

A Remarkable Sexually Dimorphic New Genus and Species of Neoplecostomine Catfish (Siluriformes, Loricariidae) from a Coastal Drainage of Eastern Brazil

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A new neoplecostomine genus and species is described from headwater tributaries of the lower Rio Pardo basin, a coastal drainage in Bahia, eastern Brazil. *Hirtella carinata* is a small loricariid with a maximum standard length barely reaching 50 mm. The new genus and species are diagnosed among all other loricariids by a unique, remarkable pattern of sexual dimorphism in which adult males have five conspicuous longitudinal rows of bristle-like hypertrophied odontodes on the head and along the lateral dermal plates of the body. *Hirtella* is further distinguished from most loricariids by the anterior position of the pelvic fin, which originates in a vertical anterior to the nuchal plate, and by the possession of an elongate keel formed by 15–17 azygous plates along the mid-dorsal line between the dorsal and the caudal fins. *Hirtella* is additionally distinguished from other members of the Neoplecostominae by having a medium sized palatine splint, never reaching the anterior border of the nasal fossa. Phylogenetic analysis indicates that *Hirtella* is the sister taxon of *Pareiorhina*. The description of this new genus raises to six the number of currently recognized genera in the Neoplecostominae.

Um novo gênero e espécie de neoplecostomíneo é descrito das cabeceiras de tributários do baixo Rio Pardo, drenagem costeira da Bahia, leste do Brasil. *Hirtella carinata* é um pequeno loricarídeo que atinge quase 50 mm de comprimento padrão. O novo gênero e espécie são diagnosticados de todos os demais loricarídeos por um único e notável padrão de dimorfismo sexual, em que os machos adultos possuem um conjunto de odontódeos hipertrofiados na cabeça e ao longo das placas laterais do corpo que formam cinco linhas longitudinais evidentes. *Hirtella* é também distinguido da maioria dos loricarídeos pela posição anterior das nadadeiras pélvicas, que se originam em uma vertical anterior a placa nuchal e pela presença de uma longa quilha formada por 15–17 placas ázigas na linha média dorsal, entre as nadadeiras dorsal e caudal. *Hirtella* é ainda distinguido dos outros membros de Neoplecostominae por ter o palatine splint de tamanho médio, nunca alcançando a borda anterior da abertura nasal. A análise filogenética atual indica que *Hirtella* é o táxon irmão de *Pareiorhina*. A descrição desse novo gênero eleva para seis o número de gêneros atualmente reconhecidos em Neoplecostominae.

THE subfamily Neoplecostominae was erected by Regan (1904) to accommodate *Neoplecostomus granosus*, a species he believed was intermediate between typical loricariids with the body encased in dermal plates and those devoid of dermal plates (Argiinae = Astroblepiidae). More than forty years later, Gosline (1947) proposed a significant rearrangement of Regan's classification and included *Canthopomus* (= *Pseudorinelepis*), *Corymbophanes*, *Delturus*, *Hemipsilichthys*, *Kronichthys*, *Neoplecostomus*, *Pareiorhaphis*, *Pareiorhina*, *Pogonopoma*, *Pogonopomoides* (= *Pogonopoma*), *Rhinelepis*, and *Upsilonodus* (= *Hemipsilichthys*) within a more encompassing Neoplecostominae. Isbrücker (1980) produced the most recent classification of the entire family Loricariidae, with only *Neoplecostomus* of these genera retained in the Neoplecostominae and the remaining genera transferred to the subfamily Hypostominae.

With the application of phylogenetic methods, *Isbrueckerichthys*, *Kronichthys*, *Pareiorhaphis*, and *Pareiorhina* were hypothesized to be closely related to *Neoplecostomus* by Montoya-Burgos et al. (1998), and later were recognized as members of a broader Neoplecostominae by Armbruster (2004). Most of the currently known diversity in the Neoplecostominae has been discovered and described in

the last 25 years, particularly in the genera *Neoplecostomus* and *Pareiorhaphis*. Nonetheless, the last genera described in the subfamily were *Pareiorhina* by Gosline (1947), and *Isbrueckerichthys*, proposed by Derijst (1996) as a replacement name to accommodate two species then in *Pareiorhaphis*.

The many distinct forms of secondary sexual dimorphism among loricariids were reviewed by Py-Daniel and Cox-Fernandes (2005). Dimorphisms include males being larger than females in some hypoptomatines (Nomura and Mueller, 1980), males having shorter snouts than females in some species of *Farlowella* (Retzer and Page, 1996), males having larger nostrils than females in some hypoptomatines (Calegari et al., 2011), males developing an enlarged, fleshy lower lip to carry developing eggs in *Furcodontichthys*, *Hemiodontichthys*, *Loricariichthys*, and *Pseudoloricaria* (Py-Daniel and Cox-Fernandes, 2005), mature males with a reduction of the lower lip filaments in *Apistoloricaria*, *Loricaria*, and *Planiloricaria* (Py-Daniel and Cox-Fernandes, 2005), males having more developed or flattened pectoral-fin spines, or bearing hypertrophied odontodes on that spine in *Acanthicus*, *Harttia*, *Hemipsilichthys*, *Lamontichthys*, *Lasiancistrus*, *Lithoxus*, *Panaque*, and *Rineloricaria* (Isbrücker

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and Nijssen, 1992), males having broader, more rounded premaxillary and dentary teeth in some loricariines (Isbrücker and Nijssen, 1992), and males with more developed tentacles on the snout in species of *Ancistrus* (Sabaj et al., 1999). In addition, mature females of the delturines *Hemipsilichthys papillatus* and *H. gobio* share a more elongate anal fin relative to conspecific males (Pereira et al., 2000; Reis et al., 2006). Furthermore, a skin flap occurs on the dorsal surface of the first pelvic-fin ray of males in the Neoplecostominae and Hypoptopomatinae, but is usually reduced or absent in females. Males, but not females, of both of these subfamilies have a conical urogenital papilla invariably present immediately behind the anal opening.

