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**The genus *Peckoltia* with the description of two new species and  
a reanalysis of the phylogeny of the genera of the Hypostominae  
(Siluriformes: Loricariidae)**

JONATHAN W. ARMBRUSTER



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## The genus *Peckoltia* with the description of two new species and a reanalysis of the phylogeny of the genera of the Hypostominae (Siluriformes: Loricariidae)

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### Abstract

*Peckoltia* contains 12 described species, eight of which are considered valid. *Peckoltia arenaria*, *P. filicaudata*, and *P. ucayalensis* are recognized as synonyms of *P. bachi* and *P. kuhlmanni* is recognized as a synonym of *P. vittata*. In addition, two new species are described. The type species of *Peckoltichthys* and *Sophiancistrus* are synonyms of *P. bachi* and both genera are recognized as junior synonyms of *Peckoltia*. The species of *Peckoltia* range throughout much of the Amazon basin, the upper Orinoco, the upper Essequibo, and perhaps the Maroni, and can be identified from most other ancistrins by having dentaries that form angle of 90° or less and from others with angled dentaries by lacking the synapomorphies of those genera. The species of *Peckoltia* vary from one another mostly in coloration. *Peckoltia braueri*, *P. caenosa* n. sp., *P. cavatica* and *P. vittata* lack spots on the head while the other species have them. *Peckoltia braueri* and *P. cavatica* have orange bands in the dorsal and caudal fins and have the bones and plates of the head and nape outlined in black (vs. no orange bands and head plates and bones not outlined in black in *P. caenosa* and *P. vittata*). *Peckoltia caenosa* has a color pattern consisting of dark vermiculations on the head and abdomen (vs. saddles or blotches on the head and faint dark spots on the abdomen in *P. vittata*). Among the species with spots on the head, *P. lineola* n. sp. and *P. vermiculata* have some of the spots combining to form vermiculations (vs. spots free in *P. bachi*, *P. brevis*, *P. furcata*, and *P.*

*oligospila*) with the vermiculations larger than the pupil in *P. lineola* and narrower in *P. vermiculata* and the vermiculations radiating from a central point in *P. vermiculata* vs. no such pattern in *P. lineola*. *Peckoltia bachi* can be identified from the other species by having widened pelvic-fin spines that can be pulled ventrally such that they are completely ventral and parallel to the body (vs. pelvic-fin spines narrow and cannot be adducted ventral to body) and by having the eye low on the head (vs. high). *Peckoltia brevis* can be identified from *P. furcata* and *P. oligospila* by having well-developed dorsal saddles (vs. saddles faint), no spots on the body behind the nape (vs. spots generally present behind the nape); from *P. oligospila* by having bands in the caudal fin (vs. spots); and from *P. furcata* by having the lower caudal-fin spine longer than the upper (vs. upper spine longer). *Peckoltia furcata* can be identified from *P. oligospila* by having the upper caudal-fin spine longer than the lower (vs. lower spine longer) and by having bands in the caudal fin (vs. spots). *Ancistrus yaravi* had been recognized as a species of *Peckoltia*. The type of *A. yaravi* is lost, but the original description suggests that the species is the senior synonym of *Neblinichthys roraima*. A revised morphological phylogeny demonstrates the lack of support for *Peckoltia* and *Hemiancistrus* as monophyletic, and phenetic definitions are provided for the two genera. The phylogeny also demonstrates a lack of support of the genus *Watawata*.

**Key words:** Ancistrini, *Hemiancistrus*, *Neblinichthys*, Neotropics, South America

## Introduction

*Peckoltia* is a medium-sized genus of the loricariid catfish subfamily Hypostominae, tribe Ancistrini with 13 species currently recognized from the Orinoco, Amazon, and Essequibo River drainages (Fisch-Muller, 2003; Armbruster, 2004; Armbruster and Werneke, 2005). The name *Peckoltia* is often applied to a wide variety of fishes by scientists and aquarists, but the true *Peckoltia* are fairly rare in collections and are rarely exported for the pet trade. Most species that masquerade as *Peckoltia* are species of *Panaque* (*Panaqolus*) or *Hypancistrus*.

Currently, the state of the taxonomy of *Peckoltia* is confused. No diagnosis has been presented for *Peckoltia*, and the species placed in *Peckoltia* and the potentially related *Hemiancistrus* are in a state of disarray. In the original description of *Peckoltia*, Miranda Ribeiro (1912) did not designate a type species for the genus, although *Chaetostomus vittatus* Steindachner 1881 would be the type by monotypy, and later Gosline (1945) designated *Chaetostomus vittatus* as the type of *Peckoltia*. Ferraris (2007) states that Miranda Ribeiro had intended on publishing *Peckoltichthys* as a replacement name for *Peckoltia*, which was already a genus of plants. The publication of this paper was delayed (Miranda Ribeiro, 1920), and was preceded by the publication of *Peckoltichthys filicaudatus* as the sole species (and the type by monotypy) of *Peckoltichthys* (Miranda Ribeiro, 1917). Isbrücker (1980) recognized *Peckoltichthys* as an unnecessary emendation of *Peckoltia* and kept this arrangement later (Isbrücker, 2001); however, with each genus having a different type species, this is incorrect. Isbrücker *et al.* (2001) described *Sophiancistrus* (type *Hemiancistrus ucayalensis* Fowler 1940). *Peckoltichthys* and *Sophiancistrus* were recognized as synonyms of *Peckoltia* in Fisch-Muller (2003) and Armbruster (2004). Fisch-Muller (2003) also recognized *Ancistomus* as a synonym of *Peckoltia*, but Armbruster (2004) recognized it as a synonym of *Hemiancistrus*.

The species of *Peckoltia* and *Hemiancistrus* were found to be part of several clades (Armbruster, 2004). *Peckoltia ucayalensis* was sister to *Panaque*, and species similar to *Peckoltia vittata* were sister to this larger clade. *Peckoltia sabaji* and *Hemiancistrus* sp. (now described as *H. guahiborum*) were found to be in an unresolved polytomy at the base of the other species of *Peckoltia*, *Panaque*, *Hypancistrus*, and *Parancistrus*. Other species of *Hemiancistrus* were found to be members of *Pseudancistrus*, the Pterygoplichthini, and at the base of the Ancistrini. *Peckoltia* presents a very difficult and confusing taxonomic problem. In this paper, *Peckoltia* is restricted to those species similar to *P. vittata*, the type of the genus, a phenetic definition of *Peckoltia* is provided as the genus does not appear to be monophyletic, two new species of *Peckoltia* are described, *Peckoltichthys* and *Sophiancistrus* are recognized as junior synonyms of *Peckoltia*. *Peckoltia sabaji* is transferred to *Hemiancistrus* until such time as a proper diagnosis of *Hemiancistrus* can be made. *Ancistrus snethlageae* (placed in *Peckoltia* by Fisch Muller, 2003, and Ferraris, 2007, and in *Ancistomus*,

Isbrücker et al., 2001), was recognized in *Hemiancistrus* by Armbruster (2004), and is included in a revised and expanded phylogenetic analysis based on Armbruster (2004).

## Methods

Methods follow Armbruster (2003a). Institutional abbreviations are as listed in Leviton *et al.* (1985) with the addition of UG/CSBD for the University of Guyana, Center for the Study of Biological Diversity. *Peckoltia braueri* and *P. cavatica* were recently described or redescribed (Armbruster and Werneke, 2005), and descriptions are not repeated here. *Peckoltia multispinis* is not included in species diagnoses and the key because the species is of dubious validity and I have only examined photographs of the recently rediscovered type (see *P. multispinis* description). Names of skeletal characteristics are as in Schaefer (1987) and of plate rows as in Schaefer (1997). The following abbreviations are used in the text: cs = cleared and stained, D. = distance, Dia. = diameter, Dp. = depth, dr. = drainage, L. = length, premax. = premaxillary, W = width. Cleared and stained specimens indicated in specimens examined lists are included in the number of specimens examined (4, 1 cs means that there are four specimens in total, one of which is cleared and stained).

The phylogenetic analysis follows Armbruster (2004), and a revised data matrix with new taxa and some minor revision of character states (Appendix 1). Revisions to Armbruster (2004) only involved some taxa changing states for a few characters and Character 103 was removed as it did not seem to be providing phylogenetic signal. Some taxa (particularly some *Hypostomus* and some *Pareiorhaphis*) were removed from Armbruster's (2004) dataset because they were part of large polytomies; however, data for these removed species are given in Appendix 1. The partially ordered matrix with *Scoloplax* excluded of Armbruster (2004) was used. Phylogenetic analysis was performed using PAUP\*, version 4.0b4a, (Swofford, 2000) using 100 replicates of the tree bisection-recombination algorithm of the heuristic search. The ingroup included most genera of the Hypostominae and the Neoplecostominae, representative members of the Loricariinae and the Hypoptommatinae, and *Astroblepus* and *Lithogenes*, and the outgroup included several callichthyids. One hundred bootstrap replicates were performed in PAUP\* using a heuristic search (TBR) with one replicate and the maximum number of trees set at 15,000. Character state evolution was examined using MacClade, ver. 3.08a (Maddison and Maddison, 1999) on the first of the trees found (as in Armbruster, 2004) with only unambiguous characters resolved for those nodes in the strict consensus tree (Appendix 2). Bremer Decay support was estimated with TreeRot using 40 heuristic search (TBR) replicates per node with the maximum number of trees set at 1000.

## *Peckoltia* Miranda Ribeiro (1912)

*Peckoltia* Miranda Ribeiro, 1912:7. Type species: *Chaetostomus vittatus* Steindachner, 1881.

*Peckoltichthys* Miranda Ribeiro 1917:49. Type species: *Peckoltichthys filicaudatus* Miranda Ribeiro, 1917.

*Sophiancistrus* Isbrücker & Seidel 2001 (in Isbrücker, et al., 2001):21. Type species: *Hemiancistrus ucayalensis* Fowler, 1940.

### Species Included:

*Hemiancistrus arenarius* Eigenmann and Allen 1942 (synonym of *P. bachi*)

*Chaetostomus bachi* Boulenger 1898

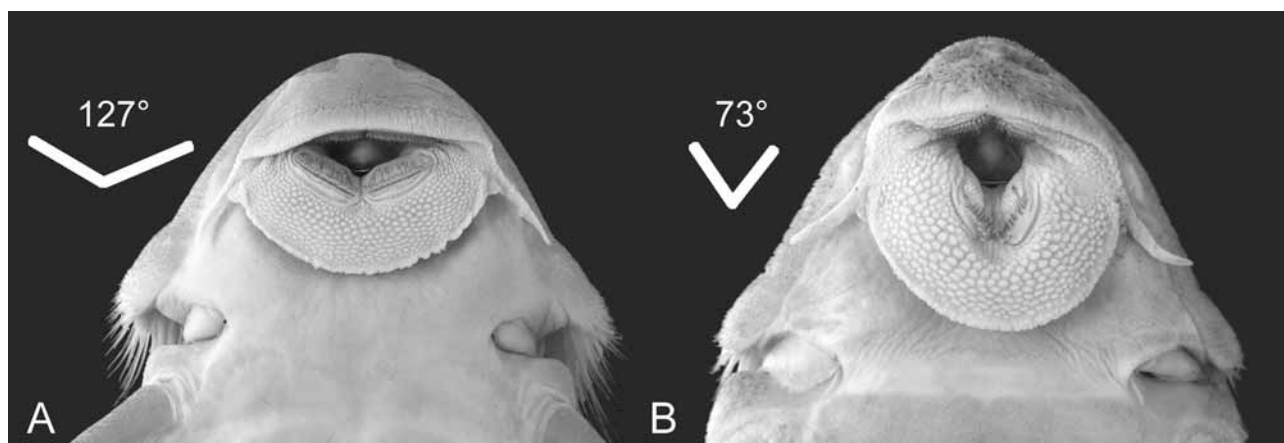
*Hemiancistrus braueri* Eigenmann 1912

*Hemiancistrus brevis* La Monte, 1935

*Peckoltia caenosa* new species

*Peckoltia cavatica* Armbruster and Werneke 2005

*Peckoltichthys filicaudatus* Miranda Ribeiro 1917 (synonym of *P. bachi*)  
*Chaetostomus furcatus* Fowler 1940  
*Peckoltichthys kuhlmanni* Miranda Ribeiro 1920 (synonym of *P. vittata*)  
*Peckoltia lineola* new species  
*Ancistrus multispinis* Holly 1929  
*Chaetostomus oligospilus* Günther 1864  
*Hemiancistrus ucayalensis* Fowler 1940 (synonym of *P. bachi*)  
*Chaetostomus vittatus* Steindachner 1881 (type species of *Peckoltia*)  
*Chaetostomus vittatus vermiculata* Steindachner 1908 (recognized as *Peckoltia vermiculata*)



**FIGURE 1.** Ventral view of mouths of A. *Hemiancistrus snethlageae* MCP 15151, 132.8 mm SL, and B. *Peckoltia lineola*, MCNG 55684, holotype, 88.1 mm SL. Lines are representations of the orientations of the dentaries and the approximate angle for these fishes is provided.

