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Delturinae, a new loricariid catfish subfamily (Teleostei, Siluriformes), with revisions of *Delturus* and *Hemipsilichthys*

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A new subfamily, Delturinae, is described to accommodate the loricariid catfish genera *Delturus* Egenmann & Eigenmann, 1889 and *Hemipsilichthys* Eigenmann & Eigenmann, 1889, a clade recently demonstrated to be the sister group of all remaining loricariids except *Lithogenes*. The genus *Hemipsilichthys* is restricted to three species, *H. gobio* (Lütken, 1874), its sister species *H. papillatus* Pereira *et al*., 2000, and *H. nimius* Pereira *et al*., 2003. Relationships among species of *Delturus* were not resolved and a new species, *D. brevis*, is described from the Rio Jequitinhonha basin in eastern Brazil. The geographical distribution of Delturinae, exclusively on the south-eastern Brazilian Shield, indicates that south-eastern Brazil acts as either a refugium for basal loricariid taxa or a point of origin for the Loricariidae. Lectotypes are designated for *D. parahybae* Eigenmann & Eigenmann, 1889 and *Plecostomus angulicauda* Steindachner, 1877. Keys are presented for subfamilies of Loricariidae and for genera and species of Delturinae. Diagnoses are provided for all delturine clades and species. © 2006 The Linnean Society of London, *Zoological Journal of the Linnean Society*, 2006, **147**, 277–299.

ADDITIONAL KEYWORDS: Loricariidae – Loricarioidei – South America – systematics – taxonomy.

INTRODUCTION

Loricariidae is the largest catfish family, with 673 species currently recognized (Reis, Kullander & Ferraris, 2003). Traditionally, the Loricariidae has been divided into several subfamilies. However, the classification of genera in subfamilies has not been stable. Instability has been caused by both the finding of previously undetected diversity in the family and the advent of phylogenetic analysis. Regan (1904) settled a subfamily level classification for the loricariids (then with 189 species) that served as a basis for modern classifications. He recognized the subfamilies Plecostominae [most similar to Armbruster's (2004) recent definition of Hypostominae, plus *Delturus* Eigenmann & Eigenmann, 1889 and *Hemipsilichthys* Eigenmann & Eigenmann, 1889]; Hypoptopomatinae, Loricariinae, Neoplecostominae (including only *Neoplecostomus* Eigenmann & Eigenmann, 1888), and Argiinae, which included the species presently assigned to the family Astroblepidae.

Gosline (1947), in light of the *c*. 400 loricariid species then known, recognized the subfamilies Astroblepinae (including species of *Astroblepus* Humboldt, 1805, formerly *Arges* Valenciennes, 1840), Lithogeneinae (including *Lithogenes villosus* Eigenmann, 1909, which he considered as intermediate between *Astroblepus* and *Neoplecostomus*), Neoplecostominae, Plecostominae, Hypoptopomatinae, and Loricariinae. Contrary to previous classifications, Gosline's Neoplecostominae included *Upsilodus* Miranda Ribeiro, 1924, *Hemipsilichthys*, *Pareiorhaphis* Miranda Ribeiro, 1918, *Pareiorhina* Gosline, 1947; *Kronichthys* Miranda Ribeiro, 1908, *Corymbophanes* Eigenmann, 1909, *Delturus*, *Rhinelepis* Agassiz, 1829, *Canthopomus* Eigenmann, 1910, *Pogo-*

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nopoma Regan, 1904; and *Pogonopomoides* Gosline, 1947, as well as *Neoplecostomus*.

Isbrücker (1980) arranged the 600 species then in the Loricariidae into six subfamilies. Isbrücker's classification included the subfamilies Lithogeneinae for *Lithogenes villosus*, Neoplecostominae in Regan's sense for *Neoplecostomus* alone, Hypostominae, including *Delturus* and *Hemipsilichthys*, Ancistrinae, Hypoptopomatinae, and Loricariinae. Some of those subfamilies were further subdivided into tribes and subtribes. Howes (1983), in a detailed study of cranial muscles of loricarioid catfishes, presented the first phylogenetically based classification for the loricariids, recognizing the subfamilies Lithogeneinae, Neoplecostominae, Chaetostominae, Loricariinae, Hypoptopomatinae, and Hypostominae. In his analysis, however, Howes (1983) examined a limited number of loricariid taxa. Schaefer (1987), in a more encompassing phylogenetic analysis of the Loricariidae, retained Isbrücker's classification, despite his finding that recognition of the Ancistrinae made the Hypostominae paraphyletic.

Armbruster (2004) presented another phylogenetically based classification for the subfamilies of the Loricariidae, including the Loricariinae, Hypoptopomatinae, Neoplecostominae, and Hypostominae (Fig. 1). Hypostominae was further divided into five tribes, including the Ancistrini for Isbrücker's (1980) Ancistrinae. The Neoplecostominae, although not positively demonstrated as monophyletic, was defined to include most species currently assigned to *Hemipsilichthys*, *Isbrueckerichthys* Derijst, 1996, *Kronichthys*, *Neoplecostomus*, and *Pareiorhina*. Neoplecostominae was provisionally maintained by Armbruster (2004) because two of us (EHLP and RER) are engaged in a study that will examine the relationships of these genera to each other and to the Hypoptopomatinae. In addition, Armbruster found that *D. angulicauda* and *H. gobio* (identified as *Upsilodus victori* Miranda Ribeiro, 1924) form a monophyletic group, sister to all other loricariids except *Lithogenes*, and he suggested that a new subfamily should be described for *Delturus* + *Hemipsilichthys*. He did not formally implement that suggestion.

The basal position of *H. gobio* was first discovered by Montoya-Burgos *et al*. (1998) using 12S and 16S rRNA gene sequence data. Later, Montoya-Burgos (2001) demonstrated that 12S and 16S rRNA also suggest that *D. carinotus* and *H. gobio* form a sister clade to all other loricariids except *Lithogenes*. With molecular and morphological data in concordance, it is necessary now to describe the Delturinae as a new subfamily of the Loricariidae, and one that occupies a basal position in the family.

Many species have been described in *Hemipsilichthys* (see Pereira & Reis, 2002), but it is now clear from both morphological (Armbruster, 2004) and molecular data (Montoya-Burgos *et al*., 1998) that *Hemipsilichthys* is a polyphyletic taxon. In this paper, we describe Delturinae as a new subfamily for the species of *Delturus* plus three species of *Hemipsilichthys*, *H. gobio*, *H. papillatus* Pereira, Oliveira & Oyakawa, 2000, and *H. nimius* Pereira *et al*., 2003. In addition, we present a taxonomic revision of the species included in the new subfamily. The generic assignment of the remaining species currently in *Hemipsilichthys* is uncertain and will be dealt with in a future paper.

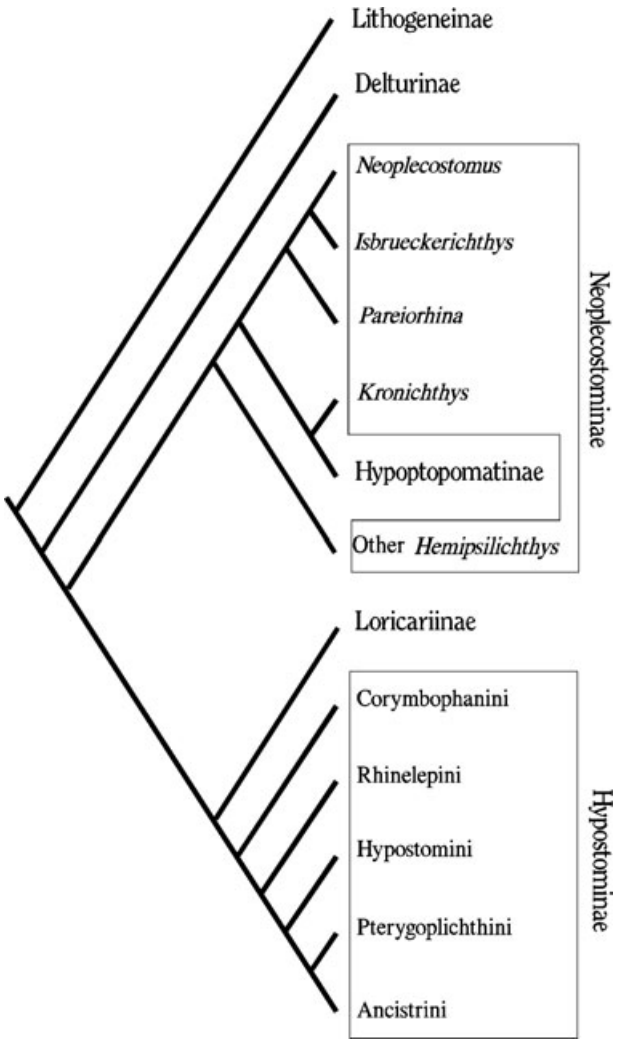

Figure 1. Phylogenetic interrelationships of the Loricariidae modified from Armbruster (2004).

MATERIAL AND METHODS

The specimens examined belonged to the following institutions: FMNH, Field Museum of Natural History, Chicago, USA; MCP, Museu de Ciências e

Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil; MCZ, Museum of Comparative Zoology, Cambridge, UK; MNRJ, Museu Nacional, Rio de Janeiro, Brazil; MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil; NMW, Naturhistorisches Museum, Vienna, Austria; UFJF, Universidade Federal de Juiz de Fora, Juiz de Fora, Brazil; USNM, National Museum of Natural History, Smithsonian Institution, Washington, USA.

Counts and measurements follow Boeseman (1968). Additional measurements include: (1) postdorsal length, measured from the end of the dorsal-fin base to the posterior hypural margin; (2) anal-fin spine length; (3) upper unbranched caudal-fin ray; (4) lower unbranched caudal-fin ray; (5) body depth at dorsal-fin origin; (6) caudal peduncle length, measured from the origin of the anal fin to the posterior hypural margin; (7) caudal peduncle width, taken at the point of least depth; (8) mandibular ramus, measured by pressing the callipers on the long axis of the dentary bone (presented as the average of left and right dentaries); (9) plates between adipose and caudal fins, counted from the last preadipose plate to the last plate in the dorsal plate series; (10) plates bordering the dorsal fin, the number of lateral plates along the dorsal-fin base; and (11) plates between anal and caudal fins, counted from the insertion of the last anal-fin branched ray to the last plate in the ventral plate series. All measurements are straight lines taken with digital callipers. Standard length (SL) is expressed in mm. All other measurements are expressed as a percentage of SL, except subunits of the head, which are expressed as a percentage of head length (HL). Nomenclature of the lateral dermal plates series follows Schaefer (1997). All specimens were cleared and double-stained according to the procedures of Taylor & Van Dyke (1985).

All characteristics described by Armbruster (2004) for the clade *D. angulicauda* and *H. gobio* were examined in all remaining Delturinae, in order to assess the exact distribution of these features. Numeric codes presented with characters in the diagnoses correspond to characters discussed by Armbruster (2004).

Delturinae, Armbruster, Reis & Pereira, new subfamily

Genera included: Delturus Eigenmann & Eigenmann, 1889 and *Hemipsilichthys* Eigenmann & Eigenmann, 1889.

Type genus: Delturus Eigenmann & Eigenmann, 1889.

Diagnosis: Delturinae is diagnosed by two uniquely derived synapomorphies (from Armbruster, 2004), not seen in any other loricariid and not reversed in any known member of the subfamily: (1) pterotic-supracleithrum with a long, thin, dorsomesial process that originates just ventral to where the hyomandibula contacts the pterotic-supracleithrum (character 115–1); and (2) anteromesial processes of pelvic basipterygium absent (character 170–1).

