

## New Species of *Harttia* (Loricariidae, Loricariinae) from the Rio São Francisco Basin

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A new species of the mailed catfish genus *Harttia* is described from the São Francisco River drainage, States of Minas Gerais and Bahia, Brazil. The new species is distinguished from congeners by the combination of an abdominal region covered by small bony plates, plates 3–4 times in eye diameter; interorbital width 3.1–4.0 in head length and greater than eye diameter; body width at anal fin origin 6.3–8.3 in standard length; margins of the head and pectoral fin spine of mature males with elongate and conspicuous odontodes; anal fin of males longer than of females. A key to *Harttia* species and a comparison with other species are provided.

Uma nova espécie de cascudos do gênero *Harttia* é descrita da drenagem do rio São Francisco, nos estados de Minas Gerais e Bahia, Brasil. A nova espécie é prontamente diferenciada das demais espécies por possuir a seguinte combinação de caracteres: região abdominal revestida por placas ósseas pequenas (3–4 vezes o diâmetro do olho), desde a cintura escapular até as placas pré-anais; largura interorbital maior que o diâmetro do olho, 3,1–4,0 vezes no comprimento da cabeça; corpo delgado, sua largura na altura da origem da nadadeira anal 6,3–8,3 vezes no comprimento padrão; margens do focinho e acúleo da nadadeira peitoral dos machos maduros com odontodes longos e conspícuos e nadadeira anal dos machos muito mais longa do que nas fêmeas. Apresenta-se uma chave de identificação e uma comparação entre o novo táxon e as demais espécies.

THE Loricariinae, one of the most speciose subfamilies of the Loricariidae, comprises about 32 genera and 190 species distributed among four tribes (Isbrücker, 1980). All Loricariinae are easily recognized by the presence of an elongate and depressed caudal peduncle. Among the 32 genera of Loricariinae, only four (*Harttia*, *Loricarichthys*, *Rineloricaria*, and *Loricaria*) occur in the hydrographic systems of the Pre-Cambrian Brazilian Shield. According to Oyakawa (1993), the greatest species diversity of *Harttia* occurs in this region: *H. loricaformis* Steindachner, 1876, and *H. carvalhoi* Ribeiro, 1939, from rio Paraíba do Sul; *H. kronei* Ribeiro, 1908, from rio Ribeira do Iguape; *H. rhombocephala* Ribeiro, 1939, from the rio Jacaré basin, Rio de Janeiro state; *H. leiopleura* and *H. novalimensis*, both described by Oyakawa (1993) from rio das Velhas, rio São Francisco drainage; *H. torrenticola* Oyakawa, 1993, from rio Paraopeba, rio São Francisco drainage; *H. gracilis* Oyakawa, 1993, from rio São João, upper rio Paraná system (sensu Britski and Langeani, 1988), and *H. garavelloi* Oyakawa, 1993, from rio Jequitinhonha. Only one other species occurs outside of this region, *Harttia surinamensis* Boeseman, 1971, described from the Suriname River, Surinam.

According to Rapp Py-Daniel (1997), *Harttia* is a monophyletic taxon diagnosed by the following synapomorphies: internal anterior pro-

cesses of basypterygia oriented mesially and not in contact medially, point of bifurcation of infraorbital and supraorbital canals at border between sphenotic and pterotic-supracleithrum, first ceratobranchial with huge flange, parapophysis of fourth vertebra not contacting transcapular ligament, parietal branch terminal exit on supraoccipital.

Recent expeditions to the rio São Francisco drainage revealed *Harttia* specimens that could not be assigned to any of the known species. We present a description of this new species, an identification key to species, and a comparison among *Harttia* species.

### MATERIALS AND METHODS

Point-to-point measurements were made with caliper on the left side of specimens whenever possible. The measurements follow Boeseman (1971), except for predorsal length, which is measured from the tip of snout to the last pair of predorsal plates anterior to the azygous plate of the dorsal fin spine, and trunk length, measured from the origin of the pectoral fin spine to origin of the pelvic fin spine. Data were recorded to 0.1 mm. Counts follow Langeani (1990). Institutional abbreviations are as listed in Leviton et al. (1985), with the addition of DZSJRP for Departamento de Zoologia, Univ-

ersidade Estadual Paulista, São José do Rio Preto, SP.