In addition to the above types of secondary sexual dimorphism, the odontodes also demonstrate many dimorphic features. Although odontodes are structures characteristic of the Loricarioidea (Schaefer and Lauder, 1986), additional development of these structures in mature males has only been observed in the Loricariidae and a few species of the Callichthyidae, with sexual dimorphism of the odontodes more general in the Loricariidae (Py-Daniel and Cox-Fernandes, 2005). Hypertrophied odontodes usually occur on the pectoral fin and lateral surfaces of the head, but some species possess developed odontodes on the interopercular and predorsal regions, the snout tip, the parieto-supraoccipital, and caudal peduncle. Some species show combinations of distinct body regions with hypertrophied odontodes, such as some species of *Hemipsilichthys*, *Pareiorhaphis*, and *Pseudancistrus*, which have a remarkable development of odontodes on the lateral surface of the head and on the pectoral-fin spine. *Hypostomus spinosissimus* similarly possesses hypertrophied odontodes on the lateral surfaces of the head, the pectoral-fin spine, and along the body plates. In addition, *Rineloricaria lanceolata* is well known for having hypertrophied odontodes on the cheeks, the pectoral-fin spine, and the parieto-supraoccipital and predorsal areas (Py-Daniel and Cox-Fernandes, 2005). Some species of hypoptopomatines have what were described as contact organs, on a portion of the caudal peduncle where the odontodes have a different orientation than those on the remainder of the peduncle (Aquino, 1994; Schaefer, 1997; Reis, 2004). With few exceptions, secondary sexually dimorphic odontode features are limited to males. When both males and females possess large odontodes, those of the males are the more developed (Py-Daniel and Cox-Fernandes, 2005).

The species described herein demonstrates a previously undocumented remarkable sexual dimorphism. It is unambiguously assignable to the Neoplecostominae, being at the same time readily distinguishable from the other genera of the subfamily. Determining the phylogenetic relationships of this new taxon is beyond the scope of the present study, and is deferred for a later study being prepared by two of the authors (EHL and RER). We diagnosed the new taxon, described a new genus and species, and discuss the characters used to place it within the Neoplecostominae, based on the available evidence.

MATERIALS AND METHODS

Measurements and counts were taken following Pereira et al. (2007), with the exception of those inapplicable due to the absence of an adipose fin in the new taxon. Preadipose azygous plates are accordingly replaced by azygous plates—the number of all unpaired plates covering the area otherwise occupied by the adipose fin. Counts of procurrent caudal-fin

rays, azygous plates and vertebrae were taken from cleared-and-counterstained specimens (CS) prepared according to Taylor and Van Dyke (1985). Vertebral counts include all vertebrae including the five centra incorporated into the Weberian Apparatus, with the compound caudal centrum (PU1+U1) counted as one element. Nomenclature and counts of body plates follow Schaefer (1997). Morphological measurements were taken as point-to-point linear distances using digital calipers to the nearest 0.1 mm under a stereomicroscope. Specimens examined belong to the following institutions: American Museum of Natural History, New York (AMNH), Academy of Natural Sciences, Philadelphia (ANSP), Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP), Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP), and Museu de Zoologia da Universidade Federal da Bahia, Salvador (UFBA). Number and standard length of specimens reported in Table 1 are included in parentheses in the list of paratypes. Adult males are herein defined as specimens having distinctive modifications that involve an elongate patch of hypertrophied odontodes along the lateral dermal plates of the body, although such individuals are not necessarily in reproductive maturity. Other specimens included in the list of material examined are a combination of females, young males, and immatures of both sexes.

Hirtella, new genus

urn:lsid:zoobank.org:act:D1C94DFD-5DC8-44A3-AC2C-140B6D B18D86

Type species.—*Hirtella carinata*, new species.

Diagnosis.—Diagnosed from all other genera of the Loricariidae by a unique pattern of secondary sexual dimorphism with bristle-like hypertrophied odontodes on the head and predorsal area and forming five longitudinal rows on the lateral plates of body in mature males. Also distinguished from all neoplecostomines and most loricariids by the anterior position of the pelvic fins, which originate on a vertical passing anterior to the nuchal plate and by the possession of an elongate keel of 15–17 azygous plates along the mid-dorsal line between dorsal and caudal fins. Further distinguished from all neoplecostomines, except *Neoplecostomus*, by having a medium-sized palatine splint never reaching the anterior border of the nasal fossa.

Etymology.—*Hirtella*, from the Latin *hirtus*, meaning hairy, prickly, in allusion to the bristle-like hypertrophied odontodes which distinguish the mature males of this species from conspecific females and from all other loricariids. Gender: feminine.