The following characters are also hypothesized as synapomorphic transitions for the Delturinae, but are shared with a number of other loricariid subgroups: (1) interhyal bone large, almost rectangular (a reversal, character 27–0, shared with *Astroblepus*, the Loricariinae, *Chaetostoma*, *Cordylancistrus*, *Dolichancistrus*, *Leptoancistrus*, and *Pseudolithoxus*); (2)

Key to subfamilies of the Loricariidae

1a. Lateral and dorsal plates anterior to the dorsal fin absent ..... Lithogeneinae
1b. Lateral plates anterior to the dorsal fin always present (predorsal plates absent in *Pareioraphis nudula*) 2
2a. Ventral surface of the pectoral girdle exposed (i.e. supporting odontodes) mesial to the coracoid strut ..... Hypoptopomatinae
2b. Ventral surface of the pectoral girdle covered in skin or plates mesial to the coracoid strut (coracoid strut may be exposed; plates may cover the pectoral girdle, but odontodes are supported by the plates and not the girdle) 3
3a. Caudal peduncle dorsoventrally flattened; adipose fin absent ..... Loricariinae
3b. Caudal peduncle not dorsoventrally flattened; oval, round, or triangular in cross-section; adipose fin rarely absent 4
4a. Postdorsal ridge formed from several azygous preadipose plates. Teeth almost symmetrically bifid ..... Delturinae
4b. Postdorsal ridge usually absent. Teeth asymmetrical or unicuspid 5
5a. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional ..... Hypostominae
5b. Dorsal-fin spinelet rectangular or absent, dorsal-fin spine lock not functional ..... Neoplecostominae

interhyal bone located well above the ventral margin of the hyomandibula (character 28–1, shared with *Lithogenes* and the Loricariinae); (3) quadrate very wide, nearly as wide as long (character 64–2, shared with *Otocinclus* and *Pseudorinelepis*); (4) quadrate with a small flap extending ventrally to symplectic foramen (character 66–1, shared with the clade Hypostomini, Pterygoplichthyini, and Ancistrini); (5) small sesamoid ossification mesial to the preopercle and connected by a ligament to the opercle and angulo-articular (character 73–1, shared with *Lithogenes* and *Pogonopoma*); (6) rib of sixth vertebral centrum flared distally so that its tip is much wider than its shaft (character 128–1, shared with *Neoplecostomus*, *Otocinclus*, *Acanthicus*, *Megalancistrus*, *Lasiancistrus*, *Lithoxus*, *Neblinichthys*, and *Pseudancistrus*); (7) nuchal plate entirely covered by plates or thick skin (character 147–1, shared with *Chaetostoma*, *Cordylancistrus*, *Dolichancistrus*, *Leptoancistrus*); (8) anterolateral processes of pelvic basipterygium straight (character 167–2, shared with *Pogonopoma* and a number of Ancistrini genera); (9) nuptial males with hypertrophied odontodes on cheeks (character 183–1, shared with *Isbrueckerichthys*, *Pareiorhaphis*, and some Loricariinae as *Ixinandria*, *Rineloricaria*, *Sturisoma*, and *Sturisomatichthys*); (10) nuptial males with hypertrophied odontodes on snout, anterior to cheek plates (character 188–1, shared with *Isbrueckerichthys*, *Pareiorhaphis*, some Loricariinae as *Ixinandria*, *Rineloricaria*, *Sturisoma*, and *Sturisomatichthys*, *Pseudorinelepis*, and a number of Ancistrini genera); (11) postdorsal ridge formed by raised, median, azygous plates between dorsal and adipose fins (character 192–1, shared with *Corymbophanes* and *Leptoancistrus*); (12) five transverse rows of plates on the least deep part of the caudal peduncle (character 196–3, shared with *Isbrueckerichthys*, some *Pareiorhaphis*, and Hypostominae except *Corymbophanes*).

Three other characteristics found by Armbruster (2004) to diagnose *Delturus* are also present in *H. nimius* but are absent in *H. gobio* and *H. papillatus*. These traits are ambiguous, and may either be synapomorphies for Delturinae reversed in the ancestor of *H. gobio* plus *H. papillatus*, or convergent for *Delturus* on the one hand, and for *H. nimius* on the other. Pending further resolution of that question, the characters are here included as tentative synapomorphies for Delturinae: (1) dorsal fin with supranumerary branched rays (eight to ten in *Delturus* and seven to nine in *H. nimius*) (character 142–1, shared with *Pterygoplichthys*, and a number of Ancistrini); (2) dorsal-fin spinelet V-shaped (a reversal, character 148–0, shared with Hypostominae); and (3) dorsal-fin membrane extended posteriorly (character 143–1, shared with *Spectracanthicus* and *Parancistrus*; contrary to the situation in *Delturus*; however, in *H. nimius* the membrane never contacts the first preadipose plate).

On the basis of external morphology, a member of the Delturinae can easily be identified by the combination of two characters: (1) a high preadipose keel, formed by the azygous preadipose plates, and (2) jaw teeth almost symmetrically bifid (Fig. 2). These two traits in combination are not seen in any nondelturine loricariid.

HEMIPSILICHTHYS EIGENMANN & EIGENMANN

Xenomystus Lütken (1874): 217 (type species: *Xenomystus gobio* Lütken, 1874 by original designation. Name preoccupied in fishes by *Xenomystus* Günther, 1868 as a subgenus of *Notopterus*).

Hemipsilichthys Eigenmann & Eigenmann, 1889: 46 (type species: *Xenomystus gobio* Lütken, 1874; name in substitution to *Xenomystus* Lütken, 1874).

Upsilodus Miranda Ribeiro, 1924: 365 (type species: *Upsilodus victori* Miranda Ribeiro, 1924 by monotypy).

Diagnosis: No uniquely derived features were found to diagnose *Hemipsilichthys*. The following features are derived for *Hemipsilichthys* but are shared with a number of other loricariid groups: (1) anterior and posterior edges of hyohyal bone concave, making it spindle-shaped (character 21–0); (2) some of the bifid neural spines under the dorsal fin are perforated above the spinal cord (character 126–1); (3) adductor fossa of the pectoral girdle displaced laterally by the development of anterior and posterior rims of the fossa

KEY TO GENERA OF DELTURINAE

1. Adults with body strong and massive, usually attaining large sizes around 200 mm SL (but *D. brevis* smaller); eye large (orbital diameter 18.0–24.5% HL); dorsal-fin membrane extended posteriorly and contacting first preadipose plate ..... *Delturus*
1′. Adults with body slender and elongate, usually attaining sizes smaller than 100 mm SL; eye small (orbital diameter 8.6–16.9% HL); dorsal-fin membrane not or slightly extended posteriorly but never in contact with first preadipose plate ..... *Hemipsilichthys*

(character 152–1); and (4) ventral ridge of the pelvic basipterygium tall (a reversion, character 172–0).

In addition, *Hemipsilichthys* can be easily recognized by the combination of a high preadipose keel, formed by the azygous preadipose plates, almost symmetrically bifid teeth (Fig. 2) on premaxilla and dentary, small eye (orbital diameter 8.6–16.9% HL), and dorsal-fin membrane not or slightly extended posteriorly but never in contact with the first preadipose plate.

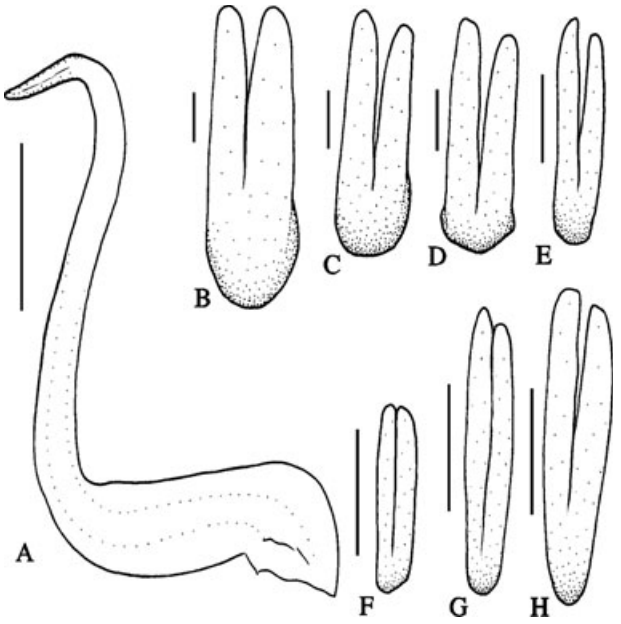

Figure 2. Teeth of the Delturinae. A, right premaxilary tooth of *Delturus angulicauda*, USNM 318180, lateral view. Scale bar 1 mm. B–H, dorsal view of right premaxillary tooth crown. B, *D. parahybae*, MCZ 7726. C, *D. angulicauda*, USNM 318180. D, *D. carinotus*, MCP 28039. E, *D. brevis*, MZUSP 69858. F, *Hemipsilichthys papillatus*, MCP 21423. G, *H. nimius*, MCP 31990. H, *H. gobio*, MCP 19780. Scale bar 250 μm.

Clade *Hemipsilichthys gobio* + *Hemipsilichthys papillatus*

Diagnosis: Three of the characteristics described for *H. gobio* by Armbruster (2004) were also found in *H. papillatus*, and constitute synapomorphies for these two species: (1) 16–20 vertebrae from first normal neural spine (without bifid neural spine) behind dorsal fin up to hypural plate (a reversal, character 121–0); (2) distal margin of transverse process of Weberian apparatus pointed (character 132–1); and (3) posterior cleithral process reduced in size (character 157–1). In addition, Pereira *et al*. (2000) described two unique and unreversed synapomorphies for these two species: (1) anal fin of nuptial females much longer than in males; and (2) papillae in upper lip fused to form four or five transverse, elongate skin folds.

Hemipsilichthys gobio (Lütken) (Fig. 4)

Xenomystus gobio Lütken, 1874: 217, pl. 4 (type locality: originally unknown. Restricted herein to the Rio Paraíba do Sul, south-eastern Brazil).

Upsilodus victori Miranda Ribeiro, 1924: 366 [type locality: in Paquequer at Therezopolis, Rio de Janeiro (Rio Paquequer, a tributary of the Rio Paraíba do Sul)].

Specimens examined: Brazil: Holotype of *Xenomystus gobio*: ZMUC 76 (121.2 mm SL), male, South America. Lectotype of *Upsilodus victori*: MNRJ 639 (101.4 mm SL), male, Rio Paquequer, Teresópolis, Rio de Janeiro. Paralectotype of *Upsilodus victori*: MNRJ 646 (108.3 mm SL) Rio Paquequer, Teresópolis, Rio de Janeiro. Other specimens: MNRJ 13654 (3 + 1 cleared and stained, 60.3–88.7 mm SL) Rio dos Frades, near mouth of Córrego da Chácara, Teresópolis, Rio de Janeiro (22°17′27′S 42°50′48′W), 27 July 1995. MCP 19780 (13, 36.7–123.9 mm SL) and MHNG 2587–31 (4, 45.0–108.4 mm SL) Arroio Macaquinho, tributary of Rio Paraitinga *c*. 5 km of Bairro dos Macacos, Silveiras, São Paulo (22°50′47′S 44°50′30′W), 16 January 1997. UFJF 0362 (21, 104.8–131.8 mm SL) Ribeirão

Key to species of *Hemipsilichthys*

1. Dorsal series of plates reduced, with no plates between dorsal-fin origin and the end of the adipose fin; eye comparatively smaller (orbital diameter 8.6–11.8% HL); dorsal-fin spinelet absent..... .....*Hemipsilichthys papillatus* (Rio Preto basin, Rio Paraíba do Sul drainage)
1′. Dorsal series of plates complete, with plates between head and caudal peduncle; eye comparatively larger (orbital diameter 12.0–16.9% HL); dorsal-fin spinelet present 2
2. Dorsal fin with seven branched rays; papillae in upper lip forming transversely elongate skin folds; eye comparatively smaller (orbital diameter 12.0–14.7% HL); dorsal-fin spinelet rectangular or oval-shaped (Fig. 3)..... *Hemipsilichthys gobio* (Rio Paraíba do Sul basin)
2′. Dorsal fin with eight (rarely seven or nine) branched rays; papillae in upper lip transversely elongate but not fused to form skin folds; eye comparatively larger (orbital diameter 15.3–16.9% HL); dorsal-fin spinelet V-shaped (Fig. 3).....*Hemipsilichthys nimius* (Rio Perequê-Açu and Taquari basins)

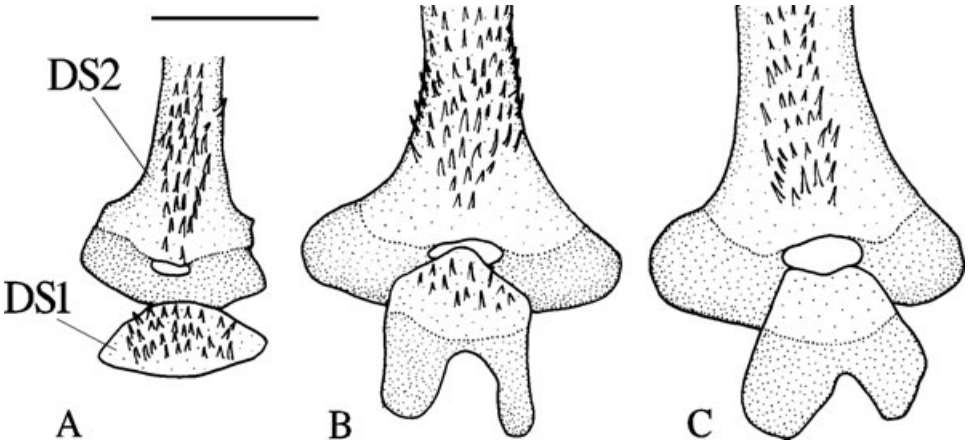

Figure 3. Dorsal-fin spinelet of the Delturinae. A, *Hemipsilichthys gobio*, MCP 19780. B, *H. nimius*, MCP 31990. C, *Delturus brevis*, MZUSP 69858. Scale bar 2 mm. DS1, first dorsal-fin spine or spinelet; DS2, second dorsal-fin spine.