**Diagnosis:** *Peckoltia* cannot be diagnosed by any synapomorphies and is likely a paraphyletic assemblage. In the phylogenetic analysis below, it was not monophyletic; however, there are no clues as to how *Peckoltia* should either be split or combined with other genera, support for nodes around the species of *Peckoltia* are weak, and *Peckoltia* is recognized through the set of comparisons that follow. *Peckoltia* can be diagnosed from all other loriciariids except members of the Ancistrini and Pterygoplichthyini by having hypertrophied cheek odontodes on plates that can be everted greater than 75° from the head. *Peckoltia* can be identified from the Pterygoplichthyini by lacking a modified stomach (vs. having the stomach connected to the dorsal abdominal wall by a connective tissue sheet (see Armbruster, 1998b; 2004)); from *Pterygoplichthys* by having seven dorsal-fin rays (vs. nine or more); and from the *Hemiancistrus annectens* group by having more than ten hypertrophied cheek odontodes in adults (vs. usually three or less although up to nine). *Peckoltia* can be identified from all other ancistrins except *Exastilithoxus*, *Hypancistrus*, *Leporacanthicus*, *Lithoxus*, *Megalancistrus*, *Panaque* and *Spectracanthicus* by having the dentaries forming angle of ~90° or less (Fig. 1); from *Exastilithoxus*, *Leporacanthicus*, and *Lithoxus* by having oval lips (vs. round lips), and by having a very deep body (vs. dorsoventrally flattened); from *Exastilithoxus* by lacking fimbriae along the lower lip; from *Leporacanthicus* by lacking fimbriae above the upper lip; from *Leporacanthicus*, *Megalancistrus*, and *Pseudacanthicus* by having three plates between the head and the dorsal fin (vs. four or more, nuchal plate is included), by lacking sharp keel odontodes, by having viliform (vs. stout) teeth; from *Hypancistrus* by having the teeth in the dentary and premaxilla of about equal size (vs. dentary teeth almost twice as long as premaxillary teeth); from *Panaque* by having viliform teeth (vs. spoon-shaped or elongate, spatulate teeth); from *Panaque* (*Panaqolus*) by always having at least a small buccal papilla (vs. buccal papilla absent); from *Spectracanthicus* by having the dorsal and adipose fins separate (vs. posterior membrane of the dorsal fin expanded such that it contacts at least the preadipose plate and usually the adipose-fin spine), by usually lacking odontodes

on the opercle as adults (vs. odontodes present), and by having a pattern of dorsal saddles (vs. either all dark or dark with white to yellow spots); and from *Spectracanthicus murinus* by having evertible cheek plates with hypertrophied odontodes.

Adult *Peckoltia* (except some *P. bachi*) have no odontodes on the opercle, a trait shared among the ancistrins with *Baryancistrus*, *Hemiancistrus*, *Hypancistrus*, *Panaque*, and *Parancistrus*. In addition to the shortened, angled jaws, *Peckoltia* can be identified from *Baryancistrus* and *Parancistrus* by having the posterior membrane of the dorsal fin short and the dorsal and adipose fins separate (vs. posterior membrane of the dorsal fin expanded such that it contacts at least the preadipose plate in all except *B. longipinnis*, where the membrane is only expanded); from *Baryancistrus*, *Hemiancistrus*, and *Parancistrus* by usually having a pattern of dorsal saddles with spots, if present, just on the head and ventral surface (vs. dark or light spots present behind the head and saddles absent; this works for all except *P. bachi*, *P. oligospila* and some *P. furcata*); and from *Parancistrus* by having restricted gill openings (vs. large gill openings), and having the body deep and narrow (vs. wide and dorsoventrally flattened). *Peckoltia oligospila* and *P. furcata* can be further separated from *Baryancistrus*, *H. chlorostictos*, *H. fuliginosus*, *H. guahiborum*, *H. macrops*, *H. meizospilos*, *H. subviridis*, *H. votouro*, and *Parancistrus* by having dark spots (vs. with light spots or uniformly dark); and from *H. medians* by lacking keels anterodorsally (vs. short keels present). *Peckoltia oligospila* can be identified from *H. punctulatus* and *H. megalopteryx* by having less than 25 teeth per jaw ramus (vs. 40 or more). *Peckoltia furcata* can be identified from *H. punctulatus* by having a strongly forked caudal fin (vs. caudal fin emarginate) and from *H. punctulatus* and *H. megalopteryx* by having bands in the caudal fin (vs. spots or uniformly dark).

### ***Peckoltia bachi***

(Figs. 2a and 3–4)

*Hemiancistrus arenarius* Eigenmann & Allen, 1942: 185, pl. 6 (fig. 2). Type locality: Yurimaguas. Holotype: CAS 77323.

*Chaetostomus bachi* Boulenger, 1898: 425, pl. 41 (fig. 1). Type locality: Rio Juruá, an affluent of the Amazons, Brazil. Holotype: BMNH 1897.12.1.61.

*Peckoltichthys filicaudatus* Miranda Ribeiro, 1917: 49. Type locality: Fluvio Solimes [Brazil]. Holotype: MNRJ 969.

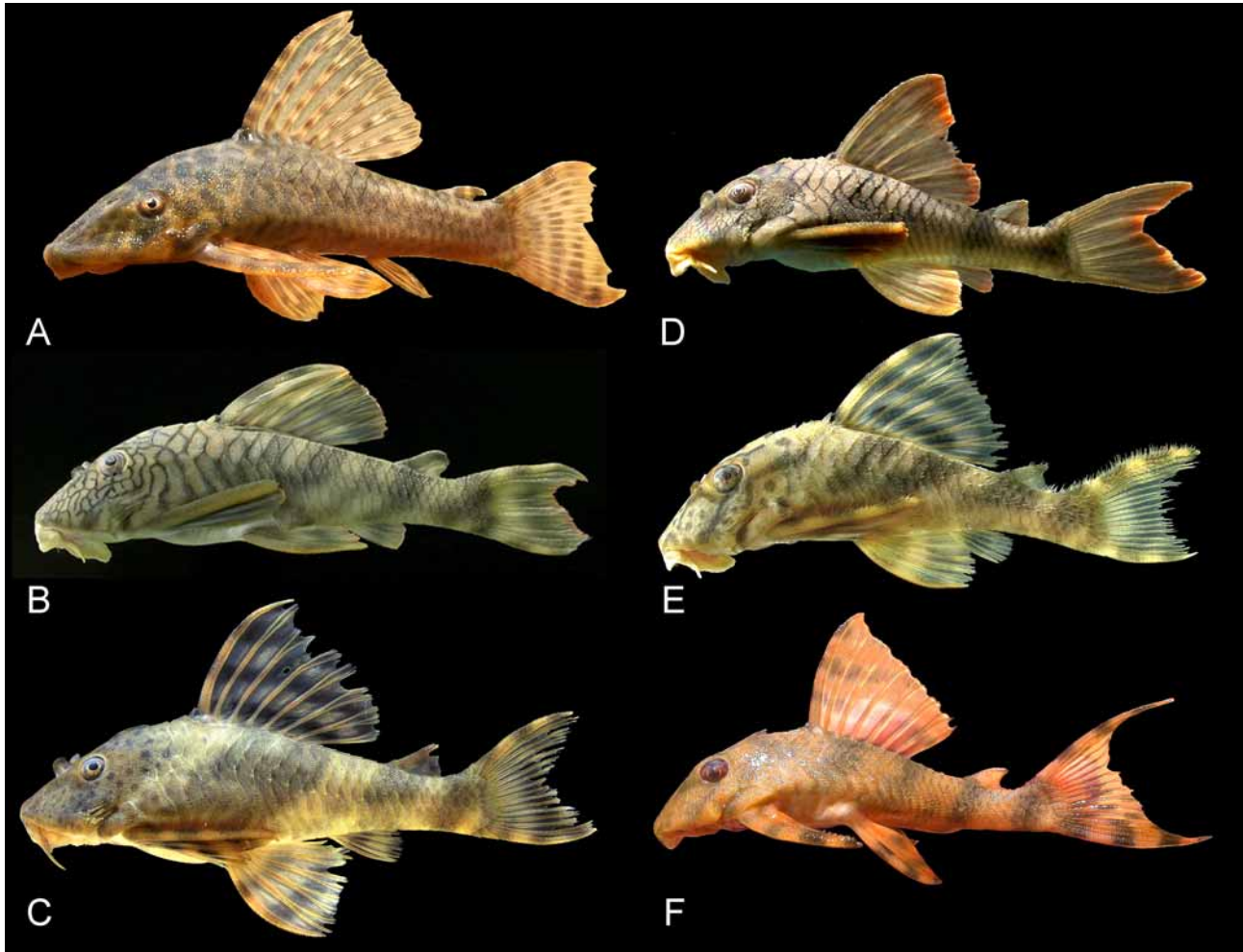
*Hemiancistrus ucayalensis* Fowler, 1940: 235, figs. 24–25. Type locality: Ucayali River, Contamana, Peru. Holotype: ANSP 68651.

**Material examined:** All collections Río Amazonas drainage (except ICNMNH 7955): BRAZIL, Unknown state: BMNH 1897.12.1.61, Holotype, 1, 95.0, Rio Juruá; MNHN A-1968, 1, 78.2, Río Amazonas, col. by Jobert; MNRJ 969, Holotype of *Peckoltia filicaudata*, 1, 97.6, Rio Solimões, col. by Alt. Machado da Silva. BRAZIL, Acre: MCP 35511, 1, Riozinho do Rola, tributary to Rio Acre, itself a tributary to Rio Purus, Rio Branco, 10°02'50"S, 068°18'39"W, L. Juno, 22–23 June 2003; MZUSP 50506, 1, Foz do Caipora, Rio Juruá, Coleção Reserva Extrativista Alto Juruá, 19 July 1994; MZUSP 50507, 1, Foz do Tejo, Rio Juruá, Coleção Reserva Extrativista Alto Juruá, 15 July 1994. BRAZIL, Amazonas: MCP 33228, 1, 93.8, Praia Caborini, confluence with Rios Solimões and Japurá, 03°09'34"S, 064°46'35", col. by W. Crampton, 12 February 2001; MZUSP 24611, 1, Rio Purus, Açaituba, col. by P.E. Vanzolini, 26 December 1974; MZUSP 56113, 1, Rio Solimões, 29.6 km below the Juruá, 02°35'55"S, 065°30'57"W, col. by J.P. Sullivan *et al.*, 5 November 1993; MZUSP 56282, 1, Rio Juruá, 10.2 km below Lago Pauapixuna, 02°41'07"S, 065°48'27"W, col. by J.P. Sullivan *et al.*, 7 November 1993; MZUSP 57950, 1, Rio Purus, 13 km below Lago do Estopa, col. by Langeani *et al.*, 27 July 1996; MZUSP 74235, 1, Beach of Rio Solimões, at Ilha Muratu, in front of the mouth of Lago Januacá, col. by Alpha Helix Expedition, 6–25 January 1977.

COLOMBIA, Amazonas: ICNMNH 2584, Grammalote, L.F. Jimenez, July 1992; ICNMNH 9101, Puerto Nariño, Laguna Loreto Yacu, P. Cala, January 1972. COLOMBIA, Meta, ICNMNH 7955, Río Meta – Río Orinoco Drainage, Quebrada La Quinchalera, Rio Upia basin, San Luis de Gacero. COLOMBIA, Putumayo,

Puerto Leguizamo, Río Caquetá basin, collected by Proyecto Ornamentales del Amazonas, October 2005.

ECUADOR, Napo: FMNH 103265, 1, 92.4, Rio Napo at Destacamento Tiputini, 00°47'S, 075°33'00"W, col. by D. Stewart, M. Ibarra, and R. Barriga, 28 October 1981; FMNH 103266, 1, 85.7, Rio Aguarico at Destacamento Zancudo and mouth of quebrada Zancudococha, Río Napo Basin, 00°33'S, 075°30'W, col. by D. Stewart, M. Ibarra, and R. Barriga, 26 October 1983.



**FIGURE 2.** Live pictures of A. *Peckoltia bachi*, AUM 45592, B. *Peckoltia braueri*, AUM 38882, C. *Peckoltia brevis*, D. *Peckoltia cavatica*, UG/CSBD 11043, holotype, E. *Peckoltia lineola*, paratype, F. *Peckoltia vittata*, AUM 39313. Photographs by N.K. Lujan (A) and M.H. Sabaj (B-F).

PERU, Amazonas: ANSP 68652, Paratypes of *Peckoltia ucayalensis*, 2, Río Ucayali basin near Contamana, col. by W.C. Morrow, July 1937; LACM 36318–2, 3, 1 cs, 82.5–98.3, La Poza, stream 1 km N, Río Marañon basin, col. by T. Justice, 12 October 1979; LACM 36325–1, 4, 1 cs, 89.7–100.6, La Poza, stream 1 km N, Río Marañon basin, col. by T. Justice, 18 October 1979; LACM 41906–3, 1, 93.2, Caterpiza, Río Marañon basin, col. by M.P. Achamposh, 25 July 1979. PERU, Loreto: AUM 29578, 1, 81.2, Caño Saccarita, probably ca. 35 min. upstream by boat from the mouth of Tonche Caño, 03°36'50"S, 072°10'55"W, col. by D.M. Schleser, 1 June 1999; CAS 77323, Holotype of *P. arenaria*, and CAS 77324, Paratype of *P. arenaria*, Río Huallaga, Yurimaguas, col. by W.R. Allen, November 1920; Río Huallaga, Yurimaguas, col. by W.R. Allen, November 1920; CAS 77325, Paratype of *P. arenaria*, Río Alto Marañon below Pastaza, col. by W.R. Allen, October 1920; CAS 77326, Paratype of *P. arenaria*, Río Amazonas, Iquitos, col. by W.R. Allen, September 1920; INHS 39970, 1, 108.4, Río Itaya ca. 4–5 km upstream from Iquitos (Belém), above mouth of Quebrada Mazana, 03°47'71"S, 073°17'29"W, col. by B.M. Burr, M.H. Sabaj, J.W. Armbruster, M. Hardman, R.L. Powell, and R.E. Weitzell, 8 August 1996; INHS 40010, 1, 72.0, Caño Zapatilla ca. 10 min. upstream by



boat from Río Orosa, 76.4 mi E Iquitos, 03°32'47"S, 072°09'22"W, col. by M.H. Sabaj, J.W. Armbruster, M. Hardman, and F. Rios Tuluvea, 14 August 1996; INHS 44127, 1, 69.1, Río Napo and creek at Mazan, 33.3 km NE Iquitos, 03°29'33"S, 073°05'12"W, col. by M.H. Sabaj, J.W. Armbruster, M.W. Littman, 2 August 1997; SIUC 29317, 1, 98.5, Río Napo at Mazan, 33.3 km NE Iquitos, 03°29'33"S, 73°05'12"W, col. by M.W. Littman, M.H. Sabaj, and J.W. Armbruster, 1 August 1997; MNRJ 3962, 1, 77.3, Río Ampiyacu near Pebas, col. by W. G. Scherer, 28 February 1940; MNRJ 3963, 1, 77.3, Río Ampiyacú near Pebas, col. by W.G. Scherer; USNM 124885, 1, 104.6, Río Ampiyacu, col. by W. G. Scherer; USNM 329590, 1, 67.2, Maynas Province, Arcadia, Río Napo, quebrada Isla, col. by F. Chang *et al.*, 3 November 1993.