*Harttia longipinna*, n. sp.

Figures 1–3

*Holotype*.—Brazil: Minas Gerais State: MZUSP 54579, male, 107.2 mm SL, rio Pará, bridge on road BR 262 between Nova Serrana and Pará de Minas, approximately 19°53'S, 44°52'W, F. Langeani and J. I. Montoya-Burgos, 14 August 1998.

*Paratypes*.—Brazil: Bahia State: DZSJRP 3666, 6: 50–85.5 mm SL; MZUSP 57168, 6: 52–85 mm SL, rio Grande, Sitio Grande, São Desidério, approximately 12°35'53"S, 45°5'7"W, O. T. Oyakawa, A. Akama, and V. Garutti, 8 July 1998; MZUSP 57898, 7: 42.5–52.3 mm SL, rio São Desidério, under the bridge on road BR 135, São Desidério, 12°20'56"S, 44°59'32"W, O. T. Oyakawa, A. Akama, and V. Garutti, 7 July 1998; Brazil: Minas Gerais State: DZSJRP 2819, 96.3 mm SL; MZUSP 54580, 80.3 mm SL, collected with the holotype; MZUSP 58522, male, 99 mm SL, cachoeira do Choro at rio Paraopeba, Curvelo, approximately 19°18'S, 43°43'W, C. B. M. Alves, July 1997; ANSP 177847, 3: 66.6–102.2 mm SL; MCP 16682, 4: 40.8–95.6 mm SL, cachoeira do Meleno at rio Meleno, Felixlândia, approximately 18°51'43"S, 44°45'14"S, S. A. Schaefer, J. C. Garavello, and A. S. Soares, 12 July 1993; ANSP 177848, 2: 23.2–80.2 mm SL, rio Marmelada, on the road from Pompeu to Frei Orlando, Abaeté, approximately 19°02'S, 45°12'W, R. E. Reis, J. F. P. Silva, and W. G. Saul, 12 July 1993.

*Nontype specimens*.—Brazil: Bahia State: MZUSP 58523, 10: 31.7–70.5 mm SL, rio São Francisco.

*Diagnosis*.—Distinguished from all other *Harttia* by the combination of (1) abdominal region covered by small bony plates between scapular bridge and anus, plate size 3–4 times in eye diameter; (2) margins of head and pectoral fin spine of mature males with elongate and conspicuous odontodes; (3) anal fin of mature males longer than in females. Among *Harttia* species, only *H. surinamensis*, *H. rhombocephala*, and *H. kronei* share some of these characters. *Harttia surinamensis*, like *H. longipinna*, has an abdominal region covered by numerous small plates in specimens larger than 75 mm SL and the pectoral fin of males with elongate odontodes; however, there are no elongate odontodes on margins of head and no elongate anal fin in males. In *H. surinamensis*, the interorbital

width equals eye diameter, 4.1–4.8 in head length (vs interorbital width greater than eye diameter, 3.1–4.0 in head length in *H. longipinna*). *Harttia rhombocephala* has abdominal plates about half the size of those in *H. longipinna* and a relatively larger body width (5.2 times in SL, vs 6.3–8.3 in *H. longipinna*). *Harttia rhombocephala*, which is based on the unique holotype, lacks conspicuous odontodes on the head and pectoral fin spine and lacks a long anal fin. *Harttia kronei* has no preanal or abdominal plates (vs two preanal plates and abdominal plates present in *H. longipinna*), its males possess smaller and less conspicuous odontodes on the head and pectoral fin spine, and the anal fin is not longer than that in females.

*Description*.—Body depressed and elongated, becoming narrow posterior to pectoral fin origin, increasingly narrow at middle portion of caudal peduncle. Dorsal profile moderately convex from tip of snout to end of supraoccipital, straight from supraoccipital to dorsal fin origin. Ventral profile straight from tip of snout to caudal fin.