Santana, tributary of Rio Preto, Rio Preto, Minas Gerais, 22 July 1997.

Diagnosis: Hemipsilichthys gobio can be distinguished from *H. nimius* and *H. papillatus* by its rectangular or oval-shaped dorsal-fin spinelet (Fig. 3) (vs. V-shaped in *H. nimius* and absent in *H. papillatus*), and by the intermediate orbital diameter (12.0–14.7% HL vs. 8.6–11.8% in *H. papillatus* and 15.3–16.9% in *H. nimius*).

Description: This species was recently described and illustrated by Pereira & Reis (2002) and the description will not be repeated here. Morphometric data, however, are presented in Table 1 for comparative purposes.

Table 1. Descriptive morphometrics of *Hemipsilichthys* species. Values are given as ranges for all measured specimens. Standard length is expressed in mm; measurements 1–17 are percentages of standard length; measurements 18–22 are percentages of head length

Character	*papillatus* (n = 15)	*gobio* (n = 13)	*nimius* (n = 12)
Standard length (mm)	47.8–91.8	45.3–123.9	55.6–105.1
1 Head length	31.2–36.2	29.7–37.5	30.4–33.6
2 Predorsal length	42.8–45.7	41.6–47.2	42.3–45.4
3 Postdorsal length	39.0–43.4	41.6–45.3	33.1–37.2
4 Dorsal-fin spine length	15.9–19.7	16.9–20.4	17.8–21.4
5 Anal-fin spine length (male)	12.7–17.1	14.0–17.6	6.4–10.5
6 Anal-fin spine length (female)	20.8–31.2	29.0–29.8	11.1–12.7
7 Pectoral-fin spine length	19.5–23.7	19.6–23.6	13.3–17.1
8 Pelvic-fin spine length	16.1–20.8	17.1–22.1	15.4–19.4
9 Upper unbranched caudal ray	16.9–22.3	17.0–23.6	14.7–19.6
10 Lower unbranched caudal ray	18.5–26.3	19.5–27.5	16.7–20.9
11 Trunk length	17.9–20.0	17.1–20.0	17.6–18.9
12 Abdominal length	21.6–25.3	20.8–25.9	21.0–27.2
13 Cleithral width	29.7–32.9	26.7–29.7	30.9–33.2
14 Body depth at dorsal origin	14.5–18.8	17.2–23.8	19.1–22.0
15 Caudal peduncle length	31.0–35.5	33.6–38.3	34.7–38.2
16 Caudal peduncle depth	7.0–8.2	7.5–9.0	9.3–11.3
17 Caudal peduncle width	3.0–4.3	4.7–5.5	4.3–5.7
18 Snout length	66.0–73.9	61.3–68.1	62.4–70.1
19 Orbital diameter	8.6–11.8	12.0–14.7	15.3–16.9
20 Least interorbital width	26.7–31.1	22.9–27.7	25.4–28.2
21 Head depth	42.0–49.3	48.2–67.8	56.1–62.5
22 Mandibular ramus	24.3–28.7	17.6–25.6	20.3–27.9

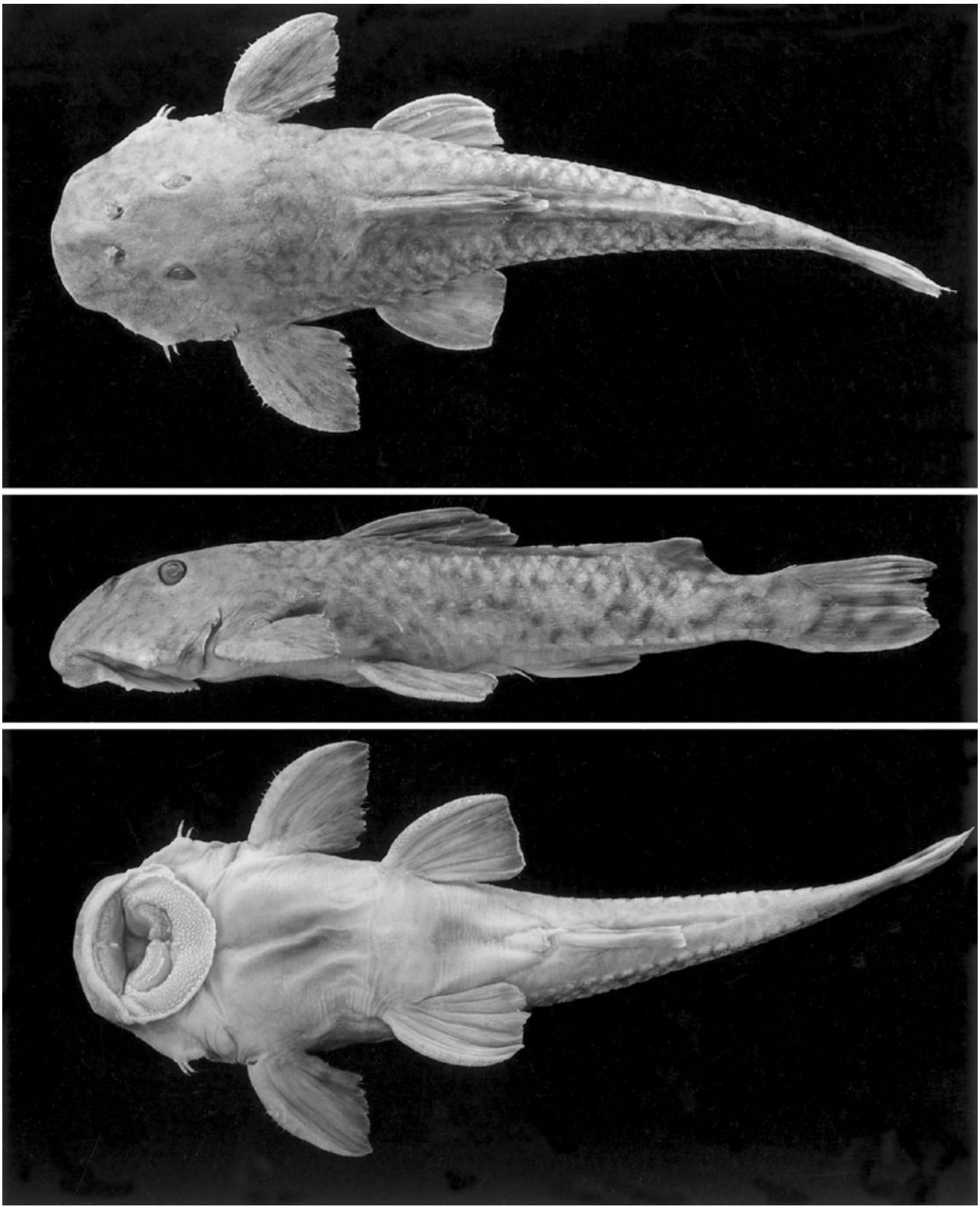

Figure 4. *Hemipsilichthys gobio*, UFJF 0362, 111.6 mm standard length, male, Ribeirão Santana, Rio Paraíba do Sul drainage, Minas Gerais.

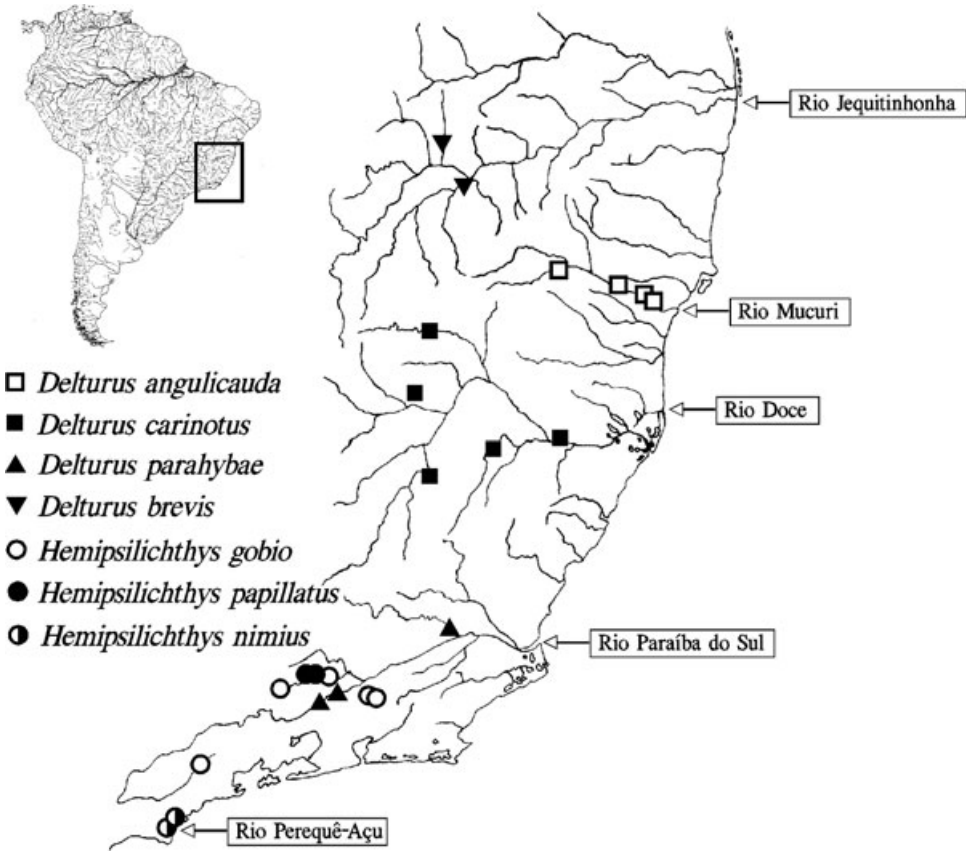

Figure 5. Geographical distribution of the species of *Delturus* and *Hemipsilichthys* in south-eastern Brazil.

Distribution: Hemipsilichthys gobio is known from several localities in the Rio Paraíba do Sul basin, in the states of São Paulo, Rio de Janeiro, and Minas Gerais, Brazil (Fig. 5).

Ecology: Found in small rivers, with clear water, moderate to strong current, and a substrate of rocks, loose stones and gravel.

Remarks: The type locality of *Xenomystus gobio* was not cited in the original description. Eigenmann & Eigenmann (1889) described the genus *Hemipsilichthys* for *Xenomystus gobio* and included one specimen from the Rio Paraíba do Sul basin. All known specimens collected so far are also from that basin, and it is probable that the holotype is from the Rio Paraíba do Sul drainage. For this reason, we herein restrict its type locality to the Rio Paraíba do Sul.

HEMIPSILICHTHYS PAPILLATUS PEREIRA, OLIVEIRA & OYAKAWA (FIG. 6)

Hemipsilichthys papillatus Pereira, Oliveira & Oyakawa, 2000: 378: fig. 1 [type locality: Ribeirão Santana, tributary of Rio Preto, at Rio Preto (approximately 22°02′S 43°47′W) Rio Paraíba do Sul drainage, Minas Gerais, Brazil].

Specimens examined: Brazil: Minas Gerais: Holotype: MZUSP 53085 (91.8 mm SL), male, Ribeirão Santana, tributary of Rio Preto, at Rio Preto, Rio Paraíba do Sul drainage (approximately 22°02′S 43°47′W), 22 July 1997. Paratypes: all collected with the holotype: MCP 21423 (2 + 1 c&s, 70.6–77.2 mm SL), MZUSP 53086 (1, 60.0 mm SL), UFJF 0378 (5 + 1 c&s, 26.1–85.9 mm SL), UFJF 0379 (3, 65.2–75.3 mm SL) and USNM 352350 (1, 60.4 mm SL). Other specimens: MCP 27982 (2, 26.8–36.7 mm SL), Ribeirão Santa Rita, tributary of Ribeirão Santana, itself a tributary of Rio Preto, Rio Preto, 29 July 1997. MCP 27983 (6, 26.3–45.3 mm SL), Ribeirão Santana, tributary of Rio Preto, Rio Preto, 27 September 1996.