AQUARIUM SPECIMEN: INHS 40916, 1 cs (not measured).

**Diagnosis:** *Peckoltia bachi* is diagnosed by one unique characteristic: presence of deep pockets ventrally on the pelvic girdle for the insertion of hypertrophied pelvic adductor muscles. In whole specimens, this results in the ability to fold the pelvic fins ventrally such that the pelvic-fin spines run parallel with the ventral surface body. In addition, *P. bachi* can be diagnosed by the homoplastic characteristic of the presence of widened pelvic-fin spines.

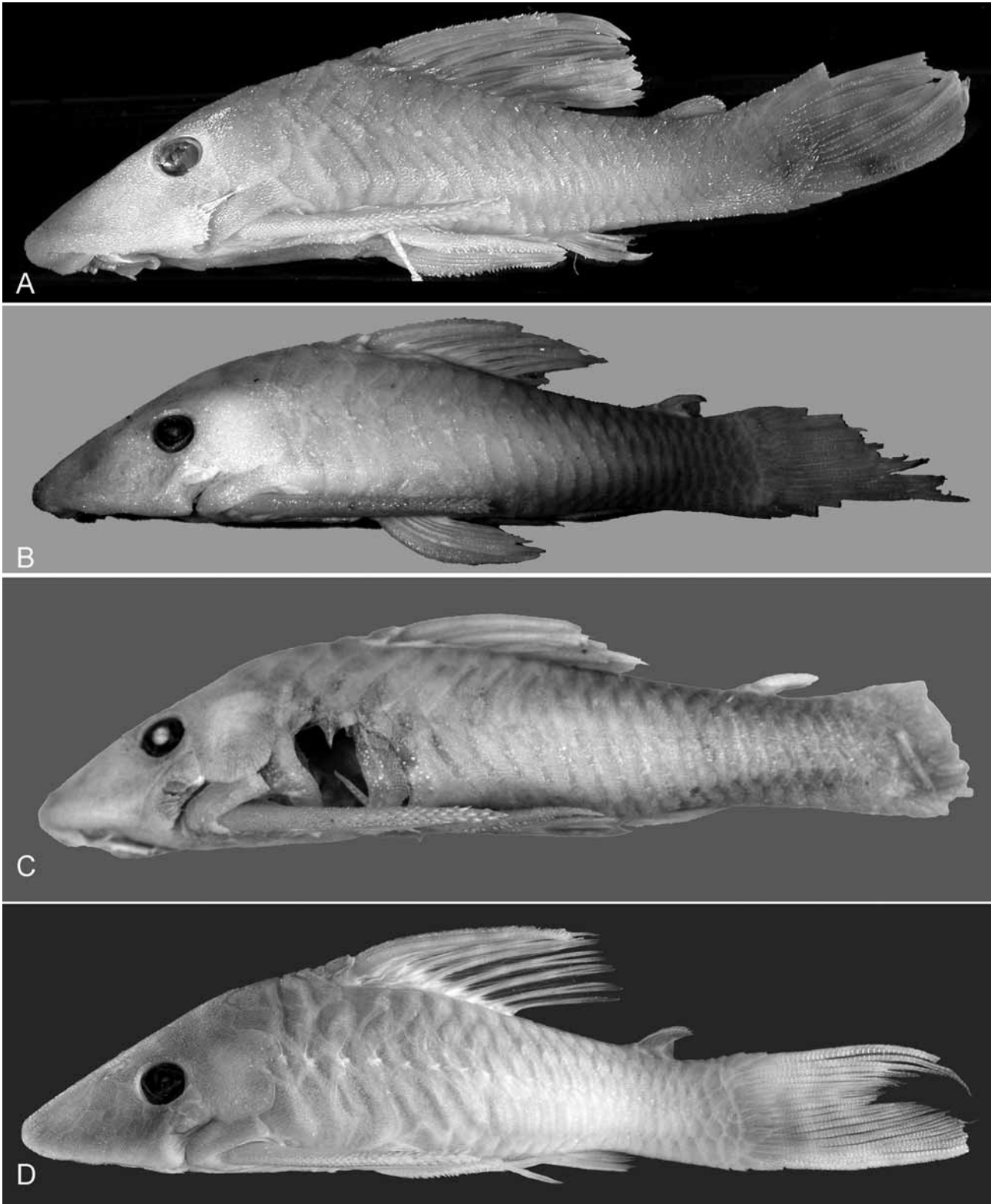
*Peckoltia bachi* can be identified from all other *Peckoltia* by the presence of widened pelvic-fin spines, enlarged plates on the abdomen (Fig. 4), eye low on the head (Fig. 3–4), and opercle generally with a patch of odontodes at all ages (vs. opercle maximally with a single row of odontodes with odontodes disappearing with size). *Peckoltia bachi* can be identified from all other *Peckoltia* except *P. caenosa* by being mottled (vs. the presence of dorsal saddles or spots), and it can be identified from *P. caenosa* by having diffuse, large spots on the head and the abdomen without markings (vs. head and abdomen with vermiculations).

**Description:** Morphometrics in Table 1, counts based on 30 individuals unless otherwise stated. Largest specimen examined 108.4 mm SL. Body stout and fairly wide. Head and nape gently sloped to insertion of dorsal fin. Parieto-supraoccipital with slight rounded crest. Dorsal profile sloped ventrally to dorsal procurrent caudal-fin spines, then inclined steeply to caudal fin. Ventral profile flat to caudal fin. Supraorbital ridge rounded, continuing to anterolateral corner of anterior nare. Mesethmoid raised slightly above lateral surface of snout to form slight ridge. Head contours smooth. Eye relatively large, set low on head. Interorbital space slightly convex; supraorbital ridge just slightly higher than interorbital space.

Keels absent. Mid-ventral plates bent at their midline above pectoral fin to form ridge. Dorsal plates bent dorsally below dorsal fin to form very slight ridges that converge at adipose fin, dorsal surface flat between ridges. Five rows of plates on caudal peduncle. Abdomen almost completely plated with fairly large platelets; fairly large naked area around insertion of pelvic fins. First anal-fin pterygiophore exposed to form a platelike structure. A pair of lateral plates converging at midline between anus and exposed first anal-fin pterygiophore. 23–27 (mode 24) plates in the median series.

Frontal, infraorbitals, nasal, compound pterotic, sphenotic, and parieto-supraoccipital, supporting odontodes; opercle usually supporting odontodes although some specimens lack odontodes on opercle. Posterodorsal corner of opercle covered by one or two plates in adults. Odontodes on lateral plates not enlarged to form keels. Hypertrophied cheek odontodes 11–44, longest reaching anterior border of compound pterotic. Cheek plates evertible to approximately 90° from head.

Odontodes on tip of pectoral-fin spine slightly hypertrophied. Dorsal fin reaching preadipose plate when adpressed in some specimens; dorsal-fin spine not elongate. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional. Dorsal fin II,7. Adipose fin with one preadipose plate and moderately long spine. Caudal fin emarginate, lower lobe longer than upper, I,14,I (one specimen I,13,I and one specimen with caudal peduncle damage I,17,I) with three to six (N=29, mode four) dorsal procurrent caudal-fin rays and three to six (mode four) ventral procurrent-fin rays. Anal fin short with unbranched ray weak and approximately same length of first branched ray. Anal fin I,4. Pectoral-fin spine reaching slightly behind posterior insertion of pelvic fin when adpressed ventral to pelvic fin. Pectoral fin I,6 (one specimen I,5). Pelvic fin reaching to middle of anal-fin when adpressed. Pelvic fin I,5.



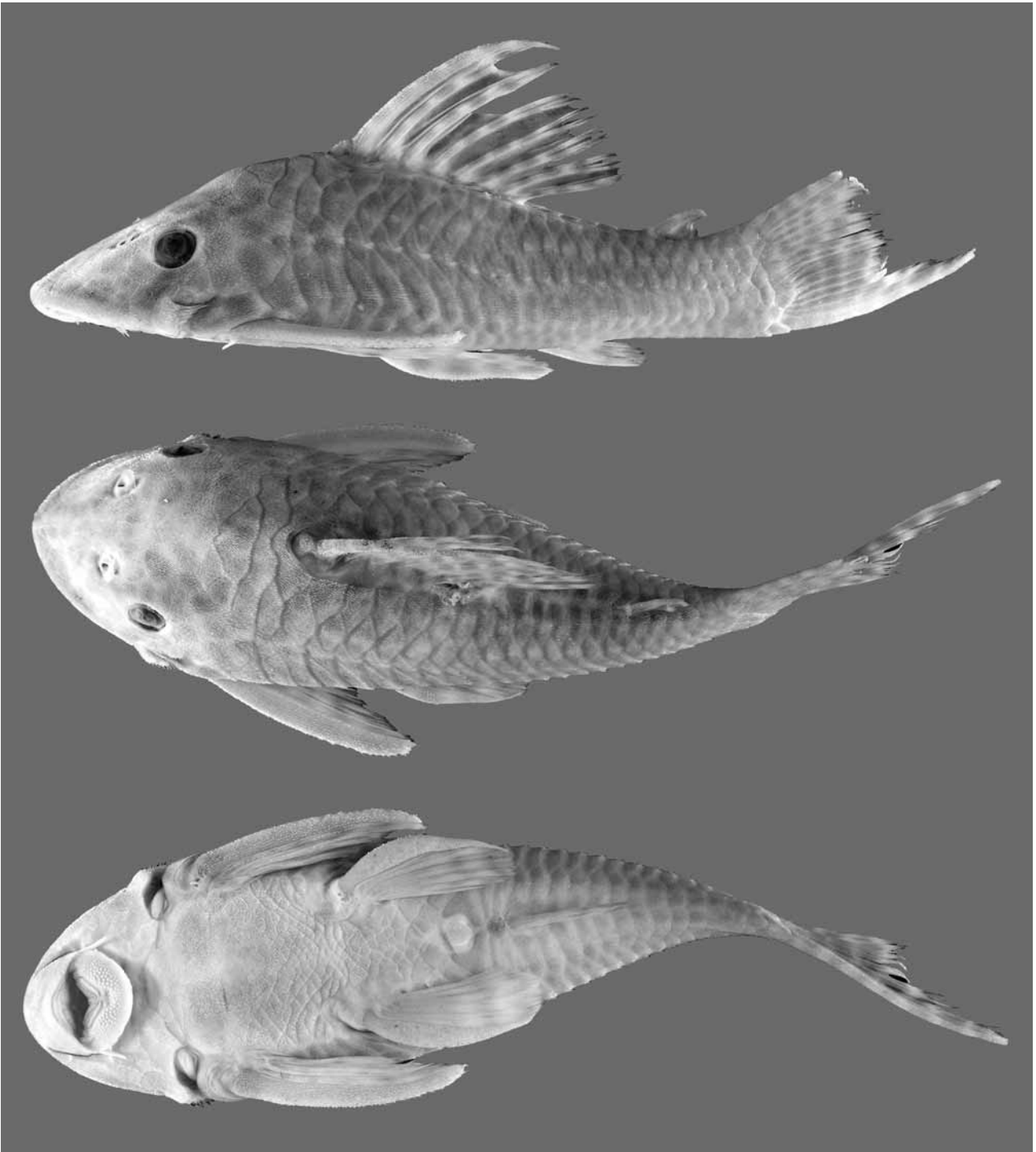
**FIGURE 3.** Lateral views of types of species assigned to *Peckoltia bachi*, A. *Hemiancistrus arenarius*, CAS 77323, holotype, ~80 mm SL; B. *Chaetostomus bachi*, BMNH 1897.12.1.61, holotype, C. *Peckoltichthys filicaudatus*, MNRJ 969, holotype, 97.6 mm SL; and D. *Peckoltia ucayalensis* ANSP 68652, 85.2 mm SL. Photographs by the California Academy of Sciences Department of Ichthyology (A) and J.W. Armbruster (B-D).

**TABLE 1.** Selected morphometrics of *Peckoltia bachi* and *P. braueri*. Numbers in parentheses refer to landmark numbers in Armbruster (2003). Measurements are ratios of SL (predorsal l. to pelvic-dorsal l.) or head l. (head-eye l. to premaxillary tooth cup l.).