Hirtella carinata, new species

urn:lsid:zoobank.org:act:F0D8BC0B-09F2-4444-A250-2DCF470 31BDD

Figure 1, Table 1

Holotype.—MCP 48127, male, 43.9 mm SL, Brazil, Bahia, Camacan, Riacho Braço do Sul, tributary to Rio Panelão, lower Rio Pardo drainage, 15°25'17"S, 39°34'01"W, 300 m

Table 1. Morphometric and meristic data of *Hirtella carinata*. H = holotype, *n* = number of specimens, SD = standard deviation.

	Types					
	H	<i>n</i>	Low	High	Mean	SD
Standard length (mm)	44.0	40	32.0	49.2	42.3	4.11
Percent of standard length						
Head length	30.5	40	27.7	33.4	30.6	1.32
Predorsal length	41.1	40	39.1	44.5	41.8	1.52
Postdorsal length	43.2	40	41.2	48.6	44.3	1.62
Preanal length	60.7	40	58.5	64.5	61.2	1.67
Dorsal-fin spine length	18.4	40	17.4	21.9	19.7	1.02
Anal-fin unbranched ray length	16.0	40	12.7	19.3	15.7	1.69
Pectoral-fin spine length	16.6	40	16.4	20.4	18.1	1.09
Ventral-fin unbranched ray length	24.9	40	19.0	27.8	24.2	2.69
Upper principal caudal-fin ray	19.8	34	18.9	25.2	21.2	1.52
Lower principal caudal-fin ray	23.2	36	19.7	28.4	24.3	2.19
Trunk length	14.6	40	13.3	17.8	15.4	1.15
Abdominal length	25.8	40	24.1	28.1	25.9	0.96
Cleithral width	28.2	40	27.8	32.6	29.5	1.18
Body depth at dorsal-fin origin	19.8	39	16.4	22.2	18.5	1.14
Body width at dorsal-fin origin	21.9	40	19.1	25.2	22.1	1.59
Body width at anal-fin origin	15.3	40	11.1	16.6	13.7	1.27
Caudal peduncle length	40.2	40	35.7	42.2	39.5	1.59
Caudal peduncle depth	8.0	40	6.7	9.1	8.0	0.58
Caudal peduncle width	5.1	40	3.7	6.3	4.8	0.60
Percent of head length						
Snout length	66.7	40	58.9	68.8	64.0	2.07
Orbital diameter	13.1	40	13.1	16.5	14.5	0.71
Interorbital width	35.0	40	29.1	36.0	33.1	1.78
Head depth	58.5	40	50.4	63.9	55.4	3.36
Mandibular ramus left	24.5	40	20.6	26.0	23.3	1.27
Mandibular ramus right	23.1	40	20.2	26.0	23.0	1.37
Meristics						
Premaxillary teeth left	56	36	43	61	52.6	4.12
Premaxillary teeth right	58	36	44	64	53.2	4.60
Dentary teeth left	56	33	42	66	51.6	5.15
Dentary teeth right	54	36	41	63	51.6	5.32
Plates in median lateral series left	25	40	24	27	25.4	0.68
Plates in median lateral series right	25	40	24	27	25.4	0.67
Plates at dorsal-fin base	5	40	5	5	5.0	0.00
Plates at anal-fin base	2	40	2	3	2.1	0.33
Plates between anal and caudal	11	40	11	13	12.0	0.53

above sea level, 5 November 2009, A. M. Zanata, P. Camelier, and R. Burger.

Paratypes.—All from Brazil, Bahia, Camaçan, lower Rio Pardo drainage. UFBA 5633, 11, 18.2–44.0 mm SL (2, 41.9–43.5 mm SL), MCP 48128 (2, 44.4–49.1 mm SL + 1 CS, 40.9 mm SL), MZUSP 115091, 6, 28.3–43.5 mm SL (5, 36.4–43.5 mm SL), collected with the holotype; UFBA 5655, 1, 36.5 mm SL, Riacho Braço do Sul, tributary to Rio Panelão at Fazenda Tupinambá, 15°24'41"S, 39°33'11"W, 200 m above sea level, 5 November 2009, A. M. Zanata, P. Camelier, and R. Burger; UFBA 5660, 15, 11.3–49.2 mm SL (5, 40.9–49.2 mm SL), stream near entrance of R.P.P.N. Serra Bonita, tributary to Rio Panelão, 15°22'58.6"S, 39°33'21.4"W, 344 m above sea level, 3 November 2009, A. M. Zanata, P. Camelier, and R. Burger; UFBA 5662, 7, 11.3–42.5 mm SL, stream tributary to Rio Panelão, near research center of R.P.P.N. Serra Bonita, 15°23'30"S, 39°33'53"W, 796 m above

sea level, 3 November 2009, A. M. Zanata, P. Camelier, and R. Burger; UFBA 7606, 11, 29.9–46.5 mm SL (6, 36.7–46.5 mm SL), MCP 48129 (4, 41.6–45.4 mm SL), stream near entrance of R.P.P.N. Serra Bonita, tributary to Rio Panelão, 15°22'58.6"S, 39°33'21.4"W, 344 m above sea level, 16 September 2013, A. M. Zanata, T. Ramos, L. Oliveira, and T. Duarte; MCP 41340, 19, 17.3–48.7 mm SL (2, 47.3–48.7 mm SL), AMNH 262774, 3, 35.6–44.8 mm SL (1, 44.8 mm SL), Rio Panelinha at Biscó, 15°19'13.4"S, 39°32'57.1"W, 3 February 2007, M. Cetra and M. J. Trindade; MCP 45770, 19, 19.8–46.3 mm SL (8, 34.1–46.3 mm SL) + 4 CS, 19.4–43.8 mm SL, ANSP 198032 (3, 38.0–42.5 mm SL), Rio Panelinha at Biscó, 15°19'13.4"S, 39°32'57.1"W, 2008, M. Cetra.