Diagnosis: Hemipsilichthys papillatus is diagnosed by an autapomorphic mesial bend of the ventral portion of both preopercle and quadrate, forming a concave fossa where strong facial odontodes are implanted (Fig. 7), and by the absence of a dorsal-fin spinelet. It can also be distinguished from *H. gobio* and *H. nimius* by having no plates in the dorsal series between the dorsal-fin origin and the end of

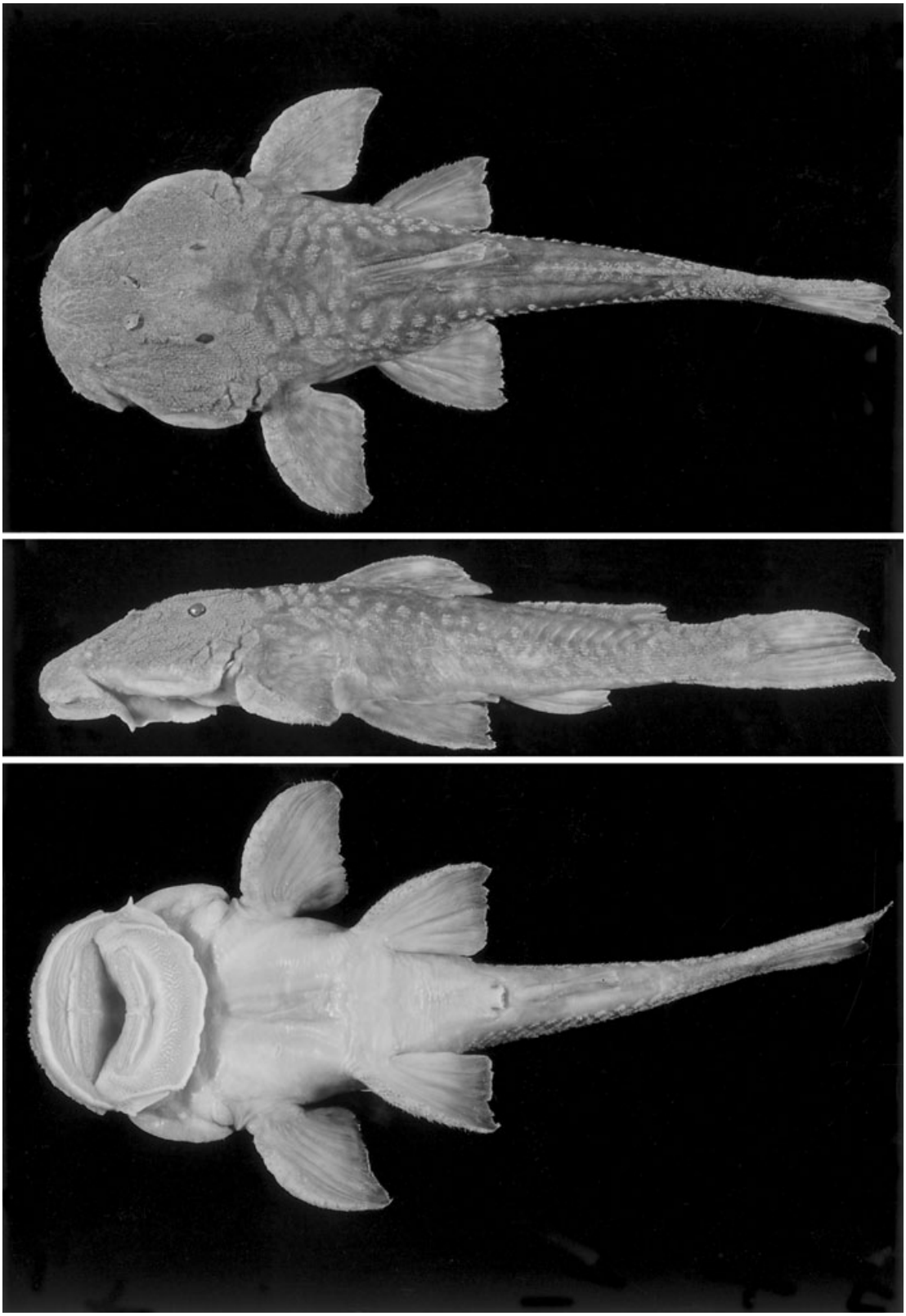

Figure 6. *Hemipsilichthys papillatus*, holotype, MZUSP 53085, 91.8 mm standard length, male, Ribeirão Santana, Rio Paraíba do Sul drainage, Minas Gerais.

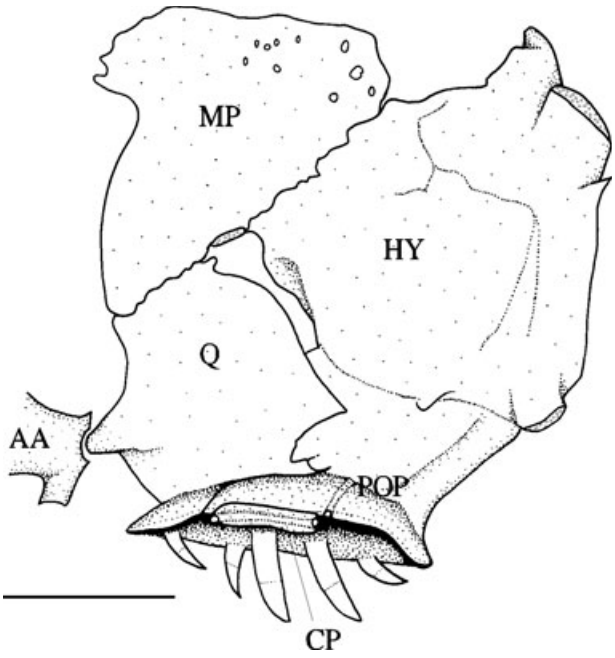

Figure 7. *Hemipsilichthys papillatus*, MCP 21423, ventral (mesial) view of suspensorium. Scale bar 2 mm. AA, angulo-articular; CP, canal plate; HY, hyomandibula; MP, metapterygoid; POP, preopercle; Q, quadrate.

the adipose fin (vs. dorsal series of plates complete but plates not reaching the mid-dorsal line). *H. papillatus* can be further distinguished from its congeners by its smaller orbital diameter (8.6–11.8% HL vs. 12.0–14.7% in *H. gobio* and 15.3–16.9% in *H. nimius*).

Description: This species was recently described and illustrated by Pereira *et al*. (2000) and the description will not be repeated here. Morphometric data, however, are presented in Table 1 for comparative purposes.

Distribution: Hemipsilichthys papillatus is known only from two localities in a tributary of the Rio Preto, Rio Paraíba do Sul basin, Minas Gerais, Brazil (Fig. 5).

Ecology: The type specimens were collected in a small, shallow river, with clear water, moderate to strong current, and a substrate of rocks, loose stones, and gravel.

HEMIPSILICHTHYS NIMIUS PEREIRA, REIS, SOUZA & LAZZAROTTO (FIG. 8)

Hemipsilichthys nimius Pereira, Reis, Souza & Lazzarotto, 2003: 5: fig. 1 [type locality: Brazil: Rio de Janeiro: Parati: Rio Carrasquinho below the Cachoeira do Tobogã, upper Perequê-Açu basin, Penha, *c*. 7.5 km west of highway BR101, on the road from Parati to Cunha (23°12′51′S 44°47′28′W)].

Specimens examined: Brazil: Rio de Janeiro: Holotype: MCP 33049 (105.1 mm SL), male, Rio Carrasquinho below the Cachoeira do Tobogã, upper Perequê-Açu basin, Penha, *c*. 7.5 km west of highway BR101, on the road from Parati to Cunha, Parati (23°12′51′S 44°47′28′W), 1 February 2003.

Paratypes: MCP 31990 (11, 45.7–98.1 mm SL), collected with the holotype. MCP 30671 (9 + 1 c&s, 35.9–102.2 mm SL), same locality of holotype, 18 October 2002. MCP 31573 (1, 48.7 mm SL) Rio Taquari at Taquari Village, *c*. 2.2 km west of highway BR101, Parati (23°02′29′S 44°41′34′W), 18 October 2002.

Diagnosis: Hemipsilichthys nimius can be distinguished from *H. gobio* and *H. papillatus* by having eight (rarely seven or nine) branched rays in the dorsal fin (vs. always seven), by possessing the dorsal-fin membrane expanded posteriorly, connecting the proximal half of the last dorsal-fin ray to the dorsum (vs. dorsal-fin membrane not expanded posteriorly), and by the V-shaped dorsal-fin spinelet (Fig. 3) with functional dorsal-fin locking mechanism (vs. oval in *H. gobio* and absent in *H. papillatus*). It can be further distinguished from congeners by its larger orbital diameter (15.3–16.9% HL vs. 8.6–11.8% in *H. papillatus* and 12.0–14.7% in *H. gobio*).

Description: This species was recently described and illustrated by Pereira *et al*. (2003) and the description will not be repeated here. Morphometric data, however, are presented in Table 1 for comparative purposes.

Distribution: Hemipsilichthys nimius is only known from its type locality in the upper Rio Perequê-Açu and from the nearby Rio Taquari, in the southern coast of Rio de Janeiro state (Fig. 5).

Ecology: The type specimens were collected in small coastal streams flowing through well-preserved Atlantic forest. *Hemipsilichthys nimius* was collected in localities between 100 and 370 m a.s.l., always in rocky substrate with fast flowing, clear water, under direct sunlight, and depths between 10 and 50 cm. Underwater observations indicate that *H. nimius* is most active during the night, grazing on the bottom (Pereira *et al*., 2003).

DELTURUS EIGENMANN & EIGENMANN

Delturus Eigenmann & Eigenmann, 1889: 45 (type species: *Delturus parahybae* Eigenmann & Eigenmann, 1889; by original designation).

Diagnosis: No uniquely derived features were found to diagnose *Delturus*. The following features are derived

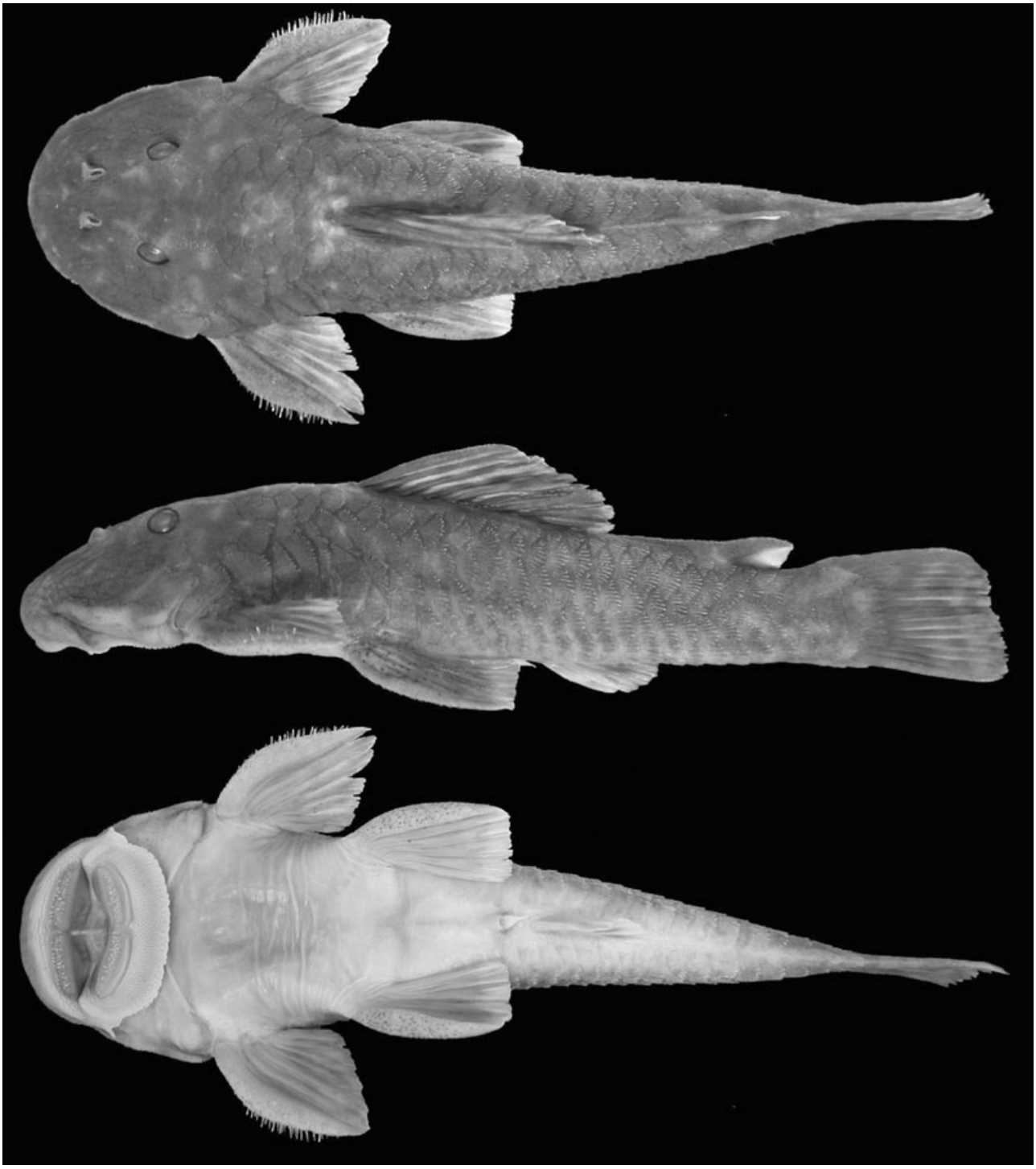

Figure 8. *Hemipsilichthys nimius*, holotype, MCP 33049, 105.1 mm standard length, male, Rio Carrasquinho below Cachoeira do Tobogã, upper Rio Perequê-Açu, Rio de Janeiro.

for *Delturus* but are shared with a number of other loricariid groups (from Armbruster, 2004): (1) more than six infraorbital canal plates (character 91–2); (2) ridge on lateral ethmoid, from metapterygoid contact to near the anterior margin of the bone, short (character 97–1); and (3) reduction to eight to 11 vertebrae from first normal (not bifid) neural spine behind dorsal fin up to hypural plate (character 121–2).