	<i>P. bachi</i>					<i>P. braueri</i>				
	N	Avg.	SD	Min.	Max.	N	Avg.	SD	Min.	Max.
SL (1-20)	31	89.9	11.5	67.2	108.4	49	75.7	17	39.8	103.9
Predorsal L. (1-10)	31	43.9	1.2	41.7	46.9	49	43.0	1.2	40.1	46.9
Head L. (1-7)	31	35.2	1.5	33.4	40.6	49	36.9	1.4	35.0	41.5
Head-dorsal L. (7-10)	31	8.7	1.1	5.0	10.4	49	6.2	1.0	4.0	8.3
Cleithral W. (8-9)	31	31.3	1.1	27.9	33.0	49	31.2	1.4	28.5	38.1
Head-pectoral L. (1-12)	31	29.7	1.4	24.6	31.8	49	26.4	1.7	24.0	31.1
Thorax L. (12-13)	31	20.9	1.8	18.1	28.7	49	24.5	1.9	20.3	29.7
Pectoral-spine L. (12-29)	30	32.7	1.8	29.4	36.7	49	32.4	1.6	28.8	35.6
Abdominal L. (13-14)	30	23.0	1.2	20.4	25.2	49	23.0	1.2	19.8	26.1
Pelvic-spine L. (13-30)	30	23.0	1.4	21.2	27.5	49	26.9	1.4	24.5	31.6
Postanal L. (14-15)	31	32.8	1.9	28.9	36.6	49	33.7	1.7	29.9	36.5
Anal-fin spine L. (14-31)	30	15.9	1.5	13.4	18.4	46	14.4	1.2	12.5	17.6
Dorsal-pectoral D. (10-12)	31	29.5	0.9	27.5	31.0	49	29.1	1.1	27.3	34.3
Dorsal spine L. (10-11)	23	36.3	2.2	29.4	39.4	48	34.4	2.0	30.2	38.6
Dorsal-pelvic D. (10-13)	31	25.6	1.5	23.1	29.2	49	25.4	1.6	21.3	28.7
Dorsal-fin base L. (10-16)	31	26.7	1.0	25.0	29.5	49	28.7	1.9	23.9	31.9
Dorsal-adipose D. (16-17)	31	18.4	2.2	12.4	21.9	49	14.8	1.6	11.0	19.3
Adipose-spine L. (17-18)	30	8.7	2.2	6.6	18.4	49	9.4	1.0	7.1	11.5
Adipose-up. caudal D. (17-19)	31	14.2	1.5	11.3	18.8	49	17.9	1.9	13.8	21.4
Caudal peduncle Dp. (15-19)	31	13.7	1.4	10.5	16.8	49	9.9	1.6	7.6	13.7
Adipose-low. caudal D. (15-17)	31	21.6	1.3	19.1	24.5	49	23.7	1.4	20.8	27.9
Adipose-anal D. (14-17)	31	21.7	1.5	18.6	25.0	49	19.3	1.7	14.4	21.9
Dorsal-anal D. (14-16)	31	17.6	1.1	13.3	19.2	49	16.8	1.0	14.3	19.0
Pelvic-dorsal D. (13-16)	31	26.9	2.0	23.0	30.8	49	26.5	1.9	21.5	28.9
Head-eye L. (5-7)	31	44.7	2.4	38.5	47.9	49	37.6	1.8	33.9	42.9
Orbit Dia. (4-5)	31	19.3	1.2	16.2	21.2	49	21.9	1.9	19.7	27.1
Snout L. (1-4)	31	61.7	2.3	53.9	64.5	49	58.5	2.5	49.8	62.9
Internares W. (2-3)	31	21.0	2.0	15.5	24.0	49	14.2	1.6	10.3	18.1
Interorbital W. (5-6)	31	60.8	6.0	51.5	71.0	49	47.5	3.8	38.7	53.7
Head Dp. (7-12)	31	72.3	2.8	66.9	76.0	49	70.9	1.9	66.3	75.9
Mouth L. (1-24)	30	50.2	2.9	44.1	56.3	49	48.2	2.7	40.9	52.9
Mouth W. (21-22)	30	42.4	2.6	38.0	48.2	49	47.7	3.9	37.5	53.8
Maxillary barbel L. (22-23)	30	11.2	1.9	6.8	15.2	49	16.2	2.0	9.5	20.8
Dentary tooth cup L. (25-26)	31	13.7	1.7	9.5	17.5	49	13.9	2.2	9.5	18.1
Premax. tooth cup L. (27-28)	31	12.5	1.4	9.6	15.5	49	13.8	2.3	5.7	16.5

Iris operculum present. Flap between anterior and posterior nares short. Lips wide, fairly thin. Upper lip with small, round papillae. Lower lip with medium-sized papillae anteriorly and smaller ones posteriorly. Maxillary barbel short, not reaching gill opening. Buccal papilla represented only by very small flap, never

absent. Jaws narrow, dentaries forming angle just slightly greater than  $90^\circ$ , premaxillaries forming very shallow arc with overall angle less than  $135^\circ$ . Teeth with small, moderately narrow cusps, lateral cusp approximately half-length of medial cusp, stalks of teeth long, dentary and premaxillary teeth about equal in length; 13–25 dentary teeth (mode 22) and 11–22 premaxillary teeth (mode 19).

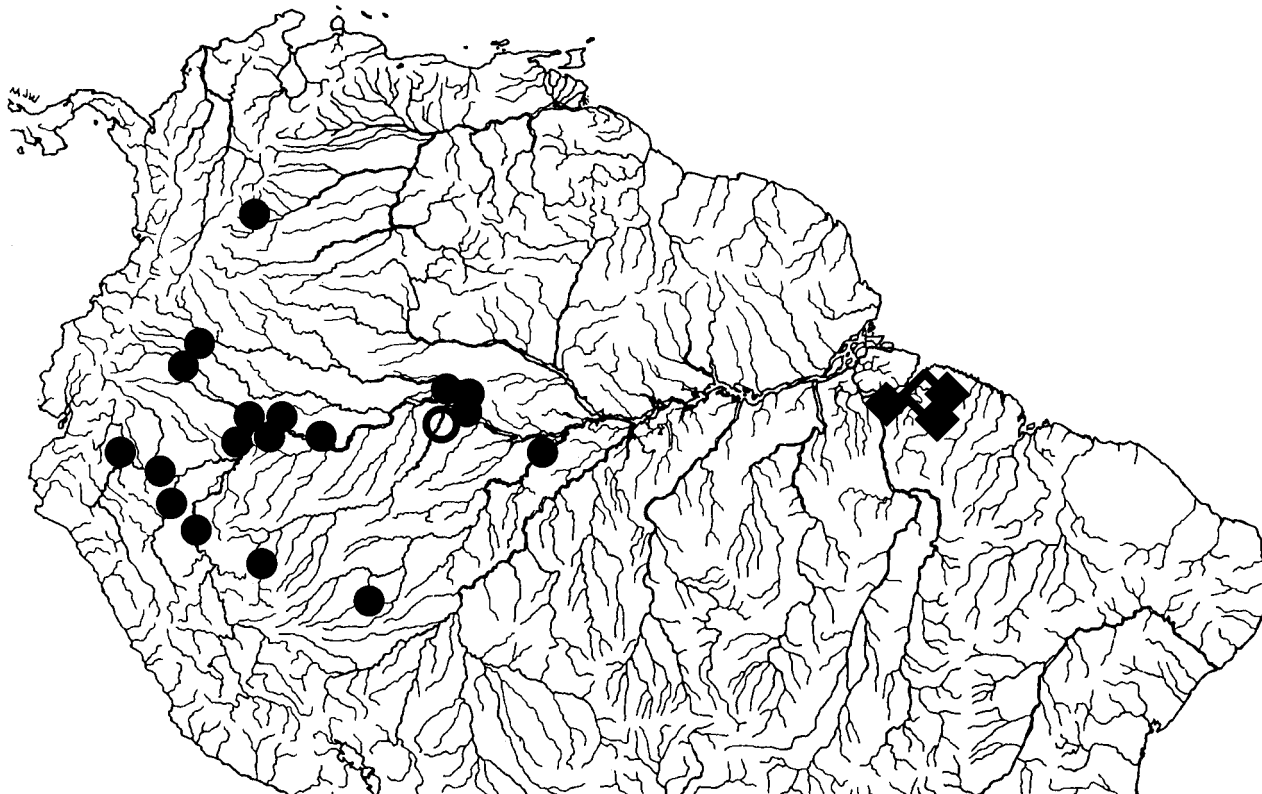


**FIGURE 4.** Dorsal, lateral, and ventral views of *Peckoltia bachi*, SIUC 29317, 98.5 mm SL. Photographs by J.W. Armbruster.

**Color:** Base color tan with slightly darker markings on most specimens (one specimen examined with greater contrast). Head with large spots or mottling. Body mottled occasionally with four weak saddles. Dorsal-fin spines and rays with oblong spots; interradiation membranes usually unmarked or with slightly darker

spots. Pectoral, pelvic, and anal fins with slightly darker spots on spines and rays or unmarked. Caudal fin with dark spots combining to form bands that are wider than the light interspaces; bands darker on lower lobe. Abdomen and lower surface of caudal peduncle slightly lighter than sides.

**Sexual Dimorphism:** One specimen (presumably male) examined with hypertrophied odontodes on sides of body and posterior part of head. Hypertrophied odontodes becoming larger posteriorly, but lacking on caudal- and adipose-fin spines. No apparent increase in size of pectoral-fin spine odontodes.



**FIGURE 5.** Distribution of *Peckoltia bachi* (circles) and *P. oligospila* (diamonds). Open symbols are type localities. Symbols may represent more than one locality.

**Range:** *Peckoltia bachi* can be found throughout the upper Amazon and its tributaries in Brazil, Colombia, Ecuador, and Peru (Fig. 5). One specimen was found from the Río Meta system near Villavicencio, Colombia. Given that no other specimens have been collected in the Orinoco basin, this collection is suspect. Villavicencio has been active in exporting fishes for a long time, and Armbruster (2005) suggested that a collection of *Lasiancistrus guacharote* (endemic to the Lago Maracaibo basin) collected near Villavicencio was the result of aquarium release. This may also be the case for *P. bachi*.

**Habitat:** *Peckoltia bachi* can be found at the edge of medium to large rivers among submerged twigs and grasses, usually in flow. The specimens I have collected appear to have been chased from the middle depths of submerged grasses and twigs as the seine was not fully on the bottom. This suggests that the hypertrophied pelvic muscles and widened pelvic-fin spines may be used to grasp the grasses and twigs. In morphology, *P. bachi* is very similar to *Hypoptopoma* of the Hypoptopomatinae, sharing the eye placed laterally on the head and the pelvic fins that can be adducted underneath the body. *Hypoptopoma* also will grasp submerged sticks with its pelvic-fins (pers. obs.).

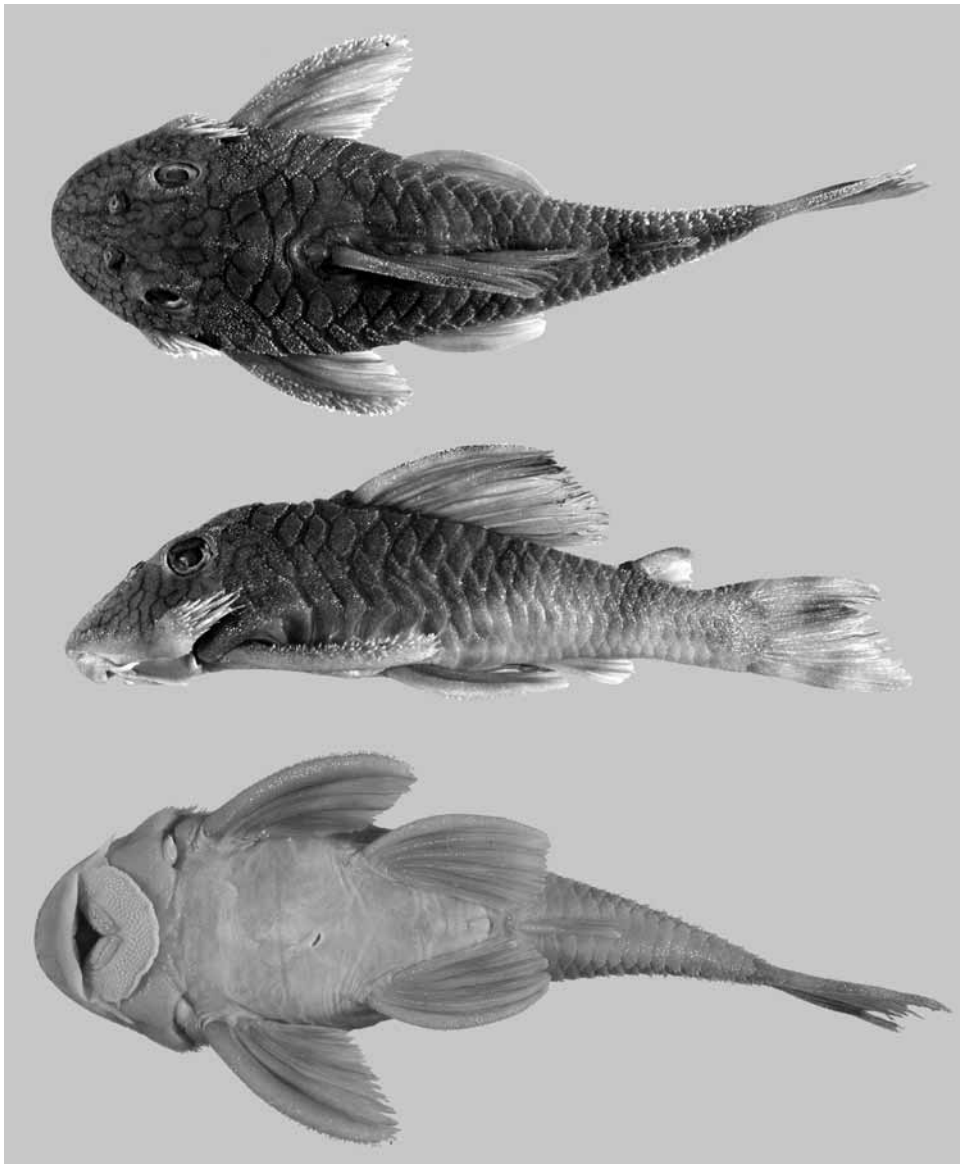
**Comments:** There are some differences in intensity of pigmentation of specimens of *Peckoltia bachi*, but there is nothing to suggest that the species needs to be broken up. The types are all very similar, and nothing could be found to differentiate the various populations. Although the morphology of the species is quite different from any other hypostomine, the recognition of a separate genus for *P. bachi* at this time is without adequate justification. If it were to be recognized as a separate genus, it would be *Peckoltichthys*.