Diagnosis.—As given for genus.

Description.—Morphometrics in Table 1. Counts and measurements based on holotype and 39 paratypes. Largest

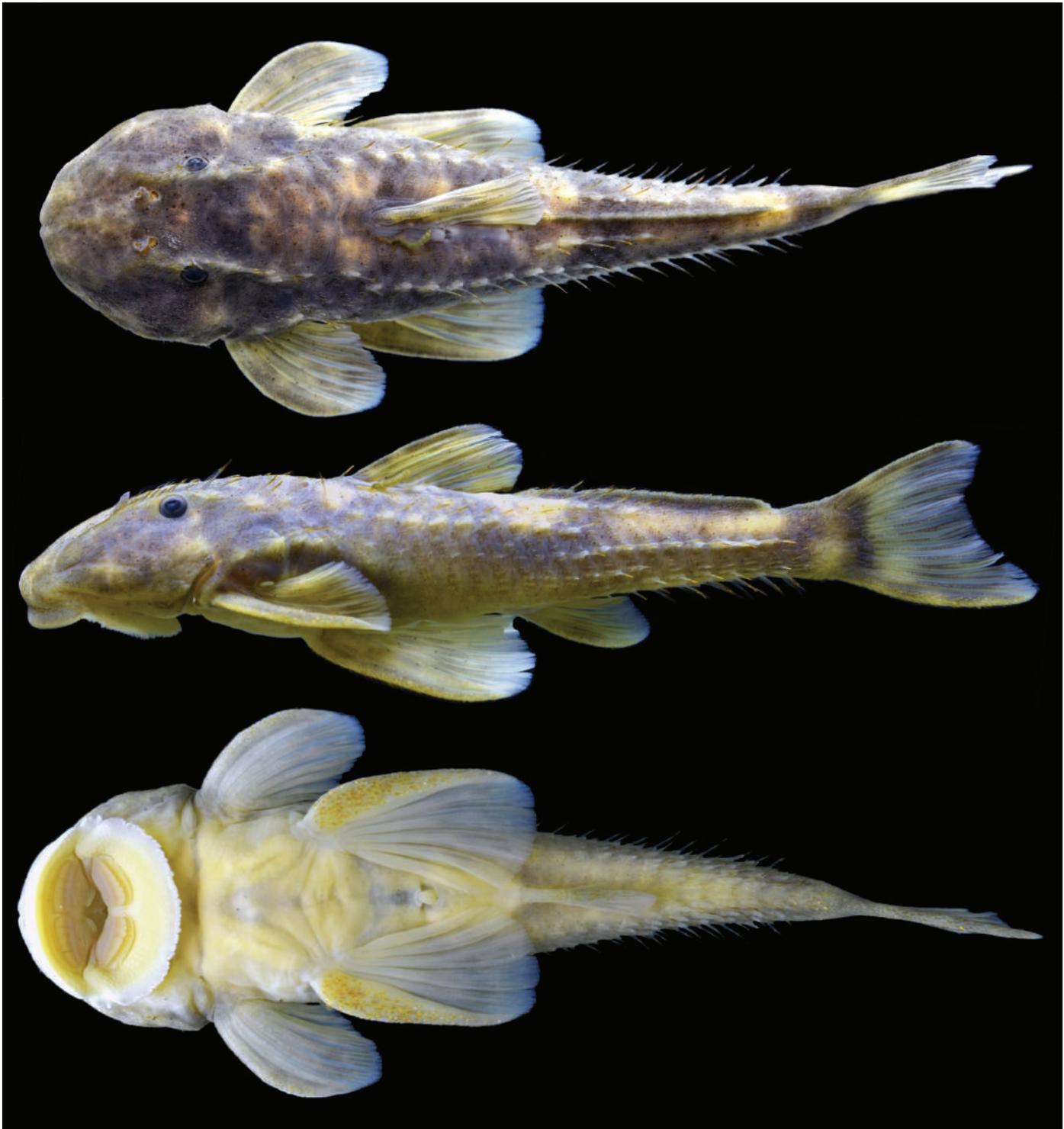


Fig. 1. *Hirtella carinata*, MCP 48127, holotype, 43.9 mm SL, male. Brazil, Bahia, Camaçan, Riacho Braço do Sul, tributary to Rio Panelão, lower Pardo drainage.

examined specimen 49.2 mm SL. Overall view of body in Figure 1. Body moderately depressed, progressively tapering from cleithrum to end of caudal peduncle. Snout gently convex in lateral profile. Dorsal profile of head and body slightly convex, anterodorsally inclined from snout tip to dorsal-fin origin, slightly concave from that point to first raised median unpaired plate posterior of dorsal fin, almost straight from that point to end of raised median ridge of unpaired plates, then slightly concave to caudal-fin base.