Head moderately triangular in dorsal view. Tip of snout naked. Premaxilla with 43–75 bilobed teeth (Table 1); dentary with 47–64 teeth similar to those on premaxilla, cusps more rounded. Maxillary barbel short. Posterior border of lower lip reaching almost to anterior margin of scapular bridge, with small papillae. Lateral portion of head in adult males with conspicuous cutaneous projections and numerous long odontodes, odontode length slightly shorter than eye diameter.

Lateral plates posterior to cleithral process 27–30. Elongate thoracic plates between pectoral and pelvic fin base 5–9; 14–19 paired plates and 1–3 azygous plates between dorsal and caudal fins; 13–15 paired plates and 1–3 azygous plates between anal and caudal fins. Abdomen partially covered by plates from posterior margin of scapular bridge to preanal plates, plates more numerous medially and posteriorly, scarce or absent in lateral portions. Body plates without keels.

Dorsal fin rays  $i + 7$ , posterior fin margin straight. Anal fin rays  $i + 5$ , posterior margin convex; males with long anal fin, 4–5 times in SL versus 6.2–7.2 in females. Pectoral fin rays  $i + 6$ , posterior border slightly convex and reaching pelvic fin origin when depressed; pectoral fin spine with well-developed cutaneous projections in the intermediate portion of anterior margin, and with numerous odontodes as long as eye diameter.

