: Mauricio Urrego Tobón.

**Note: Auto Gamma Correction was used for the image. This only affects the reviewing manuscript. See original source image if needed for review.*