Ventral profile almost straight between snout tip and pelvic girdle, slightly elevating posteriorly along anal-fin base, almost straight along caudal peduncle. Greatest body depth at posterior limit of parieto-supraoccipital bone. Least body depth at shallowest point on caudal peduncle.

Head and predorsal region with rows of hypertrophied odontodes extending from posterior margin of naris to posterior limit of dorsal-fin base and forming conspicuous crest in adult males. Greatest body width at opercular

region. Trunk and caudal peduncle mostly oval in cross-section; flattened ventrally and more compressed caudally. Lateral-line canal in median plate series complete, with pored tubes visible from compound pterotic to caudal-fin base. Ventral profile of head and body almost straight from snout tip to pelvic girdle, slightly posterodorsally inclined along anal-fin base, and almost straight along caudal peduncle. Dorsal surface of body covered by plates except for narrow naked area around dorsal-fin base. Lower surface of head around lips and portion of body from pelvic-fin insertion to anal-fin origin completely naked. Lateral abdominal plates absent. Predorsal plates sometimes arranged in three or four pairs or without any noticeable arrangement. Mid-dorsal and mid-ventral series of lateral plates incomplete, ending 7–12 plates before caudal fin. Five distinct rows of bristle-like hypertrophied odontodes extending along lateral surface of body in adult males. Hypertrophied odontodes on dorsal series of plates positioned lateral of mid-dorsal ridge of raised plates posterior to dorsal fin; on mid-dorsal series of plates extending from posterior margin of nares across head to vertical through posterior margin of dorsal fin; on cleithrum and on few plates posterior of cleithrum on median series of plates, followed by gap, and then from end of dorsal-fin base to end of caudal peduncle; on mid-ventral series of plates only on three or four plates lateral to anal fin, and on ventral series of plates extending from posterior margin of pelvic fins to slightly anterior to end of caudal peduncle. Abdomen mostly naked but with few scattered odontodes irregularly arranged from pectoral girdle to slightly anterior of pelvic-fin insertion. Some specimens with only few odontodes on each side of abdominal region just posterior to gill opening. First anal-fin pterygiophore covered by skin. Anus positioned midway between pelvic-fin insertion and anal-fin origin. Pectoral girdle completely covered by skin with few odontodes embedded in skin laterally. Arrector fossa opened laterally.

Head short and moderately depressed. Profile of anterior portion of head and snout rounded in dorsal view. Superior margin of orbit elevated. Interorbital area flat to slightly concave. Dorsal surface of head with pair of ridges formed by hypertrophied odontodes extending from lateral to naris posteriorly through upper margin of orbit. In fully developed adult males ridges highly developed and continuing posteriorly on mid-dorsal series of lateral body plates to end of dorsal-fin base. Hypertrophied odontodes absent on cheek. Posterior tip of parieto-supraoccipital without enlarged or raised odontodes even in adult males. Small ovoid area on snout tip devoid of odontodes. Rostral plate absent; two large postrostral plates laterally anterior to preoperculum. Preoperculum exposed. Canal-bearing lateral cheek plate with branched canal. Eye small, dorsolaterally situated. Iris operculum absent or very reduced. Nostrils ovoid, positioned closer to anterior margin of orbits than to snout tip.

Oral disk ovoid and relatively small. Lips moderate-sized and occupying approximately two-thirds of ventral surface of head. Upper lip narrow, covered with small rounded papillae. Lower lip short, not reaching pectoral girdle. Ventral surface of lower lip covered with small rounded papillae and with wide, smooth band devoid of papillae preceding lip margin. Papillae surrounded by narrow naked areas decreasing in size posteriorly. Posterior border of lower lip slightly fringed. Maxillary barbel short, mostly adnate to

lower lip and with small free portion distally. Both premaxillae and dentaries forming shallow arches with overall angle slightly less than 180 degrees and with mesial ends slightly curved inward. Dentary tooth series separated medially by noticeable gap. Teeth slender, asymmetrically bifid. Medial cusp large and slightly curved inwards. Lateral cusp small and pointed, usually not reaching mid-length of medial cusp. Accessory patch of unicuspid teeth absent from both premaxilla and dentary.

Dorsal fin short, posterior margin straight or slightly convex; adpressed rays usually contacting first postdorsal azygous plates in females and immature males, reaching third postdorsal azygous plates in adult males. Nuchal plate and dorsal-fin spinelet exposed, not covered by skin. Dorsal-fin spinelet transversely ovoid, usually slightly wider than base of dorsal-fin spine, sometimes divided into two small plates. Dorsal-fin locking mechanism non-functional. Moderately flexible dorsal-fin spine, followed by seven branched rays. Adipose fin absent; replaced by conspicuously elongate postdorsal ridge formed by 15–17 raised median azygous plates. Pectoral-fin origin situated more dorsally than pelvic-fin origin. Pectoral fin short with posterior margin slightly rounded. Tip of adpressed pectoral fin falling short of or almost reaching mid-length of pelvic-fin unbranched ray. Pectoral-fin spine slightly curved, flattened dorsally and more rounded ventrally; bearing minute odontodes over entire surface. Pectoral-fin spine not thickened in adult males. Dorsal fin with six branched rays; first and second longer than spine. Subsequent branched rays decrease gradually in size, with last ray one-half length of first ray. Pelvic fin well developed, distinctly longer than pectoral fin, its origin positioned on vertical anterior to dorsal-fin nuchal plate. Pelvic fin with one unbranched and five branched rays. Tip of adpressed pelvic fin falling short of or just reaching anal-fin origin in females, immature males, and juveniles; extending beyond anal-fin origin in adult males. Posterior margin of pelvic fin slightly rounded. Pelvic-fin unbranched ray dorsoventrally flattened, covered with minute odontodes ventrally and laterally. Well-developed dermal flap present on dorsal surface of unbranched ray; flap of males higher near base of fin and extending to ray tip; flap of females small or absent. Internal and external anterior processes of pelvic-fin basipterygium fused into compact bone. Anal fin with one unbranched and five branched rays. Tip of adpressed fin reaching one-half length of postdorsal ridge level. Posterior margin of caudal fin forked or slightly concave, with 14 branched rays. Dorsal caudal-fin lobe with four and ventral lobe with three or four plate-like procurrent rays; posteriormost elongate. Hypural plate asymmetrical with lower lobe slightly longer than upper. Total vertebral centra 28–29.