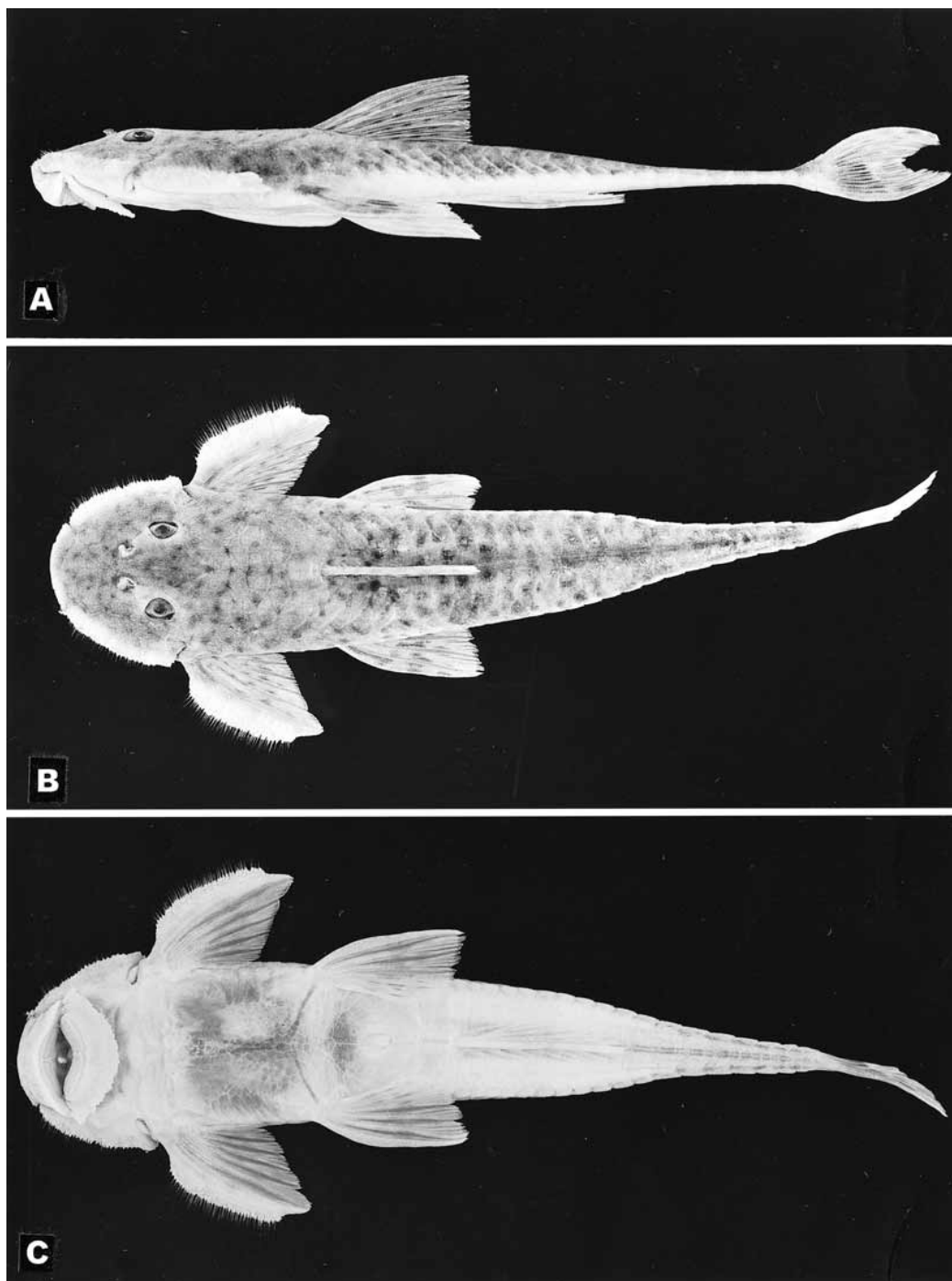


Fig. 1. *Harttia longipinna*. Holotype MZUSP 54579, male, 107.2 mm SL, (A) lateral, (B) dorsal, and (C) ventral views.