***Peckoltia braueri***  
(Figs. 2b and 6–7)

*Hemiancistrus braueri* Eigenmann, 1912b: 232, pl. 28 (fig. 1). Type locality: Takutu, British Guiana. Holotype: ZMB 3174 (larger specimen).



**FIGURE 6.** Lateral view of holotype of *Hemiancistrus braueri*, ZMB 3174. Photo by M. Allen.



**FIGURE 7.** Dorsal, lateral, and ventral views of *Peckoltia braueri*, AUM 36228, 95.4 mm SL. Photographs by D. C. Werneke.

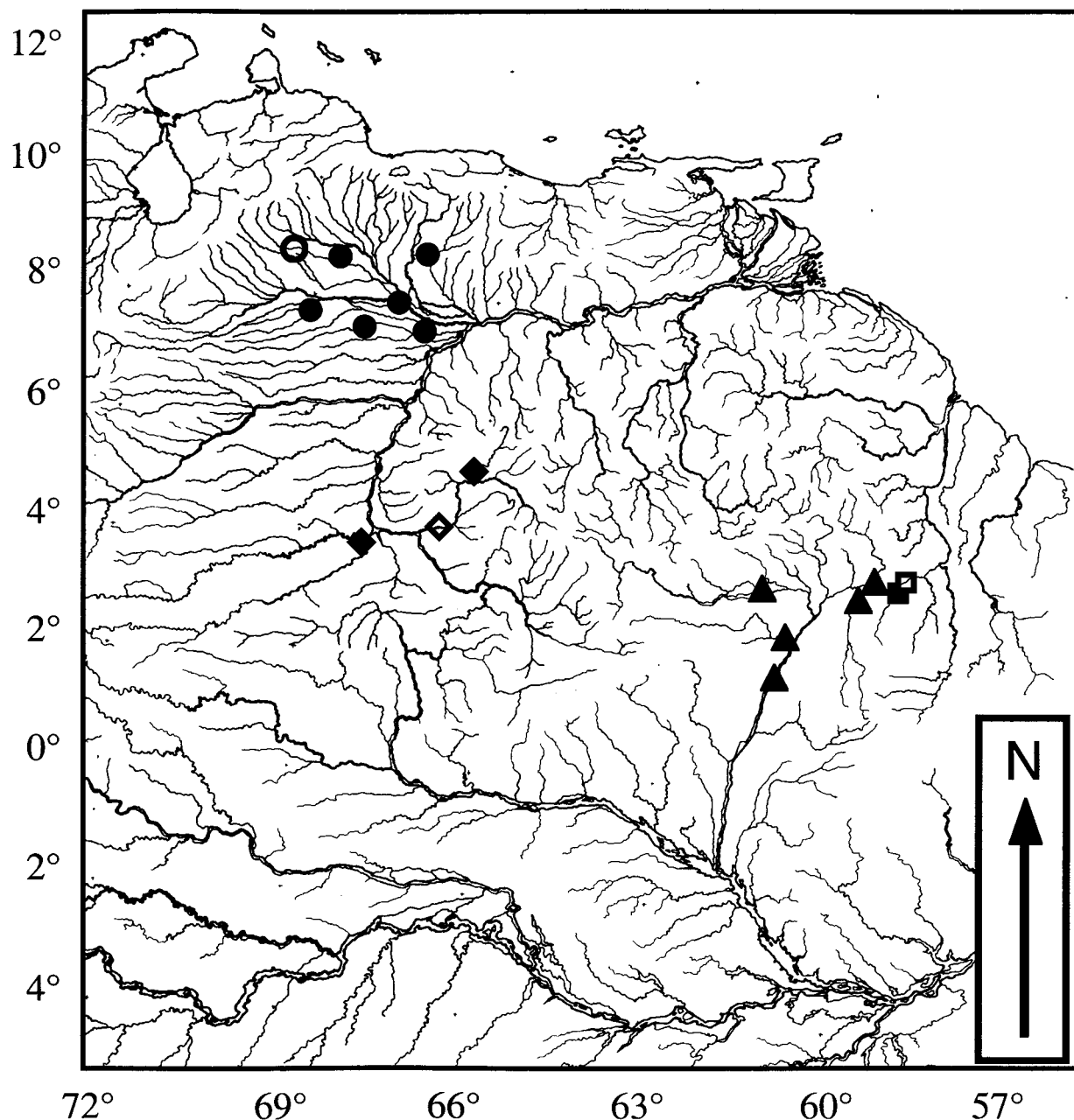
**Material Examined:** GUYANA, Region 9 (Upper Takutu – Upper Essequibo), Takutu River - Negro River drainage: ANSP 180206, 12, 44.8–91.7 mm SL and AUM 36228, 20, 4 cs, 44.7–96.5, Takutu River ca. 2.75 km W Saint Ignatius, 03°21'18"N, 059°49'51", 5–6 November 2002, J.W. Armbruster, M.H. Sabaj, D.C. Werneke, C.L. Allison, M.R. Thomas, C.J. Chin, D. Arjoon, and L. Atkinson; ANSP 180207, 2, 39.8–50.6 and AUM 35525, 3, 84.1–66.0, Pirara River, tributary of the Ireng River, 3.5 km NNW Pirara, 03°38'55"N, 059°41'20", 2 November 2002, J.W. Armbruster, M.H. Sabaj, M.R. Thomas, D.C. Werneke, and D. Arjoon; ANSP 180208, 1, 93.5 and AUM 38882, 2, 77.7–103.0, same locality as ANSP 180206, 1 November 2003, J.W. Armbruster, M.H. Sabaj, M. Hardman, D. Arjoon, N.K. Lujan, and L.S. de Souza; and AUM 37914, 1, not measured, Takutu River at Saint Ignatius, 1.86 km NNE Lethem, 03°21'20"N, 059°48'19", 2 November 2003, J.W. Armbruster, M.H. Sabaj, M. Hardman, D. Arjoon, N.K. Lujan, and L.S. de Souza; AUM 44593, Ireng River at Sunnyside, 03°44'37"N., 059°40'11"W, L.S. de Souza, N.K. Lujan, D.C. Taphorn, J.A. Hartsell, E. Liverpool, and S. Lord, 26 November 2005; AUM 44673, Pirara River at Pirara Ranch, 03°37'31"N, 059°40'37"W, L.S. de Souza, N.K. Lujan, D.C. Taphorn, J.A. Hartsell, E. Liverpool, and S. Lord, 26 November 2005; AUM 44710, Takutu River near Lethem, 03°28'14"N, 059°48'36"W, L.S. de Souza, N.K. Lujan, D.C. Taphorn, J.A. Hartsell, E. Liverpool, and S. Lord, 27 November 2005.

BRAZIL, Roraima, Rio Negro drainage: MZUSP 33703, 1, 83.6, and MZUSP 34652, 1, 62.0, Rio Branco, Bem Querer rapids, 8 January 1984, M. Goulding; MZUSP 34563, 5, 74.7–82.4. Igarapé do Cujobim, in front of Ilha de Maracá, 13 January 1984, M. Goulding.

**Diagnosis:** *Peckoltia braueri* can be identified from all other described *Peckoltia* except *P. cavatica* by the presence of an orange band at the edge of the dorsal and caudal fins and by having thin, wavy, black lines that tend to outline the plates and bones of the head (Figs. 2b and 7). *Peckoltia braueri* can be identified from *P. cavatica* by having the dorsal saddles better developed (vs. barely visible), by having the head plates and bones not completely outlined in black and with lines intense (vs. having all of the head plates and bones completely outlined in black and with the lines lighter), by having black vermiculations on the compound pterotic (vs. no vermiculations), by having at least one, broken band in the caudal fin (vs. no bands in the caudal fin), and by having the marginal orange band of the dorsal and caudal fins not as thick or as intense as in *P. cavatica*. The only other species of *Peckoltia* with wavy lines on the head are *P. caenosa*, *P. lineola* and *P. vermiculata*. *Peckoltia braueri* can be identified from *P. caenosa* and *P. lineola* by having narrow vermiculations on the head (narrower than the pupil vs. about the same width of the pupil) forming a net (vs. several distinct lines and some separate spots), and by having the plates of the nape outlined in black (vs. nape plates not outlined); from *P. caenosa* by lacking markings on the abdomen (vs. vermiculations), by having bands in the dorsal (vs. light spots) and by having the dark and light bands on the caudal fin of about equal width (vs. light bands about 25% of width of dark bands); and from *P. vermiculata* by having vermiculations that do not radiate from a central point on the parieto-supraoccipital (vs. vermiculations mostly combined to the parieto-supraoccipital and radiating from a central point), and by having the nape plates outlined with black (vs. nape plates not outlined).

**Description:** *Peckoltia braueri* was recently redescribed by Armbruster and Werneke (2005). Morphometrics in Table 1.

**Range:** Collected from three localities around Lethem in the Takutu and Pirara Rivers (Fig. 8). Found in swift riffles among very large boulders. Also known from the mainstem Rio Branco near Caracarai and the Rio Uraricoera drainage of Brazil.



**FIGURE 8.** Distribution of *Peckoltia braueri* (triangles), *P. caenosa* (circles), *P. cavatica* (squares) and *P. lineola* (diamonds). Open symbols are type localities; the type locality for *P. braueri* is not adequate to plot on the map. Symbols may represent more than one locality

***Peckoltia brevis* (La Monte 1935)**  
(Fig. 2c and 9–10)

*Hemiancistrus brevis* La Monte, 1935:3, fig. 2. Type locality: Near Sena Madureira, near mouth of River Macaua, tributary of Rio Iaco, itself a tributary to Rio Purus, Amazonas, Brazil. Holotype: AMNH 12602.

**Material Examined:** BOLIVIA, Unknown state, Río Mamore - Río Madeira drainage: MNHN 1988–1083, 2, 65.1–103.0, Isiboro, col. by, Luzanne and Loubens, October 1985; MNHN 1988–1084, 1, 92.6, Chimimita, col. by, Luzanne and Loubens, November 1984. BOLIVIA, Beni, Río Madeira - Río Amazonas drainage:

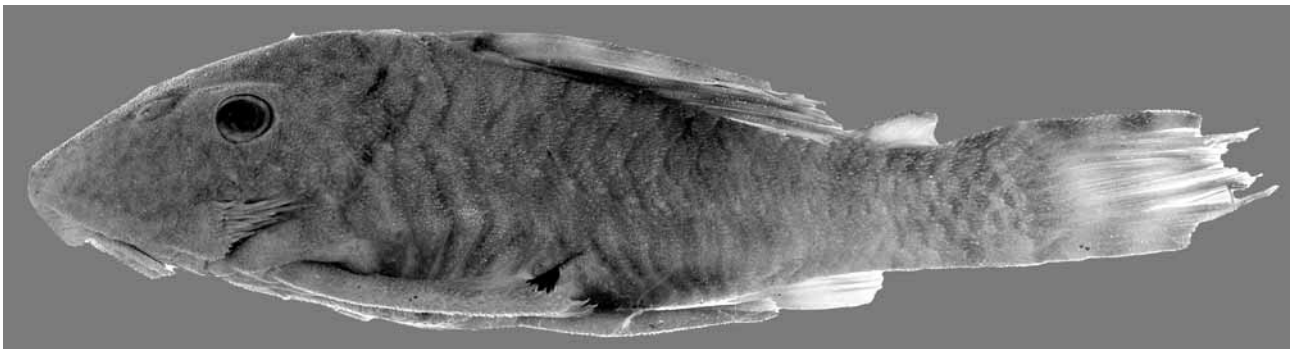


USNM 305824, 10, 3 cs., 34.1–101.2, Ballivia Province, Rio Matos Below Road crossing, 48 Km E San Borja, 14°55'S, 066°17'W, col. by, Starnes, W. C.; Munroe, T.; Sarmiento J., 31 August 1987.

BRAZIL, Acre, Rio Amazonas drainage: AMNH 12602, Holotype, and USNM 94680, 1, 84.1, vicinity of mouth of Rio Macauhan, a tributary of the Rio Yacu, which flows into the Rio Purus, col. by, B.A. Krukoff, 1934; MZUSP 50395, 1, 88.1, Rio Juruá, Colocação São João, 09°09'S, 072°41'W, col. by, Coleção Reserva Extrativista Alto Juruá, 8 July 1993. BRAZIL, Amazonas, Rio Amazonas drainage: MZUSP 23439, Igarapé Tome, Ati Paraná, NW of Fonte Boa, 02°31'S, 066°06'W, col. by, EPA, 13 October 1968; INPA 4705, 3, 98.1–106.0, Rio Japurã, Paraná do Mapixari, Lago Jarava, col. by, C. Pescad. de Tefe, 1 December 1979; MZUSP 57474, Rio Solimões, above the Rio Purus, col. by, A. M. Zanata *et al.*, 28 July 1996.

COLOMBIA, Amazonas, ICNMMNH 7944, Río Amazonas drainage, San Juan de Atacuan, Rio Amazonas, 10 July 1993. COLOMBIA, Vichada, ICNMMNH 5339, Río Orinoco drainage, La Pinsonera, Río Bitá, Puerto Carreño, Javier Climato, 23 Jan 1998; ICNMMNH 11922, Río Orinoco basin, Puerto Carreño, collected by Proyecto Ornamentales del Orinoco, February 2005.