Color in alcohol.—Body mostly dark brown dorsally with three lighter dorsal blotches; first on predorsal plates, second immediately posterior to dorsal-fin base, and third lateral and posterior to mid-dorsal azygous plates. Dorsal surface of head and most of lateral surface of body with several indistinct scattered lighter spots. Dorsal and lateral surface of body with thin, longitudinal, lighter stripes accompanying rows of hypertrophied odontodes. Ventral surface of head and trunk pale yellow. Dorsal-fin rays mostly dark, with 2–3 inconspicuous lines of darker spots. Pectoral-fin rays with 2–3, and pelvic-fin rays with 3–4 lines of dark brown spots. Anal fin with 1–2 inconspicuous spots on first



Fig. 2. Ventral view of *Hirtella carinata* showing differences in shape and proportional size of pelvic fins. Left, male 43.9 mm SL (MCP 48127) and right, female 44.4 mm SL (MCP 48128).

ray and in some specimens also on branched rays. Caudal fin with transverse, dark brown band basally and 1–2 irregular transverse dark brown bands across middle of rays. Inter-radial membranes hyaline on all fins.

Sexual dimorphism.—Secondary sexual dimorphism common of other neoplecostomines is present in the form of a pelvic-fin flap on the dorsal surface of the first pelvic-fin ray of males (vs. absent or poorly developed in females), and the conical urogenital papilla of males, located immediately posterior to the anal opening (vs. absent in females). In addition, adult males are ornamented with remarkable morphological modifications unusual among neoplecostomine species—the development of hypertrophied odontodes and the shape and size of the pelvic fins. Adult males of *Hirtella carinata* have rows of bristle-like, hypertrophied odontodes on the head and body (Fig. 1). The dorsal-most row of hypertrophied odontodes is short and situated on the dorsal series of lateral plates, immediately posterior to the dorsal fin. The second and anteriormost row extends from the dorsal margin of the orbit on the head to the area above the anal-fin base with usually one large odontode on each plate of the mid-dorsal lateral series of plates. The third row of bristle-like odontodes begins on the lateral portion of the exposed cleithrum and continues on the first plates of the mid-lateral series. This row is interrupted after a few plates and then restarts on the middle series of lateral plates above the anal-fin base and continues to the end of the caudal peduncle. Above the anal-fin base, rows of hypertrophied odontodes are also present on the mid-ventral and ventral series of lateral plates, with more odontodes (2–5) on each plate.

The size and shape of the pelvic fin are also sexually dimorphic in *Hirtella carinata* (Fig. 2). The first ray of the pelvic fin of males is thicker and stronger than that of females. In addition, the pelvic fin of males is much longer, always reaching to, or surpassing, the anal-fin origin. The shorter pelvic fin of females falls short of the anal-fin origin.

Etymology.—*Hirtella carinata* is named from the Latin *carina*, meaning keel, ridge, in allusion to the elongate keel of azygous plates at mid-dorsal line, between dorsal and caudal fins. An adjective.

Geographic distribution.—*Hirtella carinata* is known from four localities in small rivers and creeks tributaries to the Rio Panelão, itself a tributary to the lower Rio Pardo drainage, near the town of Camacan in southern Bahia State, Brazil (Fig. 3).

Habitat and ecological notes.—The Rio Pardo is an eastern Brazilian coastal drainage with its upper and part of middle portions located in the state of Minas Gerais and its lower portion in the state of Bahia, in the Atlantic Forest domain. *Hirtella carinata* was captured at elevations ranging from 200 to 796 meters above sea level, in small headwater streams emptying into the lower portion of the Rio Pardo drainage. The new species inhabits clear water stretches of moderate to rapid water current (Fig. 4), 1.0–5.0 meters wide, a few centimeters to one meter deep, and with bottoms of rocks, pebbles, organic debris, and usually small amounts of sand. Specimens were collected within, or near, the Serra Bonita Reserve Complex, a Private Natural Heritage Reserve (R.P.P.N.), which consists of a consortium of privately