KEY TO SPECIES OF *DELTURUS*

1. Premaxilla with 15–24 teeth; dorsal fin with nine to ten (usually ten) branched rays; eye comparatively smaller (orbital diameter 53.0–64.0% of interorbital space); colour pattern with distinct dots, mainly on head ..... *Delturus parahybae* (Rio Paraíba do Sul basin)
1′. Premaxilla with 26–137 teeth; dorsal fin with eight to ten (usually nine) branched rays; eye comparatively larger (orbital diameter 61.4–93.0% of interorbital space); colour pattern with small bars and vermiculations, mainly on head 2
2. Posterior margin of caudal fin convex; dorsal-fin margin rounded ..... ***Delturus brevis* sp. nov.** (Rio Jequitinhonha basin)
2′. Posterior margin of caudal fin concave; dorsal-fin margin straight 3
3. Caudal fin plain light brown, without a distinct patternof dark spots; iris usually with a large and distinct dorsal flap ..... *Delturus angulicauda* (Rio Mucuri basin)
3′. Caudal fin with distinct pattern of dark spots; iris usually with a minute and indistinct dorsal flap ..... *Delturus carinotus* (Rio Doce basin)

In addition, *Delturus* can be easily recognized by the combination of a high preadipose keel, formed by the azygous preadipose plates, almost symmetrically bifid teeth (Fig. 2) on premaxilla and dentary, dorsal fin with eight to ten branched rays, large eye (orbital diameter 18.0–24.5% HL), and dorsal-fin membrane extended posteriorly and contacting first preadipose plate.

DELTURUS ANGULICAUDA STEINDACHNER (FIG. 9)

Plecostomus angulicauda Steindachner, 1877: 672, pl. 12 (type locality: Rio Mucuri bei Santa Clara; Rio Parahyba).

Specimens examined: Brazil: Lectotype (by present designation): NMW 44069 (188.0 mm SL), male, Rio Mucuri at Santa Clara, Bahia, 1874. Other specimens: Minas Gerais: USNM 318209 (4 of 5, 29.6–38.5 mm SL), side branch of Rio Mucuri at Santa Clara, *c.* 22 km south-east of Nanuque, 23 July 1991. USNM 315901 (3 of 4, 57.4–71.3 mm SL), side channel of Rio Mucuri at Santa Clara Farm, *c.* 26 km south-east of Nanuque, 5 August 1988. MZUSP 24477 (1, 171.4 mm SL), Rio Mucuri at Nanuque, 16–18 July 1972. MCZ 9835 (1 of 2, 210.2 mm SL), Rio Mucuri at Santa Clara, Santa Clara (17°54′S 40°13′W), December 1865. MCZ 25769 (1, 270.3 mm SL), Rio Mucuri at Santa Clara, Santa Clara (17°54′S 40°13′W), December 1865. USNM 318177 (1, 172.6 mm SL), Rio Mucuri, at Santa Clara, *c.* 22 km south-east of Nanuque, 23–24 July 1991. USNM 318180 (3, 139.0–165.6 mm SL), Rio Mucuri, *c.* 9 km from Presidente Pena on dirt road on Gavião Farm, Presidente Pena, 17–23 July 1991. MCP 28036 (5 + 1 c&s, 94.5–202.3 mm SL) Rio Mucuri at Nanuque, November 1997.

Diagnosis: The posterior margin of the exposed cleithrum process tapering to a point (character 156–1) is autapomorphic to *D. angulicauda*. It is also distinguished from all other *Delturus* by having a light brown caudal fin devoid of distinct darker spots or marks (vs. caudal fin spotted); from *D. parahybae* by a less deep head (head depth 46.2–54.6% SL vs. 53.9–59.7% SL) and by tooth counts (30–52 vs. 15–24 premaxillary teeth); from *D. carinotus* by having a large dorsal flap on the iris (vs. dorsal flap small and inconspicuous) and a wider cleithral width (32.3–34.2% SL vs. 29.8–33.2% SL); and from *D. brevis* by having a concave (vs. convex) caudal fin, and a straight (vs. rounded) dorsal-fin margin.

Description: SL of examined specimens 121.3–270.3 mm. Other morphometric data are presented in Table 2.

Body depressed and progressively narrowing from cleithrum to end of caudal peduncle. Dorsal profile of body smoothly convex. Body arches from snout tip to end of supraoccipital process; slightly convex to straight from posterior margin of supraoccipital to origin of dorsal fin. Dorsal profile descending from origin of dorsal fin to end of caudal peduncle. Trunk mostly round in cross-section, caudal peduncle very flattened ventrally and more compressed caudally; trunk somewhat triangular at preadipose region. Greatest body depth at dorsal-fin origin. Dorsal surface of body mostly covered by dermal plates. Three to five median, preadipose plates present, forming tall ridge between dorsal and adipose fins. Lower surface of head and abdomen naked, except for some platelets sometimes embedded in skin laterally below the pectoral girdle. Median series of lateral plates with 23–26 plates; eight to 11 plates bordering dorsal-fin base; eight to ten plates between end of anal-fin base and caudal fin.

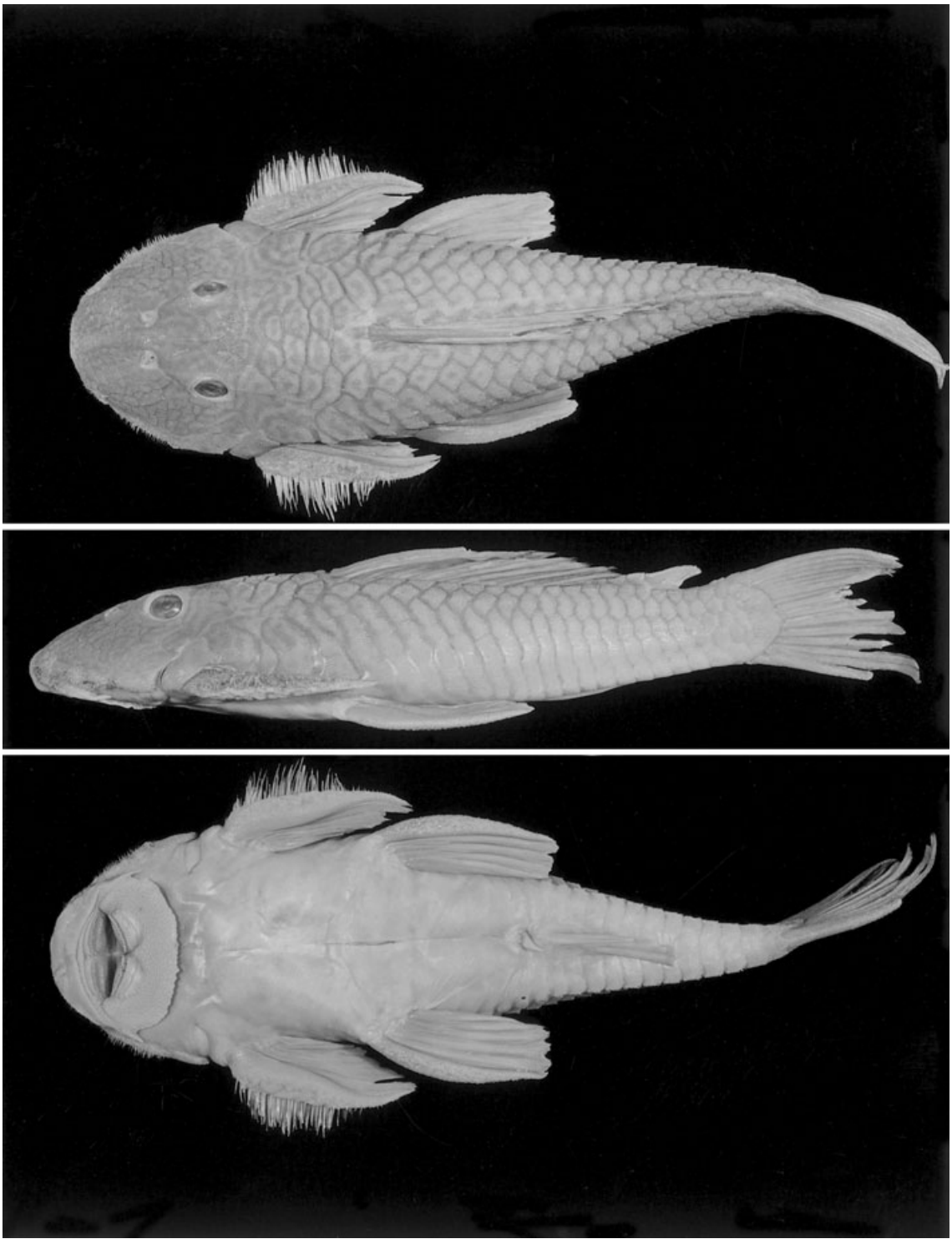

Figure 9. *Delturus angulicauda*, MCP 28036, 202.3 mm standard length, male, Rio Mucuri at Nanuque, Minas Gerais.

Head broad and depressed. Snout convex anteriorly. Three slightly elevated ridges between orbits and snout tip, lateral ridges more prominent. Dorsal region of head between orbits flat to slightly concave; upper margin of orbits slightly higher than interorbital space. Eyes large (orbital diameter 19.1–21.5% HL), placed dorsolaterally. Iris with large dorsal flap. Lateral margins of head with many thin

Table 2. Descriptive morphometrics of *Delturus* species. Values are given as ranges for all measured specimens. Standard length is expressed in mm; measurements 1–16 are percentages of standard length; measurements 17–21 are percentages of head length. The first column for *D. brevis* is the holotype

Character	*angulicauda* (*n* = 12)	*parahybae* (*n* = 5)	*carinotus* (*n* = 8)	*brevis* (*n* = 10)	
Standard length (mm)	121.3–270.3	171.0–238.0	138.9–208.8	152.1	136.0–171.8
1 Head length	29.3–31.8	30.4–31.4	26.8–32.8	32.3	29.2–32.3
2 Predorsal length	41.0–44.1	42.5–44.8	39.7–45.4	44.7	40.9–44.7
3 Postdorsal length	30.7–36.4	31.0–35.5	32.8–37.3	34.1	34.1–38.0
4 Dorsal-fin spine length	21.1–33.1	23.6–27.2	24.7–30.4	23.3	21.2–28.4
5 Anal-fin spine length	11.0–13.6	12.0–14.0	10.2–13.6	11.0	9.5–13.1
6 Pectoral-fin spine length	25.1–27.8	24.7–28.3	24.5–28.0	29.0	25.8–30.8
7 Pelvic-fin spine length	22.1–25.6	23.3–27.4	20.9–25.3	22.5	22.4–23.9
8 Upper unbranched caudal ray	21.4–26.8	24.5–26.2	23.5–26.7	22.8	21.5–26.5
9 Lower unbranched caudal ray	22.8–31.7	27.4–33.8	25.6–29.5	25.2	25.2–30.7
10 Trunk length	19.4–22.3	21.1–22.5	20.3–22.3	20.2	19.6–24.7
11 Abdominal length	21.7–23.8	20.9–23.0	20.9–23.0	20.1	19.7–22.4
12 Cleithral width	32.3–34.2	32.2–34.2	29.8–33.2	34.9	33.2–35.2
13 Body depth at dorsal origin	15.0–20.5	17.2–20.2	15.3–19.9	18.2	16.6–18.2
14 Caudal peduncle length	32.4–35.4	31.8–35.2	31.9–36.8	33.7	33.2–39.3
15 Caudal peduncle depth	9.5–11.6	10.9–12.4	10.6–11.5	10.6	9.9–11.5
16 Caudal peduncle width	5.4–7.3	5.4–6.9	6.0–7.2	6.4	5.5–7.0
17 Snout length	61.5–67.9	64.2–67.0	62.1–67.8	67.4	64.2–67.4
18 Orbital diameter	19.1–21.5	18.0–19.7	19.0–22.0	22.4	20.3–24.5
19 Least interorbital width	25.6–31.1	30.7–33.3	22.9–31.9	27.7	27.5–32.3
20 Head depth	46.2–54.6	53.9–59.7	49.0–58.9	52.5	50.7–54.1
21 Mandibular ramus	17.5–26.0	18.6–21.1	21.4–24.8	30.5	21.4–31.0

hypertrophied odontodes in mature males. Lips well developed, occupying most of ventral surface of head. Upper lip with several transversely elongate papillae. Lower lip wide, reaching anterior margin of cleithrum. Lower lip mostly covered with minute papillae, smaller posteriorly. Maxillary barbel short, free. Teeth slender, bifid, two cusps approximately equal in size (Fig. 2). Premaxilla with 30–52 teeth; dentary with 31–50 teeth. Distinct skin fold present anterior to premaxillary teeth and posterior to dentary teeth.