PERU, Loreto, Río Amazonas drainage: FMNH 111511, 1, 92.6, Rio Chambira and small tributaries ca. 15.7 km above mouth in Rio Marañon, 05°00'S, 074°53'W, col. by, Chernoff, Wheeler, Klocek, Duvall and Onate, 4 September 1988; INHS 36873, 1, 95.5, Río Itaya approximately 10 km S Santa Clara, col. by, aquarium dealer in Santa Clara, 25 July 1995; Peru, Loreto, Río Amazonas, INHS 43344, 2, 1 cs, 105.3–105.7 and SIUC 29784, 2, 58.5–73.3, Río Itaya 11 km SSW Iquitos, 03°49'48"S, 073°18'03"W, col. by, J.W. Armbruster, M.H. Sabaj, *et al.*, 6 August 1997.

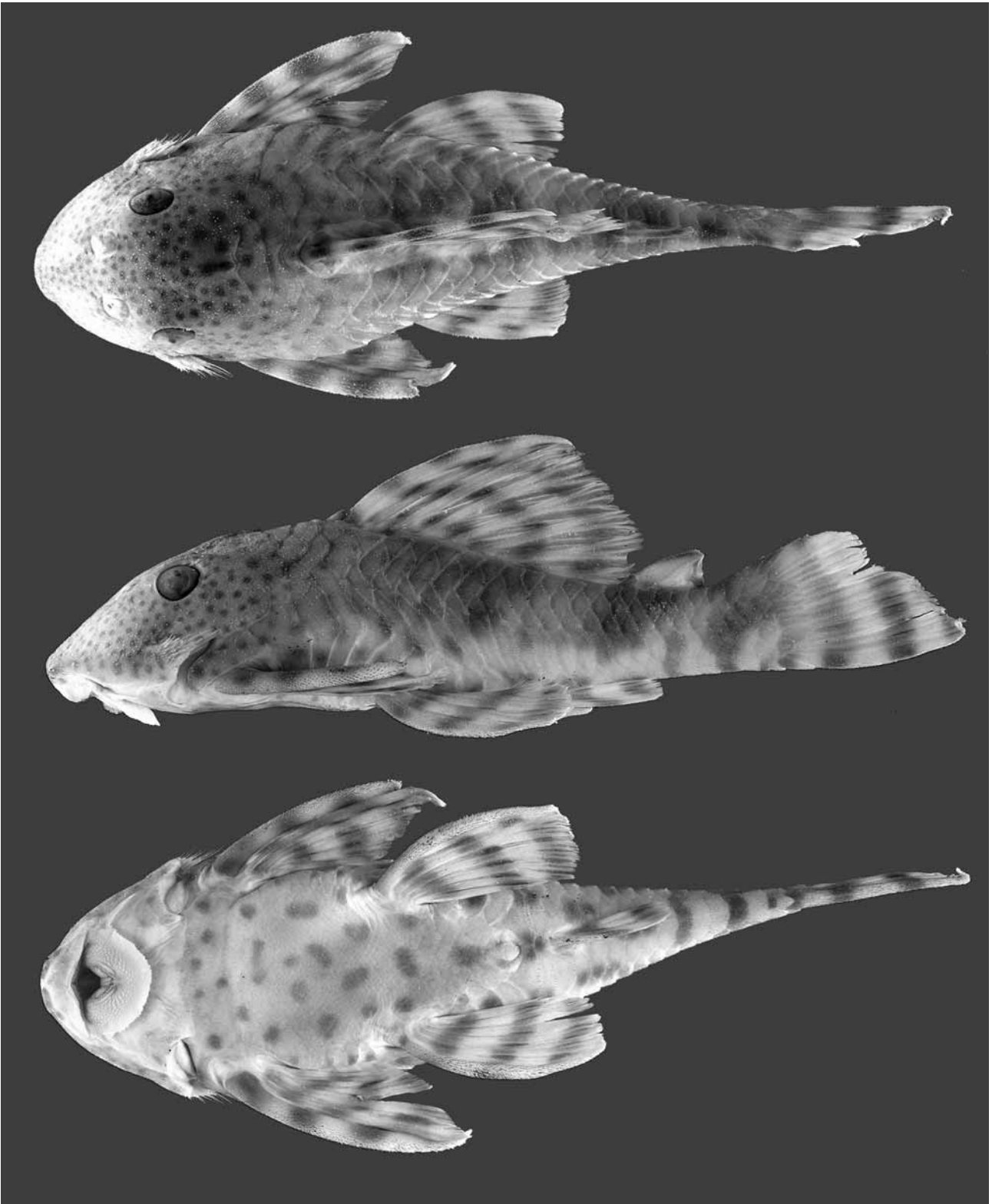


**FIGURE 9.** Lateral view of holotype of *Hemiancistrus brevis*, 86.7 mm SL. Photograph by M. Stiassny.

**Diagnosis:** *Peckoltia brevis* can be identified from all other *Peckoltia* except *P. bachi*, *P. caenosa*, *P. lineola*, and *P. oligospila* by having round spots on the head and abdomen; from *P. bachi* by having the spots on the head small (vs. large), the pelvic spines narrow (vs. wide), and the eye high on the head (vs. low); from *P. caenosa* and *P. lineola* by having none of the head spots combining to form lines; from *P. caenosa* by having spots on the abdomen (vs. vermiculations), by having bands in the dorsal (vs. light spots), and by having the dark and light bands on the caudal fin of about equal width (vs. light bands about 25% of width of dark bands); and from *P. oligospila* by lacking spots laterally behind the dorsal fin (vs. spots present on sides), and by having bands in the dorsal and caudal fins and dorsal saddles (vs. spots on the fins and body and saddles faint). *Peckoltia furcata* additionally has spots on the head, but not the abdomen and *P. brevis* can be further separated from *P. furcata* by having bands in the dorsal fin (vs. spots).

**Description:** Morphometrics in Table 2, counts based on 24 individuals unless otherwise stated. Largest specimen examined 105.7 mm SL. Body stout and fairly wide. Head gently sloped to parieto-supraoccipital. Parieto-supraoccipital with tall, rounded crest. Parieto-supraoccipital crest raised slightly above nuchal region. Nuchal region rises slightly to nuchal plate. Dorsal profile sloped ventrally to dorsal procurrent caudal-fin spines, then rising rapidly to caudal fin. Ventral profile flat to ventral procurrent caudal-fin spines and then sloping ventrally to caudal fin. Supraorbital ridge rounded, contiguous, but slightly offset medially from

rounded ridge proceeding from anterior margin of orbit to anterolateral corner of anterior nare. Head contours smooth. Eye medium-sized.



**FIGURE 10.** Dorsal, lateral, and ventral views of *Peckoltia brevis*, INHS 43344, 105.3 mm SL. Photographs by J.W. Armbruster.

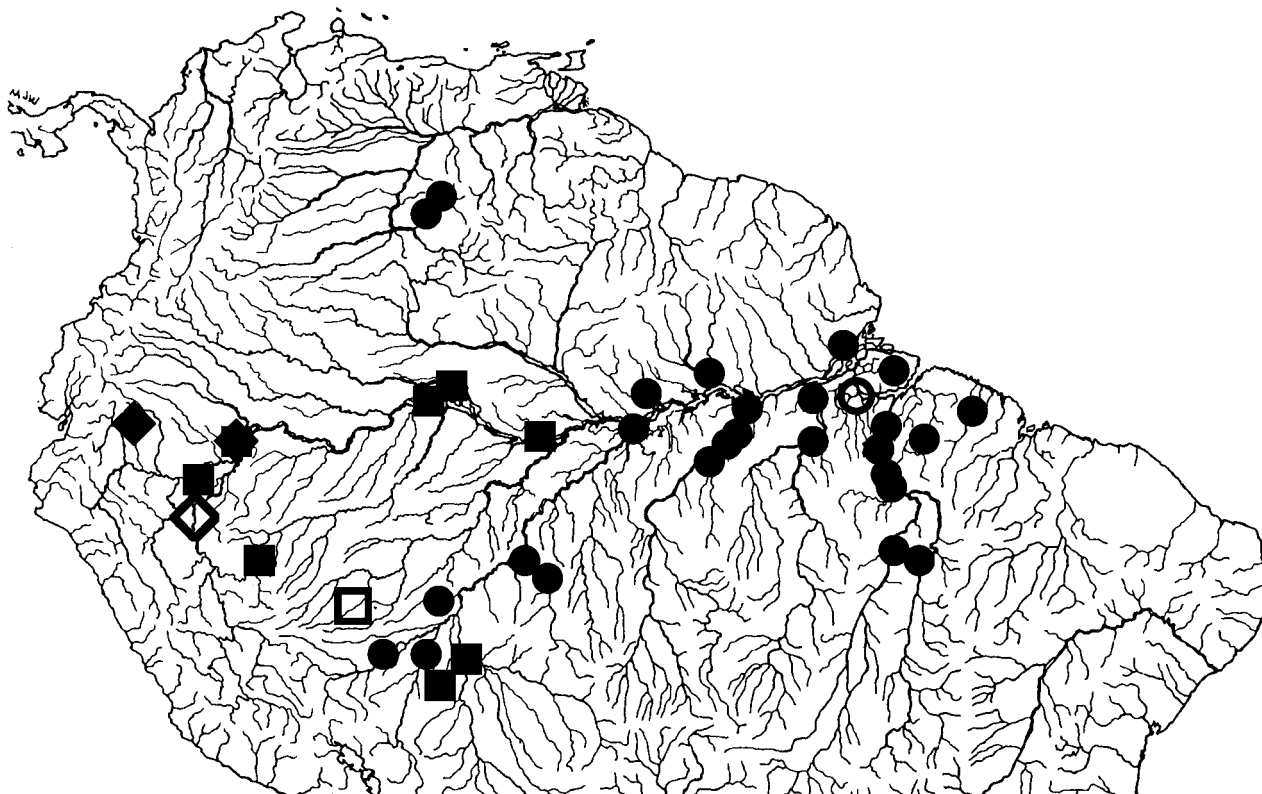
Keels absent. Mid-ventral plates bent at their midline above pectoral fin to form ridge. Dorsal plates bent dorsally below dorsal fin to form ridges that converge at preadipose plate, dorsal surface flat between ridges.

Five rows of plates on caudal peduncle. Abdomen fully covered in small plates except for small naked areas posterior to lower lip and at insertions of paired fins. First anal-fin pterygiophore exposed to form a platelike structure. Pair of lateral plates converging at midline between anus and exposed first anal-fin pterygiophore. 22–26 (mode 24) plates in the median series.

Frontal, infraorbitals, nasal, compound pterotic, sphenotic, and parieto-supraoccipital, supporting odontodes; opercle supporting odontodes in juveniles but not in adults, posterodorsal corner of opercle covered by one or two plates in adults. Odontodes on lateral plates not enlarged to form keels. Hypertrophied cheek odontodes 14–42 (N=13), longest almost reaching first mid-ventral plate in adults. Cheek plates evertible to approximately 90° from head. Odontodes on tip of pectoral-fin spine slightly hypertrophied.

Dorsal fin short, just reaching preadipose plate fin when adpressed; dorsal-fin spine same length as proceeding rays making edge straight. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional. Dorsal fin II,7. Adipose fin with one preadipose plate and fairly long spine. Caudal fin forked, lower lobe longer than upper, I,14,I with four to five (mode four) dorsal procurrent caudal-fin rays and three to five (mode four) ventral procurrent-fin rays. Anal fin short with unbranched ray weak and approximately same length of first branched ray. Anal fin I,4, Pectoral-fin spine almost reaching just beyond pelvic fin when adpressed ventral to pelvic fin. Pectoral fin I,6. Pelvic fin reaching to posterior insertion of anal-fin when adpressed. Pelvic fin I,5.

Iris operculum present. Flap between anterior and posterior nares short. Lips wide, fairly thin. Upper lip with small, round papillae. Lower lip with small papillae anteriorly and posteriorly, becoming larger medially. Maxillary barbel short, maximally reaching base of evertible cheek plates. Buccal papilla small. Jaws narrow, dentaries forming very acute angle, premaxillaries forming angle of 90° to slightly greater than 90°. Teeth with small, moderately wide cusps, lateral cusp approximately half length of medial cusp, stalk of tooth long; seven to 22 dentary teeth (mode 14), six to 22 premaxillary teeth (mode 13).



**FIGURE 11.** Distribution of *Peckoltia brevis* (squares), *P. furcata* (diamonds), and *P. vittata* (circles). Open symbols are type localities. Symbols may represent more than one locality.

**Color:** Base color light tan with brown markings. Head with small to medium spots, spots fading in region between head and dorsal fin. Parieto-supraoccipital crest dark. Body with four dorsal saddles, the first below the middle rays of the dorsal fin, the second below the posterior rays of the dorsal fin and slightly posterior, the third below the adipose fin and slightly anterior, and the fourth at the end of the caudal peduncle. The first two saddles combine at the midline or may fuse completely. Head slightly darker from tip of snout to anterior edge of orbits and medially from posterior edge of frontal to posterior edge of parieto-supraoccipital. All fins with dark bands with dark and light areas of approximately equal width, caudal bands may be irregular. Number of bands increases with size. Dark spot present between dorsal-fin spinelet and spine, and occasionally dark spots present at the bases of the dorsal-fin membranes (darkest anteriorly). Abdomen with medium spots anteriorly and large spots posteriorly. Lower surface of caudal peduncle mottled. Juveniles colored as adults, but with fewer spots on head and few spots (if any) on abdomen.

**Sexual Dimorphism:** Nuptial males with hypertrophied odontodes on sides and posterior part of head; hypertrophied odontodes becoming larger posteriorly. Hypertrophied odontodes on upper caudal-fin spine and adipose spine. Upper caudal-fin spine thickened. Odontodes on pectoral-fin spine not noticeably larger.