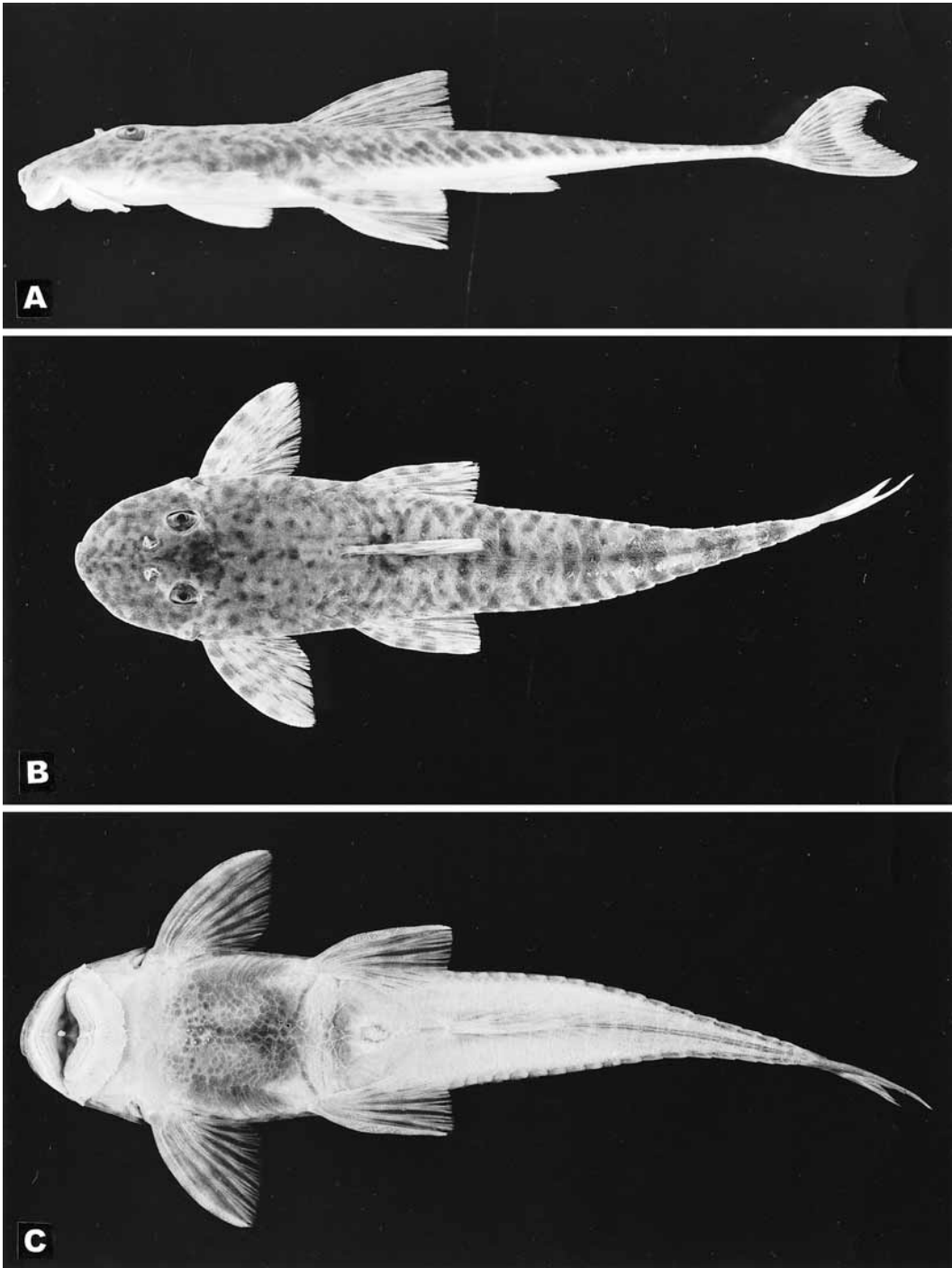


Fig. 2. *Harttia longipinna*. Paratype DZSIRP 2819, female, 96.3 mm SL, (A) lateral, (B) dorsal, and (C) ventral views.

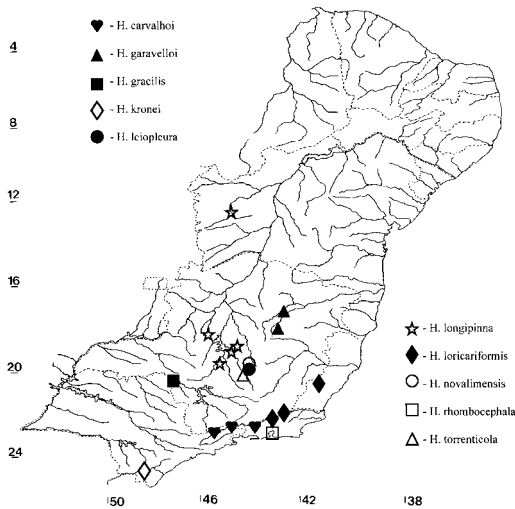


Fig. 3. Geographical distribution of *Harttia* in eastern and southeastern Brazil.

*Color in alcohol*.—Body light yellow with dark brown spots distributed on dorsal surface, arranged in six rather ill-defined transverse bands, especially in small specimens. Rays of pectoral, dorsal, and pelvic fins with dark brown spots, interradial membrane and anal fin hyaline; caudal fin rays dark brown at base, light brown at tips, otherwise with median, straight hyaline transverse band.

*Distribution*.—Rio São Francisco drainage, states of Minas Gerais and Bahia, Brazil (Fig. 3).

*Etymology*.—From the latin *longa*, meaning large, in combination with *pinna*, fin. The name refers to the large size of the anal fin in males of this species, treated as a noun in apposition.

#### DISCUSSION

*Harttia* species are morphologically similar to each other and few body proportions can be used to diagnose them. Differentiation among

TABLE 1. MORPHOMETRIC AND MERISTIC DATA FOR *Harttia longipinna*. Standard length (mm), body proportions as ratios of standard length (SL) or head length (HL). Counts of body plates, teeth, and fin rays. Dorsal fin origin (D), anal fin origin (A), standard deviation (SD), number of examined specimens (*n*).