Dorsal fin originating slightly anteriorly to or at vertical line passing through pelvic-fin origin; dorsal-fin spinelet V-shaped and locking mechanism functional; one unbranched and nine to ten (usually nine) branched rays; its margin approximately straight. Fin membrane uniting last dorsal-fin ray to first preadipose plate. Pectoral fins moderate in size, with one slightly curved and flattened unbranched ray, and six branched ones. First thickened pectoral-fin ray of mature males covered with large hypertrophied odontodes on anterodorsal margin. Posterior pectoral-fin margin straight to slightly round, reaching proximal third of pelvic fins when adpressed. Pelvic fins moderate in size, with one unbranched and five branched rays, not or just reaching to insertion of anal fin when adpressed. Anal fin with one unbranched and five branched rays. Caudal fin slightly concave; lowermost ray slightly longer than uppermost, 14 branched rays; three to four upper and three to four lower procurrent caudal-fin rays.

Colour in alcohol: Ground colour of dorsal surface of head and body light brown; pale yellow ventrally. Dorsum and flanks covered with dark brown, roundish blotches about size of pupil. Blotches arranged in series or forming vermiculate pattern on head and predorsal region. Blotches less conspicuous on snout. Dorsal, pectoral, and pelvic fins with indistinct dark spots along rays and interradial membranes, sometimes arranged in inconspicuous lines. Caudal fin plain light brown, without distinct darker marks. Ventral surface of head and body mostly unpigmented, except for light brown, scattered melanophores on caudal peduncle.

Distribution: Delturus angulicauda is known from several localities in the upper portions of the Rio Mucuri basin, in the State of Minas Gerais, Brazil (Fig. 5).

Ecology: This species is usually found in the main river channel on a rocky bottom, where the water current is very strong.

Remarks: The type locality of *D. angulicauda* is problematic. Steindachner's (1877) paper reads 'Fundort: Rio Mucuri bei Santa Clara (nach Wertheimer) Rio Parahyba (Hartt und Copeland, Thayer Expedition)'. However, the specimen herein designated as the lectotype of *Plecostomus angulicauda* (NMW 44069) is certainly from the Rio Mucuri, as it shares all characters of the species common in that drainage. On the other hand, the second syntype belongs to the species inhabiting the Rio Jequitinhonha, not the Rio Paraíba do Sul, which is described below as a new species, *D. brevis*. The lectotype designation herein proposed for *Plecostomus angulicauda* is, thus, necessary for nomenclatural stability.

DELTURUS PARAHYBAE EIGENMANN & EIGENMANN (FIG. 10)

Delturus parahybae Eigenmann & Eigenmann, 1889: 45 [type locality: Parahyba (Rio Paraíba do Sul, eastern Brazil)].

Specimens examined: Brazil: Lectotype (by present designation): MCZ 7726 (207.0 mm SL), male, Rio Paraíba do Sul between Barra do Piraí and Três Rios, Rio de Janeiro, 1865. Paralectotype: MCZ 163082 (1, 210.9 mm SL), collected with the lectotype. Other specimens: FMNH 59734 (1, 171.0 mm SL), Barra do Piraí, Rio de Janeiro, 13 July 1908. MCP 27296 (1, 238.0 mm SL), Rio Pomba, tributary of Rio Paraíba do Sul, *c*. 15 km downstream of highway Rio-Bahia, Larajal, Minas Gerais, August 1997. MCP 31467 (1 c&s, 206.8 mm SL), Rio Pombas, tributary of Rio Paraíba do Sul, downstream from future Barra do Braúna hydroelectric dam, Minas Gerais, 31 August 2002. MNRJ 701 (1, poor condition), no locality data.

Diagnosis: Delturus parahybae is distinguished from all other *Delturus* by premaxillary tooth counts (15–24 vs. 26–137), spots on the body and head (vs. a mostly vermiculate pattern), the number of plates between the end of the anal-fin base and the caudal fin [ten to 11 (usually ten) vs. eight to ten (usually nine)], more numerous dorsal-fin rays [nine to ten (usually ten) vs. eight to ten (usually nine)], and a smaller eye [orbital diameter 53.9–64.0% (average 58.4) in interorbital space vs. 61.4–93.0 (average 73.5)]; from *D. angulicauda* and *D. brevis* by a deeper head (head depth 53.9–59.7% HL vs. 46.2–54.6% HL); and from *D. brevis* by having 26–28 lateral plates in the medial series (vs. 22–24).

Description: SL of examined specimens 171.0–238.0 mm. Other morphometric data are presented in Table 2.

Body depressed and progressively narrowing from cleithrum to end of caudal peduncle. Dorsal profile of body smoothly convex. Body arches from snout tip to end of supraoccipital process; slightly convex to straight from that posterior tip of supraoccipital to origin of dorsal fin. Dorsal profile descends from origin of dorsal fin to end of caudal peduncle. Trunk mostly round in cross-section, caudal peduncle flattened ventrally and more compressed caudally; trunk somewhat triangular at preadipose region. Greatest body depth at dorsal-fin origin. Dorsal surface of body mostly covered by dermal plates. Three or four median, preadipose plates forming tall ridge between dorsal and adipose fins. Lower surface of head and abdomen naked, except for some platelets sometimes embedded in skin laterally below the pectoral girdle. Median series of lateral plates with 26–28 plates; 11–13 plates bordering dorsal-fin base; ten to 11 plates between end of anal-fin base and caudal fin.

Head broad and depressed. Snout convex anteriorly. Three slightly elevated ridges between orbits and snout tip, lateral ridges more prominent. Dorsal region of head between orbits flat to slightly concave; upper margin of orbits slightly higher than interorbital space. Eyes large (orbit diameter 18.0–19.7% HL), placed dorsolaterally. Iris with small dorsal flap. Lateral margins of head with many thin hypertrophied odontodes in mature males. Lips well developed, occupying most of ventral surface of head. Upper lip with several transversely elongate papillae. Lower lip wide, reaching anterior margin of cleithrum. Lower lip mostly covered with minute papillae, smaller posteriorly. Maxillary barbel short, free. Teeth thick and heavy, bifid, two cusps approximately equal in size (Fig. 2). Premaxilla with 15–24 teeth; dentary with 14–26 teeth. Skin fold anterior to premaxillary teeth and posterior to dentary teeth not very distinct.

Dorsal fin originating slightly anteriorly to vertical line passing through pelvic-fin origin; dorsal-fin spinelet V-shaped and locking mechanism functional; one unbranched and nine to ten (usually ten) branched rays; its margin approximately straight. Fin membrane uniting last dorsal-fin ray to first preadipose plate or terminating just anterior to first preadipose plate. Pectoral fins moderate in size, with one slightly curved and flattened unbranched ray, and six branched ones. First thickened pectoral-fin ray of mature males covered with large hypertrophied odontodes on anterodorsal margin. Posterior pectoral-fin margin straight to slightly round, reaching between origin and proximal third of pelvic fins when adpressed. Pelvic fins moderate in size, with one unbranched and five branched rays, reaching from origin to proximal third of anal fin when adpressed. Anal fin with one unbranched and five branched rays. Caudal fin slightly concave; lowermost ray slightly longer than uppermost, 14 branched rays; three to five

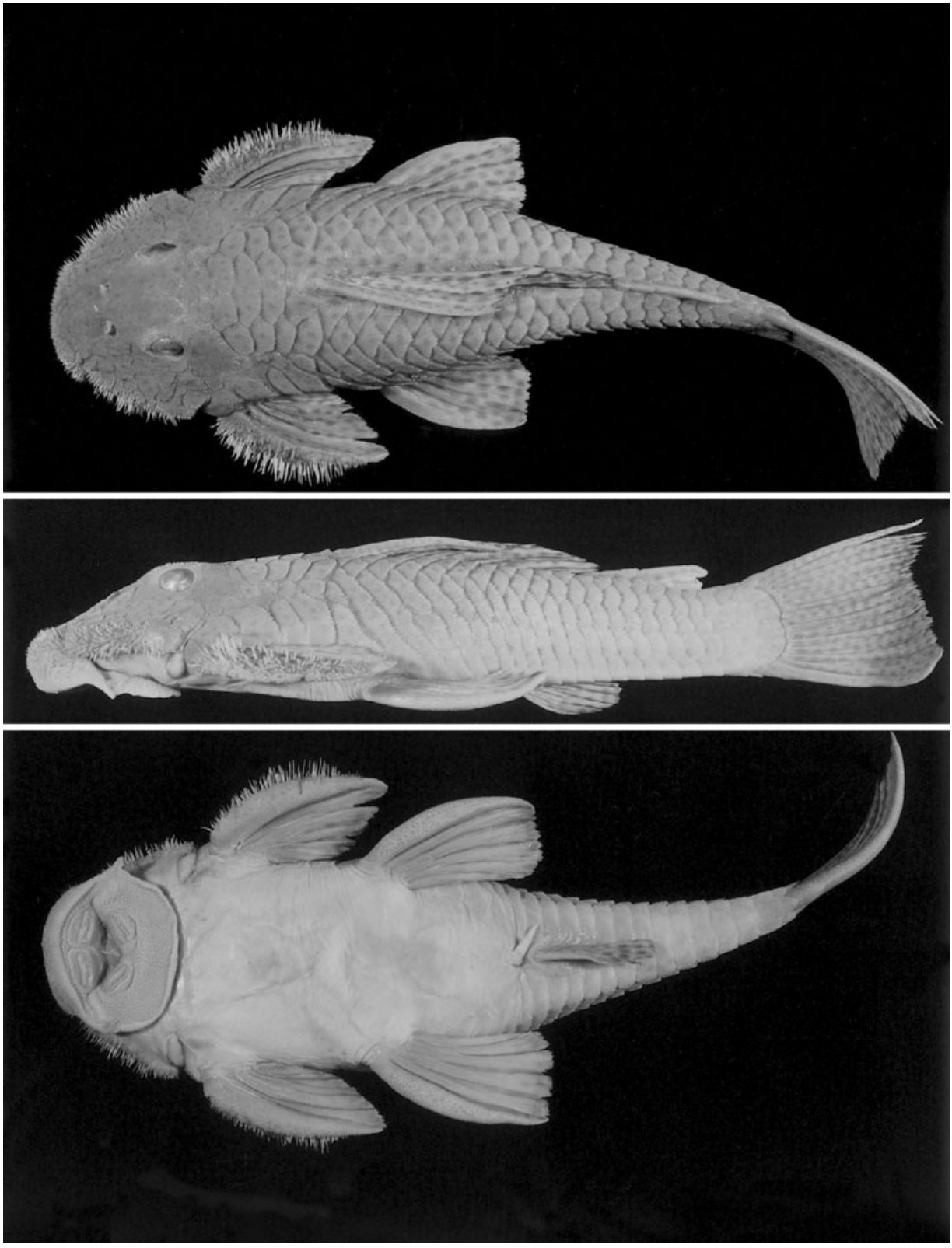

Figure 10. *Delturus parahybae*, MCP 27296, 238.0 mm standard length, male, Rio Pomba, tributary of Rio Paraíba do Sul, Minas Gerais.

upper and three to four lower procurrent caudal-fin rays.

Colour in alcohol: Ground colour of dorsal surface of head and body light brown; pale yellow ventrally. Dorsum, head, flanks, and all fins covered with many dark brown, roundish spots about size of pupil. Spots evenly scattered and not arranged in series. Spots less conspicuous on snout. Ventral surface of head and body mostly unpigmented, except for light brown, scattered melanophores on caudal peduncle.

Distribution: Delturus parahybae in known from a few localities in the Rio Paraíba do Sul basin, in the states of Rio de Janeiro and Minas Gerais, Brazil (Fig. 5).

Ecology: Very little is known on the ecology and habitat of this species, as only six specimens exist in collections. The specimens in MCP 27296 and MCP 31467, from Rio Pomba, were collected during the night in the main river channel, on a rocky bottom and in a very strong current.