**Range:** From the Rios Purus, Juruá, Marañon and upper Amazon of Brazil and Peru and also found in the upper Río Madeira of Bolivia (Fig. 11). Two collections from the Río Orinoco basin in Vichada, Colombia appear to be *Peckoltia brevis*. If it wasn't for the fact that no other collections of *P. brevis* have been found north of mainstem Amazon/Marañon and lower Caquetá, and if the range was not bisected by the range of *P. lineola*, I would not hesitate to call these specimens *P. brevis*. The specimens are small (48.0–70.2 mm SL); however, the largest specimen is developing nuptial male odontodes at a size I have not seen before. Certainly more specimens must be found to determine the range of *P. brevis*. Because of the uncertainty of the identity of the Vichada specimens, I have not included them in the morphometrics or meristics of the species.

**Habitat:** Specimens collected in Peru were from a lowland, muddy-bottomed river. The specimens were collected on and in submerged logs.

### ***Peckoltia caenosa* new species**

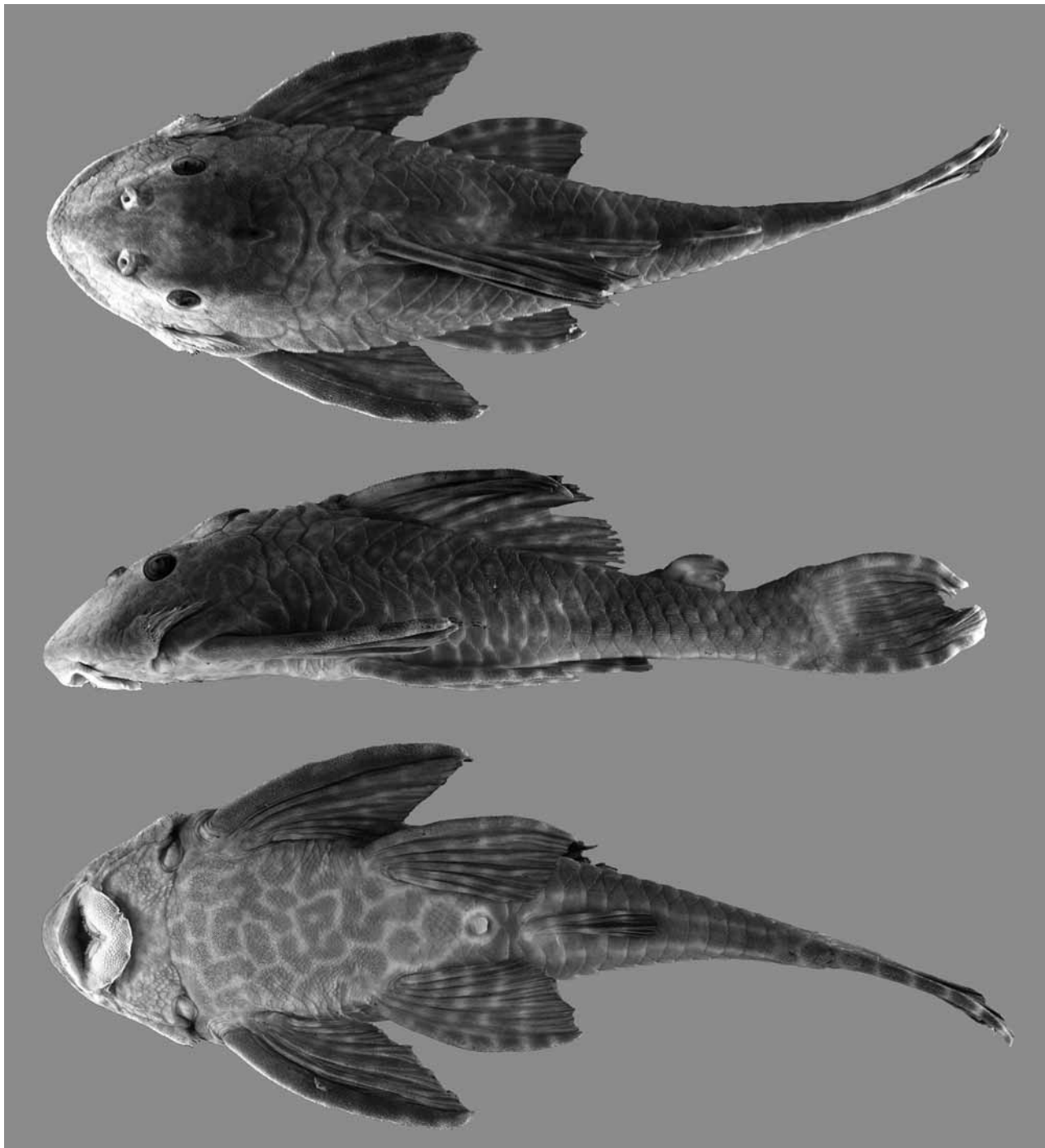
(Fig. 12)

**Holotype:** MCNG 42665, 135.1 mm SL, VENEZUELA, Portuguesa, Río Orinoco dr.: Caño Maraca, tributary of Caño Igues – Río Portuguesa, Guanare-Guanarito road at road km 60, 08°49'39"N, 069°20'42"W, 17 December 1999, J.W. Armbruster, M. Hardman, J.D. Evans, and J.A. Thomas.

**Paratypes:** All collections Río Orinoco drainage: ANSP 166749, 3, 69.4–119.7, VENEZUELA, Anzoategui, Río Orinoco dr., Soledad, Lago Tineo, 08°11'25"N, 063°28'20"W, 15 April 1986, M. Rodriguez and S. Richardson; VENEZUELA, Apure: MCNG 9721, 1, 93.8, Cao Terecay, 35 Km to the north of the road to Modulos field station, 0750'20"N, 069°19'00" W, 18 March 1981, D.C. Taphorn; MCNG 37452, 1, 123.1, Río Arauca, in El Yagual, ~07°27'31"N, ~068°25'24"W, 14 November 1997, Astudillo and Martinez; MCNG 38972, 1, 133.8, Río Manglar 500 meters from the bridge, D. Arana; VENEZUELA, Cojedes: MCNG 24200, 1, 72.6, Cao Igues, via Arismendi, south of El Baul, 1990. VENEZUELA, Portuguesa: AUM 18946, 4, 1 cs, 93.4–156.9, same data as holotype; AUM 22836, 1, 69.4 and ANSP 180224, 1, 134.1, same locality as holotype, 1 January 2000, J.W. Armbruster, M. Hardman, J.D. Evans, and J.A. Thomas; UF 32382, 2, 81.2–94.4, same locality as holotype, 27 March 1981, C.R. Gilbert and C.G. Lilyestrom.

**Nontype (Not included as paratypes because they are faded and difficult to confirm identification):** USNM 258213, 1, not measured, VENEZUELA, Guarico, Río Orinoco dr., Río Orituco where crossed by road from Calabozo, 27 January 1983, A. Machado *et al.*; USNM 258215, 1, not measured, Apure, main channel of Río Apure in region of San Fernando de Apure, 07°53'N, 067°29'W, 25 January 1983, Technicians of Apure Fisheries.

**Diagnosis:** *Peckoltia caenosa* can be identified from all other species of *Peckoltia* by having dark vermiculations on the abdomen (vs. spots, long, fairly straight, wide lines, or plain); from all except *P. bachi* by having the dorsal and lateral surface of the body mottled (vs. with spots or saddles); and from *P. bachi* by having the spots on the head small (vs. large) and generally forming vermiculations (vs. separate), the pelvic spines narrow (vs. wide), and the eye high on the head (vs. low).



**FIGURE 12.** Dorsal, lateral, and ventral views of the holotype of *Peckoltia caenosa* MCNG 42665, 156.9 mm SL. Photographs by J.W. Armbruster.

**TABLE 2.** Selected morphometrics of *Peckoltia brevis* and *P. caenosa*. Numbers in parentheses refer to landmark numbers in Armbruster (2003). Measurements are ratios of SL (predorsal l. to pelvic-dorsal l.) or head l. (head-eye l. to pre-maxillary tooth cup l.).

	<i>P. brevis</i>					<i>P. caenosa</i>				
	N	Avg.	SD	Min.	Max.	N	Avg.	SD	Min.	Max.
SL (1-20)	24	74.5	26.1	34.1	106	17	103.8	29.3	61.3	156.9
Predorsal L. (1-10)	24	44.9	1.7	42.1	48.4	17	41.1	1.2	38.3	43.4
Head L. (1-7)	24	37.6	2.2	35.1	43.0	17	34.7	1.4	31.2	36.6
Head-dorsal L. (7-10)	24	7.5	1.1	5.2	9.7	17	6.8	0.8	6.0	8.3
Cleithral W. (8-9)	24	29.0	1.8	25.3	32.4	17	28.5	1.4	25.7	31.1
Head-pectoral L. (1-12)	24	27.9	1.2	25.6	30.4	17	26.5	2.0	23.9	30.5
Thorax L. (12-13)	24	23.0	1.6	20.2	25.6	17	22.7	1.5	20.4	25.8
Pectoral-spine L. (12-29)	24	32.6	2.7	27.5	37.7	17	34.9	1.9	30.9	38.3
Abdominal L. (13-14)	24	22.7	2.1	19.8	31.3	17	22.3	0.9	20.8	23.9
Pelvic-spine L. (13-30)	24	27.9	1.9	23.9	32.9	17	27.5	2.1	21.4	29.9
Postanal L. (14-15)	24	33.2	1.5	29.8	35.5	17	36.3	1.3	33.2	38.3
Anal-fin spine L. (14-31)	23	15.4	1.9	11.7	17.7	17	16.5	1.6	11.9	18.8
Dorsal-pectoral D. (10-12)	20	30.5	1.3	28.2	33.6	17	27.5	0.9	25.8	29.6
Dorsal spine L. (10-11)	24	35.2	3.0	27.5	40.5	16	34.5	3.3	30.0	41.8
Dorsal-pelvic D. (10-13)	24	24.4	2.8	18.9	29.1	17	23.4	1.4	20.2	25.1
Dorsal-fin base L. (10-16)	24	26.2	1.6	23.4	29.0	17	26.4	1.3	24.1	29.4
Dorsal-adipose D. (16-17)	24	13.9	2.7	9.5	19.0	17	17.9	1.8	14.9	21.4
Adipose-spine L. (17-18)	23	11.8	1.7	9.1	15.0	17	9.2	1.3	7.8	12.6
Adipose-up. caudal D. (17-19)	24	19.1	3.1	12.0	24.8	17	17.6	2.0	14.0	22.8
Caudal peduncle Dp. (15-19)	24	11.4	1.5	8.4	14.9	17	11.3	0.7	9.7	12.3
Adipose-low. caudal D. (15-17)	24	23.9	2.1	21.0	28.7	17	22.5	1.3	20.5	25.5
Adipose-anal D. (14-17)	24	18.5	1.9	14.6	22.8	17	20.8	1.7	18.0	23.2
Dorsal-anal D. (14-16)	24	16.6	1.5	14.0	20.2	17	14.7	0.6	13.2	16.0
Pelvic-dorsal D. (13-16)	24	27.0	1.6	24.0	30.9	17	25.6	1.2	23.5	27.7
Head-eye L. (5-7)	24	37.8	1.6	34.5	41.0	17	38.2	1.3	34.7	40.2
Orbit Dia. (4-5)	24	18.3	1.6	15.3	21.4	17	16.6	2.6	13.8	23.9
Snout L. (1-4)	24	58.2	3.2	52.4	64.3	17	57.6	2.0	53.7	61.0
Internares W. (2-3)	24	16.8	1.8	13.8	20.7	17	15.8	1.9	11.4	18.9
Interorbital W. (5-6)	24	42.4	4.3	36.9	56.3	17	41.0	4.4	27.8	46.3
Head Dp. (7-12)	24	71.4	4.0	63.6	77.4	17	70.2	1.7	66.6	74.0
Mouth L. (1-24)	24	45.0	2.2	41.4	48.2	17	43.5	2.2	40.1	48.0
Mouth W. (21-22)	24	41.1	2.4	36.2	45.3	17	40.1	3.9	32.8	50.7
Maxillary barbel L. (22-23)	24	14.8	3.4	9.7	21.0	17	17.3	3.5	11.7	24.8
Dentary tooth cup L. (25-26)	21	12.0	2.0	7.2	16.7	17	12.4	1.6	8.3	16.0
Premax. tooth cup L. (27-28)	21	11.7	1.9	8.2	15.6	17	11.5	1.7	8.3	15.9

**Description:** Morphometrics in Table 2, counts based on 17 individuals. Largest specimen examined 156.9 mm SL. Body stout and fairly wide. Head gently sloped to parieto-supraoccipital. Parieto-supraoccipital with tall, rounded crest giving head the appearance of stepping to greater depth. Parieto-supraoccipital crest

raised slightly above nuchal region. Nuchal region rises slightly to nuchal plate. Dorsal profile sloped ventrally to dorsal procurrent caudal-fin spines, then rising rapidly to caudal fin. Ventral profile flat to ventral procurrent caudal-fin spines and then sloping ventrally to caudal fin. Supraorbital ridge rounded, contiguous, but slightly offset medially from rounded ridge proceeding from anterior margin of orbit to anterolateral corner of anterior nares. Head contours smooth. Eye relatively small.

Keels absent. Mid-ventral plates bent at their midline above pectoral fin to form ridge. Dorsal plates bent dorsally below dorsal fin to form ridges that converge at preadipose plate, dorsal surface flat between ridges. Five rows of plates on caudal peduncle. Abdomen fully covered in small plates except for small naked areas posterior to lower lip and at insertions of paired fins. First anal-fin pterygiophore exposed to form a platelike structure. A pair of lateral plates converging at midline between anus and exposed first anal-fin pterygiophore. 25–27 (mode 26) plates in the median series.

Frontal, infraorbitals, nasal, compound pterotic, sphenotic, and parieto-supraoccipital, supporting odontodes; opercle supporting odontodes in juveniles but not in adults, posterodorsal corner of opercle covered by one or two plates in adults. Odontodes on lateral plates not enlarged to form keels. Hypertrophied cheek odontodes 10–58, longest almost reaching first mid-ventral plate in adults. Cheek plates evertible to approximately 90° from head. Odontodes on tip of pectoral-fin spine slightly hypertrophied.