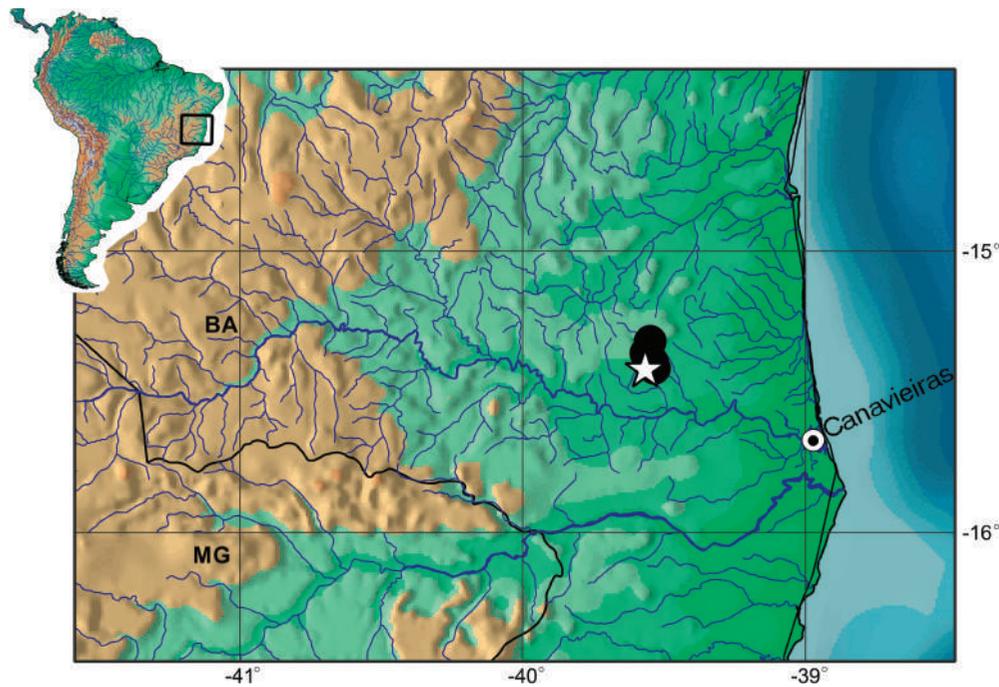


Fig. 3. Geographic distribution of *Hirtella carinata* in the Rio Pardo drainage, eastern Brazil (type locality represented by an open star). BA = Bahia State and MG = Minas Gerais State.



Fig. 4. Detail of habitat in stream near entrance of R.P.P.N. Serra Bonita, tributary to Rio Panelão, 15°22'58.6"S, 39°33'21.4"W, 344 m above sea level; collecting locality of *Hirtella carinata*.

owned properties that covers an area of approximately 7,500 hectares and represents one of the last remnants of moist submontane forest in the region (Instituto Uiraçu, Serra Bonita, <http://www.uiracu.org.br/serrabonita.html>. Accessed on 6 January 2014). Approximately 50% of the land cover around the R.P.P.N. is primary forest, and the remaining is a mosaic of forests in advanced stages of recovery mixed with 'cabruca' (cocoa trees planted under natural forest canopy) and small areas of pasture. These shade cocoa plantations represent poor habitat for forest-dependent ferns, intermediate quality habitat for birds, but high quality habitat for many forest-associated species of frogs, lizards, and bats (Faria et al., 2007). Thus, *Hirtella carinata* apparently is restricted to streams in pristine or good condition, and was collected syntopically with other fish species, including some unidentified or possibly undescribed species of *Astyanax*, *Characidium*, *Geophagus*, *Hypostomus*, and *Trichomycterus*.

DISCUSSION

Hirtella carinata is an intriguing species due to its peculiar morphology and hairy appearance, but it shares the features that unambiguously place it as a member of the Neoplecostominae. *Hirtella carinata* shares with all other members of Neoplecostominae and Hypoptopomatinae the following derived character states: (1) the olfactory organ not totally encapsulated, being partially or totally open ventrally (subsequently reversed in some members of the Hypoptopomatinae and *Neoplecostomus*), (2) the possession of a small, conical urogenital papilla behind the anal tube of males, (3) the dorsal-fin spinelet modified into a small, roundish or rectangular bony platelet, usually supporting odontodes and never V-shaped, (4) the unbranched pelvic-fin ray widened and flattened ventrally, its transverse section becoming roughly triangular, and (5) the ventromesial process of the unbranched pelvic-fin ray bearing a

posterior expansion for the insertion of the abductor superficialis muscle. *Hirtella*, however, can be readily distinguished from the Hypoptopomatinae by lacking the derived features for that subfamily, as follows: (1) the lateral ethmoid exposed posterior to the nasal opening and supporting short odontodes, (2) the transverse processes of the second dorsal-fin pterygiophore directed anterolaterally, (3) the pectoral girdle exposed to different degrees along its ventral surface and supporting odontodes, (4) the arrector fossa totally or partially closed by ventral laminar expansions of the cleithrum and coracoid, and (5) the odontodes on the ventral surface of the unbranched pelvic-fin ray turned medially (also present in *Kronichthys*). Furthermore, *Hirtella* shares the following putative derived features with the remaining members of the Neoplecostominae: (1) the lack of a dorsal expansion on the posterior margin of first epibranchial, (2) the posterodorsal margin of the lateral ethmoid with a small expansion forming an articular facet for the metapterygoid, (3) the metapterygoid completely sutured to the hyomandibula along its entire posterior margin, and (4) the possession of a patch of small platelets on the naked area posterior to the compound pterotic.