Remarks: A lectotype is herein designated for *D. parahybae* (MCZ 7726). The female specimen also previously in the original lot becomes a paralectotype, now catalogued as MCZ 163082.

Conservation status: Delturus parahybae is a very rare species. Of the six specimens known in scientific collections, two are the lectotype and paralectotype, collected by the Thayer Expedition in 1865. A third specimen was collected in 1908, a fourth in 1997, and a fifth in 2002. A sixth specimen has no locality or date and is in very poor condition. The species is currently threatened by environmental destruction and is regarded as endangered by Pompeu & Vieira (2003).

Delturus carinotus La Monte (Fig. 11)

Plecostomus (Carinotus) carinotus La Monte, 1933: 2, fig. 1 (type locality: Rio Doce, Estado do Espírito Santo, eastern Brazil).

Specimens examined: Brazil: Holotype (photographs examined): AMNH 11911 (235.0 mm SL), Rio Doce, Espírito Santo, 1932. Other specimens: Minas Gerais: MZUSP 66189 (1, 182.8 mm SL), Rio Suaçuí Grande at São Pedro do Suaçuí (18°22′S 42°31′W), 25 November 2000. MZUSP 66188 (2, 138.9–206.4 mm SL), Rio Suaçuí Grande at São Pedro do Suaçuí (18°22′S 42°34′W), 26 November 2000. MCP 28039 (2, 184.3–204.2 mm SL), Rio Doce, Resplendor, April 1997. MZUSP 52566 (1, 208.8 mm SL) Rio Santo Antônio at confluence with Ribeirão Pitangas, Braúnas, 11 August 1997. MZUSP 42037 (1, 149.7 mm SL), Rio Casca downstream of Cachoeira do Inferno, 7 March 1990. MZUSP 42139 (1, 140.1 mm SL), Rio Munhaçu at Caratinga, no date. MCP 28037 (13 + 1 c&s, 114.5–207.7 mm SL), Rio Santo Antônio at the limit between Joanésia and Braúnas, 12 April 2000. MCP 28038 (1, 278.7 mm SL), Rio Santo Antônio at the limit between Joanésia and Braúnas, October 2000.

Diagnosis: Delturus carinotus is distinguished from all other *Delturus* by its narrower cleithral width (29.8–33.2% SL vs. 32.2–35.2% SL), and by its very small, indistinct dorsal flap on the iris (vs. flap large); from *D. angulicauda* by having a spotted caudal fin (vs. caudal fin light unspotted); from *D. parahybae* by the premaxillary tooth count (40–85 vs. 15–24) and by having eight to ten (usually nine) plates between the end of the anal-fin base and the caudal fin [vs. ten to 11 (usually ten)]; from *D. brevis* it is further distinguished by its concave caudal fin (vs. convex), and straight dorsal-fin margin (vs. rounded).

Description: SL of examined specimens 138.9–208.8 mm. Other morphometric data are presented in Table 2.

Body depressed and progressively narrowing from cleithrum to end of caudal peduncle. Dorsal profile of body smoothly convex. Body arches from snout tip to end of supraoccipital process; slightly convex to straight from posterior tip of supraoccipital to origin of dorsal fin. Dorsal profile descends from origin of dorsal fin to end of caudal peduncle. Trunk mostly round in cross-section, caudal peduncle flattened ventrally and more compressed caudally; trunk somewhat triangular at preadipose region. Greatest body depth at dorsal-fin origin. Dorsal surface of body mostly covered by dermal plates. Three to five median, preadipose plates present, forming tall ridge between dorsal and adipose fins. Lower surface of head and abdomen naked, except for some platelets sometimes embedded in skin laterally below the pectoral girdle. Median series of lateral plates with 22–25 plates; eight to ten plates bordering dorsal-fin base; eight to ten plates between end of anal-fin base and caudal fin.

Head broad and depressed. Snout convex anteriorly. Three slightly elevated ridges between orbits and snout tip, lateral ridges more prominent. Dorsal region of head between orbits flat to slightly concave; upper margin of orbits slightly higher than interorbital space. Eye large (orbit diameter 19.0–22.0% HL), placed dorsolaterally. Iris with very small, indistinct dorsal flap. Lateral margins of head with many thin hypertrophied odontodes in mature males. Lips well developed, occupying most of ventral surface of head. Upper lip with several transversely elongate papillae. Lower lip wide, reaching anterior margin of cleithrum. Lower lip mostly covered with minute papillae, smaller posteriorly. Maxillary barbel short, free. Teeth slender, bifid, two cusps approximately equal in size (Fig. 2). Premaxilla with 40–85 teeth; dentary with

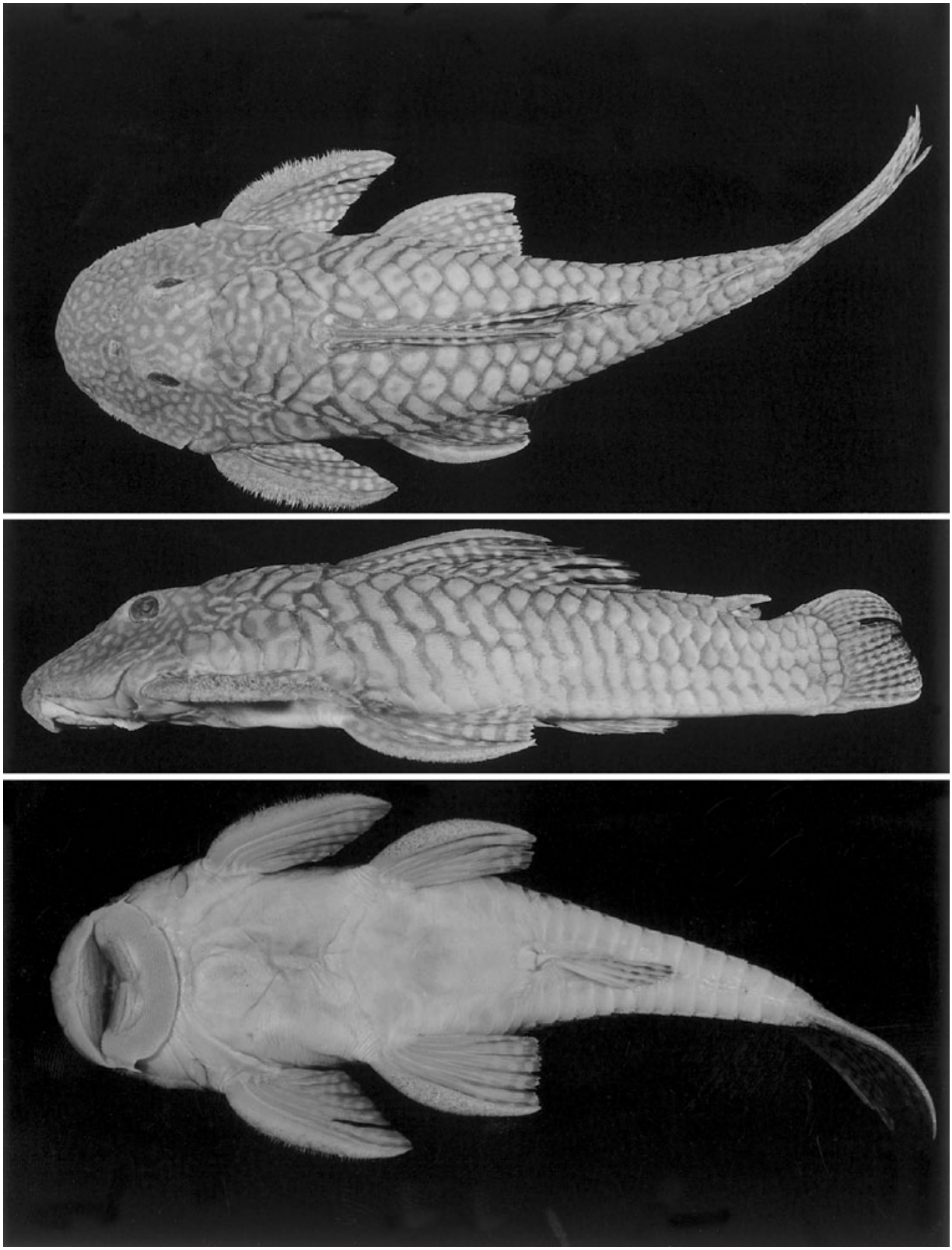

Figure 11. *Delturus carinotus*, MCP 28038, 278.0 mm standard length, male, Rio Santo Antônio at Braúnas, Minas Gerais.

38–80 teeth. Distinct skin fold present anterior to premaxillary teeth and posterior to dentary teeth.

Dorsal fin originating slightly anteriorly to vertical line passing through pelvic-fin origin; dorsal-fin spinelet V-shaped and locking mechanism functional; one unbranched and nine to ten (usually nine) branched rays; its margin approximately straight. Fin membrane uniting last dorsal-fin ray to first preadipose plate or terminating just anterior to first preadipose plate. Pectoral fins moderate in size, with one slightly curved and flattened unbranched ray, and six branched ones. First thickened pectoral-fin ray of mature males covered with large hypertrophied odontodes on anterodorsal margin. Posterior pectoral-fin margin straight to slightly round, reaching proximal third of pelvic fins when adpressed. Pelvic fins moderate in size, with one unbranched and five branched rays, not or just reaching origin of anal fin when adpressed. Anal fin with one unbranched and five branched rays. Caudal fin slightly concave; lowermost ray slightly longer than uppermost, 14 branched rays; three to four upper and three to four lower procurrent caudal-fin rays.

Colour in alcohol: Ground colour of dorsal surface of head and body light brown; pale yellow ventrally. Dorsum and flanks covered with vermiculate dark brown markings, mostly arranged on borders of plates and skin between plates. Dorsal, pectoral, pelvic, and caudal fins with dark bands, sometimes disconnected and forming large blotches. Anal fin with few dark spots or indistinct bands. Ventral surface of head and body mostly unpigmented, except for light brown, scattered melanophores on caudal peduncle and upper lip.

Distribution: Delturus carinotus is known from a few localities in the upper portions of the Rio Doce basin, in the State of Minas Gerais, Brazil (Fig. 5).

Ecology: Specimens collected recently were found in wide sectors of the river channels, with strong currents and a rocky bottom.

DELTURUS BREVIS REIS & PEREIRA, SP. NOV. (FIG. 12)

Holotype: MZUSP 69858 (152.1 mm SL), male, Rio Araçuaí upstream of its mouth on Rio Jequitinhonha, Araçuaí, Minas Gerais, Brazil, 4–12 September 1989, J. C. Garavello, A. Alves, A. Soares col.

Paratypes: NMW 44070 (1, paralectotype of *D. angulicauda*, 171.8 mm SL), female, locality unknown. MCP 28035 (3, 138.9–144.5 mm SL) and MZUSP 69859 (3, 136.5–148.8 mm SL), same data as holotype. MCP 26927 (2 + 1 c&s, 86.5–146.7 mm SL), Rio Salinas, tributary of Rio Jequitinhonha, near Rubelita, Minas Gerais, Brazil (16°25′S 42°16′W), 9 November 2000, Volney Vono col.

Diagnosis: Delturus brevis is distinguished from all other *Delturus* by its convex caudal fin (vs. concave) and rounded dorsal-fin margin (vs. straight); from *D. angulicauda* by having spots on the caudal fin (vs. caudal fin unspotted); from *D. carinotus* by its wider body (cleithral width 33.2–35.2% SL vs. 29.8–33.2% SL) and by having a large dorsal flap on the iris (vs. flap very small); from *D. parahybae* by having eight to nine plates between the end of the anal-fin base and the caudal fin (vs. ten to 11), 22–24 lateral plates in the median series (vs. 26–28), by more numerous premaxillary teeth (26–137 vs. 15–24), and by its less deep head (head depth 50.7–54.1% HL vs. 53.9–59.7% HL).

Description: SL of examined specimens 136.0–152.1 mm. Other morphometric data are presented in Table 2.

Body depressed and progressively narrowing from cleithrum to end of caudal peduncle. Dorsal profile of body smoothly convex. Body arches from snout tip to end of supraoccipital process; slightly convex to straight from posterior tip of supraoccipital to origin of dorsal fin. Dorsal profile then descends from origin of dorsal fin to end of caudal peduncle. Trunk mostly round in cross-section, caudal peduncle flattened ventrally and more compressed caudally; trunk somewhat triangular at preadipose region. Greatest body depth at dorsal-fin origin. Dorsal surface of body mostly covered by dermal plates. Four to six median, preadipose plates present, forming tall ridge between dorsal and adipose fins. Lower surface of head and abdomen naked, except for some platelets sometimes embedded in skin laterally below the pectoral girdle. Median series of lateral plates with 22–24 plates; six to eight plates bordering dorsal-fin base; eight to nine plates between end of anal-fin base and caudal fin.