Character	Holotype	Paratypes Range	Mean	SD	<i>n</i>
Standard length	107.2	40.8–100.2			15
Head length/SL	4.0	4.0–4.7	4.3	0.3	15
Body depth/SL	9.1	7.8–10.2	8.9	0.8	15
Body width (D)/SL	4.9	4.9–5.7	5.2	0.2	15
Body width (A)/SL	6.5	6.3–8.3	6.8	0.5	15
Predorsal length/SL	2.8	2.7–2.9	2.8	0.1	15
Postdorsal length/SL	2.0	1.9–2.1	2.0	0.0	15
Postanal length/SL	2.3	2.3–2.6	2.5	0.1	15
Dorsal spine/SL	4.5	4.3–4.9	4.6	0.1	15
Pectoral spine/SL	4.4	3.9–4.8	4.3	0.2	15
First pelvic ray/SL	4.8	4.8–5.6	5.1	0.2	15
First anal ray/SL	4.6	4.0–7.2	6.0	1.1	15
Trunk length/SL	4.6	4.6–5.5	5.1	0.3	15
Head width/HL	1.1	0.9–1.1	1.0	0.1	15
Head depth/HL	2.2	1.9–2.8	2.3	0.2	15
Eye diameter/HL	6.3	4.7–6.7	5.4	0.6	15
Interorbital width/HL	3.4	3.1–4.0	3.5	0.3	15
Snout length/HL	1.7	1.4–1.8	1.5	0.1	15
Lateral line plates	30	27–30	28.3	0.9	15
Thoracic plates	8	5–9	6.7	1.1	15
Dorsal–caudal plates	17	14–19	16.9	1.1	15
Anal–caudal plates	14	13–15	14.5	0.6	15
Premaxillary teeth	63	43–75	58.3	8.5	12
Dentary teeth	61	47–64	56.8	4.9	11
Dorsal fin rays	i + 7	i + 7			11
Anal fin rays	i + 5	i + 5			11
Pectoral fin rays	i + 6	i + 6			11
Pelvic fin rays	i + 5	i + 5			11
Caudal fin rays	7 + 7	7 + 7			11

species therefore is primarily based on bony plates and associated characters.

*Harttia carvalhoi*, *H. garavelloi*, *H. kronei*, *H. leiopleura*, and *H. novalimensis* lack preanal plates. *Harttia leiopleura* and *H. novalimensis* lack the head-plate anterior to the opercular membrane, the posterior odontodes are well developed. *Harttia leiopleura* has no thoracic plates. In *H. garavelloi*, the interorbital space is as large as the orbital diameter. *Harttia carvalhoi* and *H. kronei* have the interorbital twice as broad as the orbital diameter; *H. kronei* has eight thoracic plates, versus 4–6 in *H. carvalhoi*.

Among species with preanal plates, the thoracic plates are small and circular, occasionally absent in *H. torrenticola*. *Harttia gracilis*, *H. longipinna*, *H. loricariformis*, *H. rhombocephala*, and *H. surinamensis* have large, polygonal, preanal plates. *Harttia gracilis* and *H. loricariformis* have naked abdomen and can be distinguished by the number of thoracic plates (3–5 in *H. gracilis*, 7–8 in *H. loricariformis*) and number of plates between dorsal and caudal fin and anal and caudal fin (14–15 and 11–15 in *H. gracilis* and 17 and 16 in *H. loricariformis*).

*Harttia longipinna*, *H. rhombocephala*, and *H. surinamensis* are the only species of *Harttia* with abdominal plates. The holotype of *H. rhombocephala* was not examined, but, according to the original description and figures from Ribeiro (1939), it has smaller abdominal plates, half the size of those in *H. longipinna*. *Harttia rhombocephala* also has a relatively larger body width, 5.2 versus 6.3–8.3 times in SL. It lacks large odontodes on the head and pectoral fin spine, and its anal fin is not elongated. These characters are, however, sexually dimorphic, and the sex of the holotype of *H. rhombocephala* is undetermined. *Harttia surinamensis* also has smaller abdominal plates about half the size of those in *H. longipinna*, pectoral fin of males with elongate odontodes, no elongate odontodes on head and no elongate anal fin in males. Also in *H. surinamensis* interorbital width equals eye diameter, 4.1–4.8 times in head length, versus interorbital greater than eye diameter, 3.1–4.0 in HL in *H. longipinna*.