Within the Neoplecostominae, *Hirtella* is readily distinguished by the unique secondary sexual dimorphism of males that includes the bristle-like odontodes on body, the anteriorly shifted position of the pelvic fins, an elongate keel of 15–17 postdorsal azygous plates along the mid-dorsal line and, except for two species of *Pareiorhina*, the absence of an adipose fin. In addition to those features, *Hirtella* is distinguished from *Kronichthys* by having the tooth series in both the dentary and premaxilla straight and forming a wide angle (vs. the tooth series strongly curved medially, in such a way that the medial portion of the tooth series are turned and run parallel to each other), and the posteriorly directed odontodes on the ventral surface of the unbranched pelvic-fin ray along the ray axis (vs. odontodes turned medially). *Hirtella* is distinguished from *Isbrueckerichthys* by having an almost completely naked abdomen (vs. the abdomen covered with many tiny platelets embedded in the skin), the second infraorbital forming the lateral margin of the nasal opening (vs. the infraorbital series displaced from the lateral margin of the nasal opening), the three longitudinal rows of lateral plates on the posterior portion of the caudal peduncle (vs. the six or more longitudinal rows), and a dorsal-fin spinelet (vs. the spinelet usually absent).

Hirtella can be further distinguished from *Neoplecostomus* by its slightly curved pectoral-fin spine (vs. the pectoral-fin spine distinctly curved and forming a wide and conspicuous arch), by having a simple, rod-like lateropterygium on the pelvic fin (vs. the distal tip of the lateropterygium distinctly spatulated), the olfactory organ not completely encapsulated by the lateral ethmoid (vs. the olfactory organ totally encapsulated by the lateral ethmoid), by the absence of a conspicuous cluster of enlarged papillae on the lower lip immediately posterior to each dentary (vs. a cluster of enlarged papillae present), and by having a naked abdomen (vs. the abdomen covered by a set of rounded, compact plates and forming a dense plate shield between the pectoral- and pelvic-fin insertions).

Hirtella is also distinguished from *Pareiorhaphis* by having the cheek canal plate loosely attached to the ventral margin of the preopercle (vs. the canal plate firmly articulated to the preopercle in mature males), by the absence of a dense patch of hypertrophied odontodes on the lateral portion of the

head of mature males (vs. the lateral margin of the head with a dense patch of hypertrophied odontodes in mature males), and a long mid-dorsal keel between the dorsal and the caudal fins and thus lacking an adipose fin (vs. adipose fin present and keel absent).

Within the Neoplecostominae, *Hirtella* is most similar, and putatively more closely related, to *Pareiorhina*, with which it shares the small body size and three derived features, including (1) the transverse process of the first dorsal-fin pterygiophore is not articulated to the transverse processes of the second pterygiophore, (2) the absence of an adipose fin, and (3) the short posterodorsally projected process on the anterodorsal region of the basipterygium. Nevertheless, *Hirtella* does not share a series of other synapomorphic features of *Pareiorhina* and is readily distinguished from the later by having a wide, solid suture of the contralateral cleithra and coracoids along the midventral symphysis (vs. cleithrum and coracoid narrow at the midventral symphysis, thereby forming a very small suture along the midline). In addition, *Hirtella* is overall narrower than the species of *Pareiorhina* and readily distinguishable externally, not fitting in what is typically identified as a member of *Pareiorhina*.

Contrary to most loricariids, *Hirtella carinata* does not show any secondary sexual dimorphism in body size, lip shape, labial papillae, shape or size of the pectoral or anal fins, or oral teeth. The urogenital papilla and the skin flap on the unbranched pelvic-fin ray are the only sexually dimorphic traits of *Hirtella* shared with other loricariids. *Hirtella* does not share the dimorphic characters of the lips or teeth present in loricariines and ancistrines. Dimorphic features usually present in delturines and some neoplecostomines, such as hypertrophied odontodes on the lateral margin of head, and the pectoral-fin spine swollen and ornamented with hypertrophied odontodes are similarly absent in *Hirtella*.

Among members of the family Loricariidae, only a few other species possess long, hypertrophied odontodes superficially similar to those of *Hirtella*. Adult males of *Hypostomus unicolor* and *H. ammophilus* have bristle-like, hypertrophied odontodes, which are thin and flexible, and entirely cover the dorsal and lateral surface of the caudal peduncle (Armbruster and Page, 1996). *Harttia leiopleura* similarly has hypertrophied odontodes covering most of the lateral surface of the body, but without a clear arrangement along the lateral plates. In *Hirtella*, on the other hand, the hypertrophied odontodes are aligned, giving the appearance of clearly defined ridges of hypertrophied odontodes that begin on the head and continue onto the lateral plates of the body. In addition, usually only one bristle-like, hypertrophied odontode is present in each lateral plate, whereas two or more such odontodes can occur in the ventral and lateroventral region of the caudal peduncle. This unique secondarily sexually dimorphic configuration of hypertrophied odontodes among loricariids is diagnostic for the genus and is a new type of sexually dimorphic feature.

The discovery of *Hirtella carinata* in the Rio Pardo basin of southern Bahia increases the diversity of neoplecostomines in the northern limit of the distribution of the subfamily, since only species of *Pareiorhaphis* were previously known to occur in the coastal drainages of southern Bahia. Although the coastal drainages of eastern Brazil are relatively well sampled, it is likely that additional loricariid diversity remains to be discovered in the area.

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