Head broad and depressed. Snout convex anteriorly. Three indistinctly elevated ridges between orbits and snout tip. Dorsal region of head between orbits concave; upper margin of orbits distinctly higher than interorbital space. Eye large (orbit diameter 20.3–24.5% HL), placed dorsolaterally. Iris with large dorsal flap. Lateral margins of head with patch of thin hypertrophied odontodes in mature males. Lips well developed, occupying most of ventral surface of head. Upper lip with several transversely elongate papillae. Lower lip very wide, reaching anterior margin of cleithrum. Lower lip mostly covered with minute papillae, smaller posteriorly. Maxillary barbel short, free. Teeth slender, bifid, two cusps approximately equal in size (Fig. 2). Premaxilla with 26–137 teeth; dentary with 22–133 teeth. Distinct skin fold present anterior to premaxillary teeth and posterior to dentary teeth.

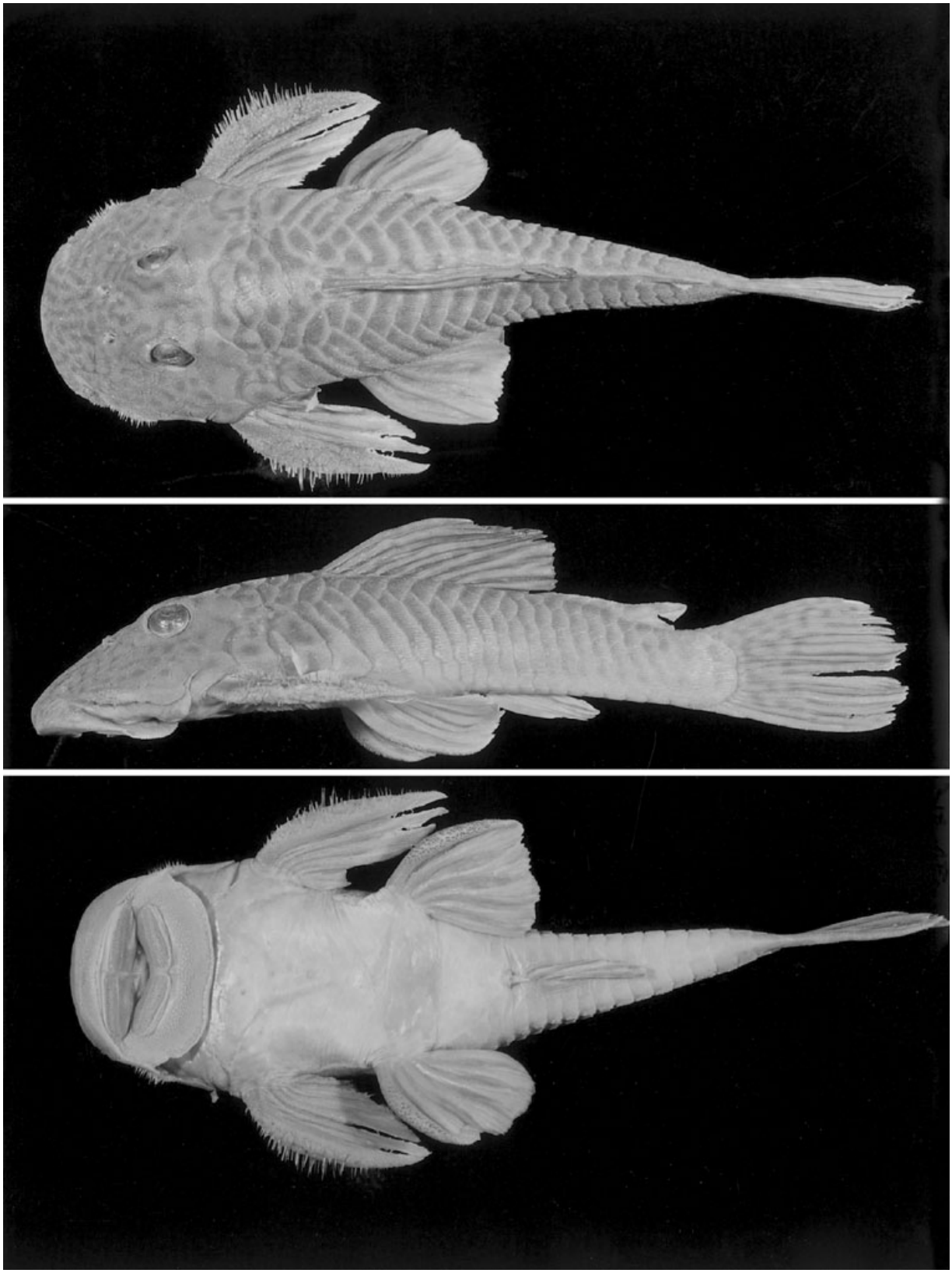

Figure 12. *Delturus brevis*, holotype, MZUSP 69858, 152.1 mm standard length, Rio Araçuaí upstream of its mouth on Rio Jequitinhonha, Araçuaí, Minas Gerais.

Dorsal fin originating slightly anterior to vertical line passing through pelvic-fin origin; dorsal-fin spinelet V-shaped and locking mechanism functional; one unbranched and eight to nine (usually nine) branched rays; its margin strongly rounded. Fin membrane uniting last dorsal-fin ray to first preadipose plate or terminating just anterior to first preadipose plate. Pectoral fins moderate in size, with one slightly curved and flattened unbranched ray, and six branched ones. First thickened pectoral-fin ray of mature males covered with large hypertrophied odontodes on anterodorsal margin. Posterior pectoral-fin margin slightly round, reaching proximal third to half-length of pelvic fins when adpressed. Pelvic fins moderate in size, with one unbranched and five branched rays, not or just reaching origin of anal fin when adpressed. Anal fin with one unbranched and five branched rays. Caudal fin distinctly convex; lowermost ray slightly longer than uppermost, 14 branched rays; three to four upper and three to four lower procurrent caudal-fin rays.

Colour in alcohol: Ground colour of dorsal surface of head and body light brown; pale yellow ventrally. Plates of dorsum and flanks darker anteriorly and lighter posteriorly, forming a barred or reticulate pattern. Markings usually more conspicuous and thicker on head forming a vermiculate pattern. All fins with dark bands, sometimes discontinuous and forming indistinct large spots. Ventral surface of head and body mostly unpigmented, except for light brown, scattered melanophores on caudal peduncle and upper lip.

Distribution: Delturus brevis is known from two localities in the upper portions of the Rio Jequitinhonha basin, in the state of Minas Gerais, Brazil (Fig. 5).

Ecology: All specimens were collected in a strong water current on a rocky bottom.

Etymology: From the Latin *brevis*, an adjective meaning short. In allusion to the smaller maximum size of this species compared with the others and to the comparatively reduced counts of some plates and dorsal-fin rays.

Remarks: Despite being labelled as from the Rio Mucuri, the paralectotype of *D. angulicauda* (NMW 44070) is in fact a specimen of *D. brevis*, and is herein included as a paratype of this new species. As *D. brevis* has only been collected in the Rio Jequitinhonha drainage, and because this river is very close to the Rio Mucuri, we believe that the specimen in NMW 44070 has actually been collected in the Rio Jequitinhonha and mislabelled as from Rio Mucuri. The type locality of *Plecostomus angulicauda*, however, includes Rio Mucuri and Rio Paraíba do Sul, and this is also a mistake (see Remarks under *D. angulicauda*).

DISCUSSION

No works other than Montoya-Burgos *et al*. (1998), Montoya-Burgos (2001), and Armbruster (2004) have suggested that the species of the Delturinae were a basal loricariid lineage. The Delturinae lack the synapomorphies possessed by all other nonlithogeneine loricariids: (1) presence of a posterior shelf in the fourth epibranchial [character 17–1 of Armbruster (2004)], (2) dorsal surface of metapterygoid split to the anterior process of the lateral ethmoid and forming a channel (character 52–2), (3) lateral wall of the metapterygoid channel present (character 53–1), (4) articulating surface between metapterygoid and lateral ethmoid present (character 57–1), (5) interoperculomandibular ligament absent (character 74–1), (6) presence of a canal plate ventral to the preopercle (character 82–1), and (7) Baudelot's ligament well ossified forming a ridge (character 93–1). *Neoplecostomus* has also been assumed to occupy a basal position in the Loricariidae, starting with Regan (1904), However, *Neoplecostomus* was recently found to be fairly derived among the Loricariidae (Armbruster, 2004) (Fig. 1).

The monophyly of the Delturinae is supported by two uniquely derived and unreversed synapomorphies and at least 12 additional non-unique or reversed synapomorphies, as presented above in the diagnosis. *Delturus* and *Hemipsilichthys* are each supported as monophyletic by a number of other synapomorphies. *Hemipsilichthys* species share four non-uniquely derived characters (one reversed; see diagnosis above). Within *Hemipsilichthys*, the sister-group relationship between *H. gobio* and *H. papillatus* is well supported by three of the characters originally described for *H. gobio* by Armbruster (2004), which are also present in *H. papillatus*. In addition, Pereira *et al*. (2000) described two unique and unreversed synapomorphies for these two species, providing a quite robust support for their sister-group relationship.

The monophyly of *Delturus* is supported by three non-uniquely derived characteristics (see diagnosis). Three other characteristics found by Armbruster (2004) for *Delturus* species are also present in *H. nimius*: (1) dorsal fin with eight to ten branched rays (seven to nine in *H. nimius*) (character 142–1), (2) dorsal-fin spinelet V-shaped (a reversal; character 148–0), and (3) dorsal-fin membrane extended posteriorly and connecting the dorsal fin to the dorsum (character 143–1). In adult *Delturus*, this membrane connects the dorsal fin to the first preadipose plate. On the other hand, in *H. nimius* the membrane is short and only connects the dorsal fin to the skin behind the fin base. These three characteristics can be interpreted either as synapomorphic for the subfamily with a reversal in the clade *H. gobio* + *H. papillatus* or as

independently acquired by *Delturus* and *H. nimius*. The phylogenetic relationships among the species of *Delturus* are not resolved, and we were unable to find characteristics to determine sister-group relationships within the genus.

The identification of a basal clade of the Loricariidae allows inferences on the early evolution of the family. The habitat of the Delturinae (as well as *Lithogenes* and the Astroblepidae), suggests that loricariids first radiated in streams with a high gradient and a rocky substrate.

Also, loricariids have a large degree of sexual dimorphism in the size of odontodes (Isbrücker & Nijssen, 1992) whereas sexual dimorphism in most members of the other loricarioid families is not as pronounced. Such extreme sexual dimorphism was noted by Darwin (1871), who described and pictured the hypertrophied odontodes along the snout of a male *Pseudancistrus* (then *Plecostomus barbatus*). Although the function of hypertrophied odontodes has not been determined precisely, they appear to act either as weapons or for display. Hypertrophied odontodes along the snout margin are present in Delturinae and are optimized as a derived characteristic for nonlithogeneine loricariids (although it has been lost several times). With the Delturinae having marked sexual dimorphism, sexual selection for male weaponry or display may be seen as a major influence in the diversification of loricariids.

Based on the range of *Lithogenes* and the Delturinae, two alternative biogeographical hypotheses can be proposed for the origin of the Loricariidae. The first is that loricariids had an origin in the Guyanan and south-eastern Brazilian Shields, and the second is that those areas act as refugia for basal loricariids. There are few loricariid fossils, so the answer to the origin of loricariids cannot be answered. However, evidence from extant taxa support both hypotheses. In support of the first hypothesis is the fact that the clade basal to all other loricariid clades except the *Lithogenes* and Delturinae (Fig. 1) is the Neoplecostominae plus the Hypoptopomatinae. The Neoplecostominae is almost exclusively found in south-eastern Brazil and the Hypoptopomatinae is very diverse in south-eastern Brazil (Schaefer, 1998). However, the Hypoptopomatinae are found throughout much of the range of loricariids in South America.

Alternatively, it could be suggested that basal loricariids were out-competed by more recent loricariids elsewhere, and that south-eastern Brazil acts as a refugium for basal taxa. The species most likely to compete with the Delturinae and other basal, fast-water loricariids are members of the Ancistrini. The diversity of the Ancistrini in south-eastern Brazil is low, and species of the Ancistrini with life histories most similar to the basal loricariids are not found in south-eastern Brazil. It has been proposed that the persistence of *Corymbophanes* (the basal genus of the Hypostominae) in the Potaro River above Kaieteur Falls in Guyana is due to the fact that members of the Ancistrini were unable to invade the upper Potaro (Armbruster *et al*., 2000). Evidence at this time is too incomplete to choose between those alternative hypotheses.

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