KEY TO THE SPECIES OF *Harttia*

- 1a. Preanal plates present ..... 2
- 1b. Preanal plates absent ..... 7
- 2a. Two to 4 small, circular preanal plates not touching anterior plates (sometimes absent in juveniles) ..... *H. torrenticola* (rio Paraopeba, São Francisco drainage)
- 2b. Two large and trapezoid preanal plates touching small anterior plates ..... 3
- 3a. Abdomen naked ..... 4

- 3b. Abdomen plated ..... 5
- 4a. Three to five thoracic plates; 14–15 plates between dorsal fin and caudal fin base and 11–15 plates between anal fin and caudal fin base; upper unbranched caudal fin ray longer than lower ray; body yellowish ... *H. gracilis* (upper rio Paraná)
- 4b. Seven to eight thoracic plates; 17 plates between dorsal and caudal fin base and 16 between anal and caudal fin base; upper and lower unbranched caudal fin rays of the same size; body brownish *H. loricariformis* (rio Paraíba do Sul and rio Itapemirim)
- 5a. Abdominal plate diameter 3–4 times in eye diameter; large odontodes on margin of head and pectoral fin spine of males, anal fin length of males 4–5 times in SL and 6.2–7.2 in females .. *H. longipinna* (rio São Francisco drainage)
- 5b. Abdominal plate diameter about 6–8 times in eye diameter; odontodes on margin of head and pectoral fin spine of males absent; anal fin length 6.4–8.2 times in SL independently the sex ..... 6
- 6a. Body relatively broad, 5.2 times in SL; 27 lateral plates .... *H. rhombocephala* (rio Farias, Baía da Guanabara drainage)
- 6b. Body slender, 6–8 times in SL; 30–31 lateral plates .... *H. surinamensis* (Coppename, Suriname, and Marowijne rivers)
- 7a. Plate present anterior to opercular membrane; males without large odontodes posteriorly ..... 8
- 7b. Plate absent anterior to opercular membrane; body of males with large odontodes posteriorly ..... 10
- 8a. Interorbital width equal to eye diameter; preorbital crest prominent ..... *H. garavelloi* (rio Jequitinhonha)
- 8b. Interorbital width two times eye diameter; preorbital crest not prominent ..... 9
- 9a. Eight thoracic plates; males with well-developed odontodes along margin of head and on pectoral fin spine ..... *H. kronei* (rio Ribeira de Iguape)
- 9b. Four to six thoracic plates; males without hypertrophied odontodes along margin of head and on pectoral fin spine .... *H. carvalhoi* (rio Paraíba do Sul)
- 10a. Three to five thoracic plates; odontodes on posterior body shorter than interorbital width ..... *H. novalimensis* (rio das Velhas, São Francisco drainage)
- 10b. Thoracic plates absent; odontodes on posterior body longer than interorbital width ... *H. leiopleura* (rio das Velhas, São Francisco drainage)

COMPARATIVE MATERIAL EXAMINED

*Harttia carvalhoi*.—Brazil: São Paulo State: MZUSP 47590, 6: 52.4–74 mm SL; Rio de Ja-

neiro State: MZUSP 44163, 3: 45.4–48.4 mm SL; MZUSP 44505, 13: 25.8–71.4 mm SL.

*Harttia garavelloi*.—Brazil: Minas Gerais State: Holotype: MZUSP 43266, 85.7 mm SL; Paratypes: MZUSP 42484, 6: 58.5–78.4 mm SL; MZUSP 42696, 2, cleared and stained; MCP 15105, 3: 58.5–77.3 mm SL; MNRJ 12142, 3: 71.8–88.8 mm SL; MZUSP 42485, 1: 66.0 mm SL.

*Harttia gracilis*.—Brazil: São Paulo State: Holotype: MZUSP 43267, 101.4 mm SL; Paratypes: MZUSP 35399, 6: 44.6–102.0 mm SL; MZUSP 42695, 2, cleared and stained; MCP 15106, 3: 48.4–94.4 mm SL; MNRJ 12143, 3: 49–85.8 mm SL.

*Harttia kronei*.—Brazil: São Paulo State: MZUSP 36553, 17: 51–82.3 mm SL; MZUSP 53811, 9: 76.5–101.7 mm SL.

*Harttia leiopleura*.—Brazil: Minas Gerais State: Holotype: MZUSP 43264, 57.6 mm ; Paratypes: MZUSP 43265, 15: 42.8–56.5 mm SL; MZUSP 42701, 2, cleared and stained; MZUSP 37151, 10: 33.3–46 mm SL; MCP 15102, 12: 31.8–50.6 mm SL; MNRJ 12140, 12: 32.8–52.6 mm SL.

*Harttia loricariformis*.—Brazil: Espírito Santo State: MZUSP 41733, 1: 110.5 mm SL; Minas Gerais State: MZUSP 49263, 23: 32.8–156.4 mm SL; MNRJ 13364, 2: 64.6–120.4 mm SL; Rio de Janeiro State: MNRJ 13328, 1: 98.4 mm SL.

*Harttia novalimensis*.—Brazil: Minas Gerais State: Holotype: MZUSP 43262, 58 mm SL; Paratypes: MZUSP 37147, 16: 40.3–59 mm SL; MZUSP 43263, 34: 21.0–56.5 mm SL; MZUSP 42702, 2: cleared and stained; MCP 15103, 20: 32.0–53.6 mm SL; MNRJ 12141, 20: 33.7–53.4 mm SL.

*Harttia surinamensis*.—Surinam: Brokopondo District: ZMA 106.521, 1: 137.6 mm SL.

*Harttia torrenticola*.—Brazil: Minas Gerais State: Holotype: MZUSP 43283, 77.0 mm SL; Paratypes: MZUSP 37170, 51: 21.2–54.7 mm; MZUSP 42698, 2: cleared and stained; MZUSP 43286, 36: 29.0–76.5 mm SL; MCP 15104, 20: 38.3–74 mm SL; MNRJ 12144, 20: 40.0–64.0 mm SL.

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#### LITERATURE CITED

- BOESEMANN, M. 1971. The “comb-toothed” Loricariinae of Surinam, with reflections on the phylogenetic tendencies within the family Loricariidae (Siluriformes, Siluroidei). Zool. Verhand. 116:1–56.
- BRITSKI, H. A., AND F. LANGEANI. 1988. *Pimelodus paranaensis*, sp. n., um novo Pimelodidae (Pisces, Siluriformes) do Alto Paraná, Brasil. Revta. bras. Zool. 5:409–417.
- ISBRÜCKER, I. J. H. 1980. Classification and catalogue of the mailed Loricariidae (Pisces, Siluriformes). Versl. Tech. Gegeev., Inst. Taxon. Zool. (Zool. Mus.), Univ. Amsterdam 22:1–181.
- LANGEANI, F. 1990. Revisão do gênero *Neoplecostomus* Eigenmann and Eigenmann, 1888, com a descrição de quatro novas espécies do sudeste brasileiro (Ostariophysi, Siluriformes, Loricariidae). Comum. Mus. Ciênc. PUCRS, sér. Zool. 3:3–31.
- LEVITON, A. E., R. H. GIBBS JR., E. HEAL, AND C. E. DAWSON. 1985. Standards in herpetology and ichthyology. Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. Copeia 1985:802–832.
- OYAKAWA, O. T. 1993. Cinco espécies novas de *Harttia* Steindachner, 1876 da região sudeste do Brasil, e comentários sobre o gênero (Teleostei, Siluriformes, Loricariidae). Comum. Mus. Ciênc. PUCRS, sér. Zool. 6:3–27.
- RAPP-PY-DANIEL, L. 1997. Phylogeny of the Neotropical armored catfishes of the subfamily Loricariinae (Siluriformes: Loricariidae). Unpubl. Ph.D. diss., Univ. of Arizona, Tucson.
- RIBEIRO, P. de M. 1939. Sobre o gênero *Harttia* Steindachner (Peixes: Loricariidae). Boletim Biológico (nova série) 4:11–13.
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