Dorsal fin short, not reaching preadipose plate fin when adpressed; dorsal-fin spine same length as proceeding rays making edge straight. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional. Dorsal fin II,7. Adipose fin with one preadipose plate and fairly long spine. Caudal fin strongly forked, lower lobe longer than upper, I,14,I with four to five (mode five) dorsal procurrent caudal-fin rays and four to five (mode four) ventral procurrent-fin rays. Anal fin short with spine weak and approximately same length of first ray. Anal fin I,4, Pectoral-fin spine almost reaching anus when adpressed ventral to pelvic fin. Pectoral fin I,6 (one anomalous specimen I,8). Pelvic fin reaching to posterior insertion of anal-fin when adpressed. Pelvic fin I,5.

Iris operculum present. Flap between anterior and posterior nares short. Lips wide, fairly thin. Upper lip with small, round papillae. Lower lip with small papillae anteriorly and posteriorly, becoming larger medially. Maxillary barbel short, maximally reaching base of evertible cheek plates. Buccal papilla small. Jaws narrow, dentaries forming very acute angle, premaxillaries forming angle of 90° to slightly greater than 90°. Teeth with small, moderately wide cusps, lateral cusp approximately half length of medial cusp, stalk of tooth long; 10–18 dentary teeth (mode 15), 11–21 premaxillary teeth (mode 17).

**Color:** Mottled with light and dark brown. Dark spots all generally combining to form vermiculations on dorsal surface of head. Light spots on fin spines and rays, membranes of caudal fin also with light marking so that spots combine to form bands, light bands about 25% width of dark bands. Four dorsal saddles present, slightly darker than surrounding areas: first below anterior portion of dorsal fin, second below posterior portion of dorsal fin and slightly posterior, third below adipose fin and fourth at base of caudal fin. Nasal flap and parieto-supraoccipital crest slightly darker than rest of head. Ventral surface slightly lighter than sides. Abdomen covered with brown spots that combine to form vermiculations. Ventral surface of caudal peduncle with light, wavy stripes. Juveniles colored as adults, but with fewer, relatively larger spots on abdomen, some of which are not combined to form vermiculations.

**Sexual dimorphism:** None observed.

**Range:** Found in the llanos of Venezuela in rivers draining into the middle Río Orinoco (Fig. 8).

**Habitat:** Found in slow-flowing muddy streams. Can be found during the day inside of submerged, hollow logs.

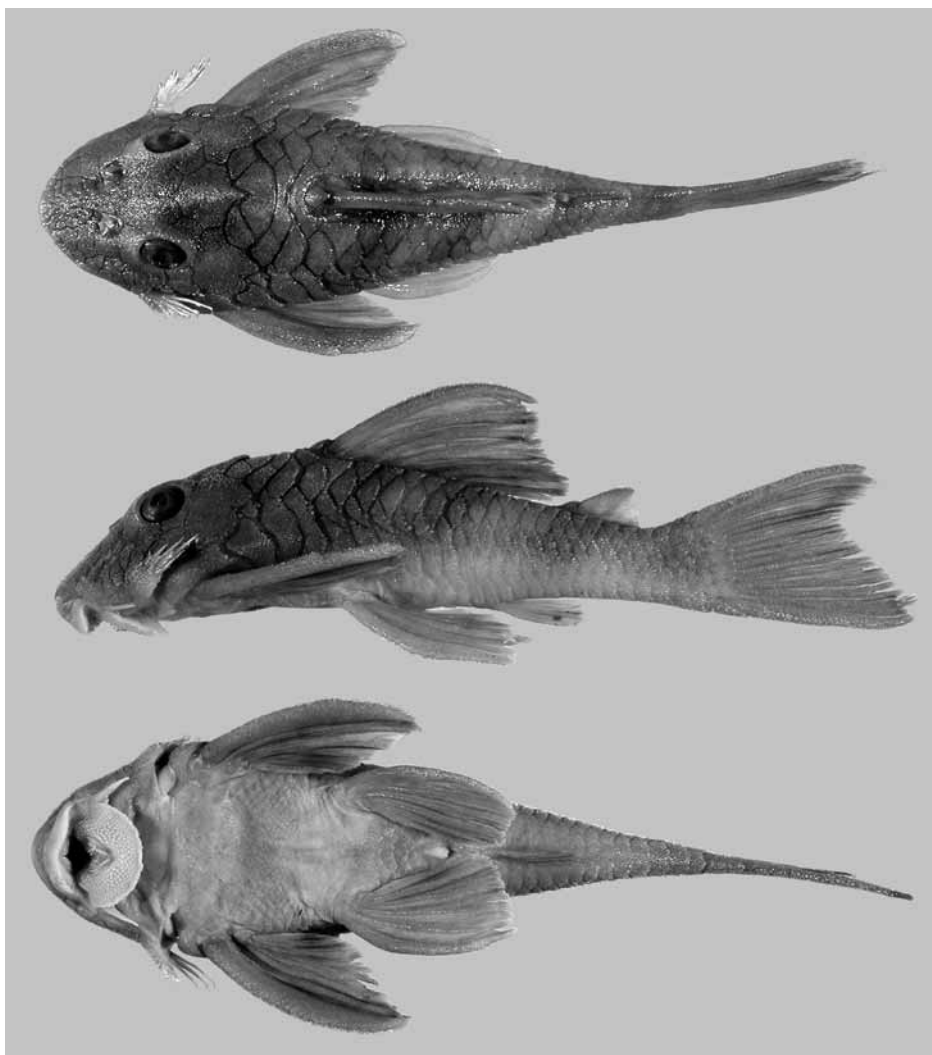
**Etymology:** From the Latin *caenosus* meaning muddy or dirty, in reference to the muddy coloration of this species and its preference for muddy habitats.

***Peckoltia cavatica* Armbruster and Werneke 2005**

(Figs. 2d and 13)

*Peckoltia cavatica* Armbruster & Werneke, 2005: 8, figs. 2 (bottom), 4. Type locality: Guyana, Rupununi (Region 9), 3.7 km SSE Massara, 03.86228°, -059.28439°. Holotype: UG/CSBD 11043.

**Material Examined:** All collections GUYANA, Region 9 (Upper Takutu- Upper Essequibo), Essequibo River drainage: ANSP 180209, 3, Paratypes, 29.8–58.2, AUM 35536, 5, 2 cs, Paratypes, 32.8–71.8 mm SL, and UG/CSBD 11045, Paratypes, 2, 33.1–55.1 mm SL, Guyana, Rupununi (Region 9), Rupununi River, 4.6 km NW Massara, 03°55'34"N, 059°16'49"W, 26 October 2002, col. by J.W. Armbruster, M.H. Sabaj, D.C. Werneke, C.L. Allison, M.R. Thomas, C.J. Chin, D. Arjoon, S.M. James, and S. Mario; ANSP 180210, 3, Paratypes, 28.4–52.8 mm SL, AUM 36229, 6, 4 cs, Paratypes, 27.5–58.2, UG/CSBD 11043, 1, Holotype, 71.8 mm SL, and UG/CSBD 11044, 3, Paratypes, 32.3–43.4 mm SL, 3.7 km SSE Massara, 03°51'44"N, 059°17'04"W, 27 October 2002, col. by J.W. Armbruster, M.H. Sabaj, D.C. Werneke, C.L. Allison, M.R. Thomas, C.J. Chin, D. Arjoon, S. MaRio, and S.M. James; AUM 44812, Rupununi River at Yukupari, 03°39'54"N, 059°20'38"W, col. by L.S. de Souza, N.K. Lujan, D.C. Taphorn, J.A. Hartsell, E. Liverpool, and S. Lord; USNM 372572, 1, Paratype, 70.0 mm SL, Guyana, Rupununi (Region 9), Rupununi River, rock area near Massara, 23 November 2001, col. by D. Arjoon.



**FIGURE 13.** Dorsal, lateral, and ventral views of the holotype of *Peckoltia cavatica* UG/CSBD 11043, 71.8 mm SL. Photographs by D. C. Werneke.



**TABLE 3.** Selected morphometrics of *Peckoltia cavatica* and *P. furcata*. Numbers in parentheses refer to landmark numbers in Armbruster (2003). Measurements are ratios of SL (predorsal l. to pelvic-dorsal l.) or head l. (head-eye l. to pre-maxillary tooth cup l.).

	<i>P. cavatica</i>					<i>P. furcata</i>				
	N	Avg.	SD	Min.	Max.	N	Avg.	SD	Min.	Max.
SL (1-20)	25	50.3	12.1	35.8	71.8	12	106.5	25.9	75.9	153.5
Predorsal L. (1-10)	25	45.3	1.0	43.4	46.6	12	41.6	1.7	38.3	44.6
Head L. (1-7)	25	39.8	1.6	37.6	46.2	12	33.2	1.7	30.4	35.9
Head-dorsal L. (7-10)	25	6.2	1.0	3.9	7.6	12	8.6	1.4	6.3	11.1
Cleithral W. (8-9)	25	30.5	1.1	28.1	32.3	12	24.8	2.4	20.8	28.3
Head-pectoral L. (1-12)	25	28.3	1.3	25.1	31.4	12	24.2	1.0	22.5	26.2
Thorax L. (12-13)	25	23.6	1.3	20.7	26.2	12	23.9	2.3	21.1	29.1
Pectoral-spine L. (12-29)	25	31.9	1.9	27.0	34.5	12	29.8	2.7	26.0	34.7
Abdominal L. (13-14)	25	21.9	1.7	17.8	24.6	12	22.3	1.2	20.7	24.0
Pelvic-spine L. (13-30)	25	27.0	1.1	24.1	29.0	12	27.6	1.9	24.5	30.7
Postanal L. (14-15)	25	34.4	1.4	31.3	36.9	12	35.2	2.2	32.2	39.5
Anal-fin spine L. (14-31)	25	12.7	1.2	9.5	14.6	12	15.7	1.5	13.1	18.3
Dorsal-pectoral D. (10-12)	25	30.8	1.0	28.2	32.4	12	27.5	1.3	25.8	29.6
Dorsal spine L. (10-11)	25	33.4	3.6	23.0	38.5	11	36.3	3.5	30.6	39.9
Dorsal-pelvic D. (10-13)	25	23.8	2.4	18.6	29.8	12	23.1	1.8	19.9	26.6
Dorsal-fin base L. (10-16)	25	27.1	1.7	23.7	30.7	12	28.2	0.6	27.0	29.1
Dorsal-adipose D. (16-17)	25	12.4	1.3	10.1	14.9	12	14.8	1.8	12.6	17.6
Adipose-spine L. (17-18)	25	10.9	1.0	9.0	12.5	12	10.0	1.5	7.6	12.7
Adipose-up. caudal D. (17-19)	25	20.4	1.5	17.5	22.5	12	18.6	1.9	15.8	22.8
Caudal peduncle Dp. (15-19)	25	10.4	1.5	7.9	13.5	12	10.6	1.6	7.6	12.6
Adipose-low. caudal D. (15-17)	25	26.4	1.2	24.6	28.5	12	23.8	2.1	20.8	28.4
Adipose-anal D. (14-17)	25	16.2	1.3	13.7	19.0	12	18.9	1.1	17.7	21.4
Dorsal-anal D. (14-16)	25	16.4	1.1	13.7	18.3	12	16.4	0.8	15.2	17.4
Pelvic-dorsal D. (13-16)	25	24.4	2.5	18.9	28.5	12	27.4	2.1	24.1	30.0
Head-eye L. (5-7)	25	36.1	2.3	32.5	42.0	12	36.4	1.6	33.3	38.7
Orbit Dia. (4-5)	25	22.2	0.8	20.5	23.7	12	17.4	1.9	14.5	21.1
Snout L. (1-4)	25	55.3	3.6	45.7	60.4	12	59.1	2.4	55.4	63.1
Internares W. (2-3)	25	16.6	2.7	12.0	20.8	12	12.8	0.9	11.5	14.3
Interorbital W. (5-6)	25	39.7	2.6	31.7	43.1	12	38.8	3.1	32.3	43.2
Head Dp. (7-12)	25	68.8	2.4	61.8	71.8	12	68.7	1.4	66.6	72.1
Mouth L. (1-24)	25	43.0	2.8	38.2	50.6	12	40.1	4.6	30.6	46.2
Mouth W. (21-22)	25	40.5	3.0	34.1	45.5	12	40.9	5.5	32.8	50.0
Maxillary barbel L. (22-23)	25	15.0	2.4	10.5	18.4	12	13.4	2.4	9.9	16.7
Dentary tooth cup L. (25-26)	25	8.3	1.6	5.4	11.4	12	12.8	2.1	8.9	16.3
Premax. tooth cup L. (27-28)	25	7.9	1.2	5.5	10.5	12	13.2	1.6	10.5	15.8

**Diagnosis:** *Peckoltia cavatica* can be identified from all other described *Peckoltia* except *P. braueri* by the presence of an orange band in the dorsal fin and by having thin, black lines that outline the plates and bones of the head. *Peckoltia cavatica* can be identified from *P. braueri* as above. The only other species of

*Peckoltia* similar to *P. cavatica* in coloration are *P. lineola* and *P. vermiculata*, which can be identified by having vermiculations on the dorsal head bones and plates (vs. coloration confined to the borders between bones and plates in *P. cavatica*).

**Description:** *Peckoltia cavatica* was recently described by Armbruster and Werneke (2005). Morphometrics in Table 3.

**Range.** Collected from two localities around the Macushi village of Massara near Anai in the Rupununi River (Fig. 8).

***Peckoltia furcata* (Fowler 1940)**  
(Figs. 14–15)

*Chaetostomus furcatus* Fowler, 1940: 238, figs. 28–29. Type locality: Ucayali River basin, Contamana, Peru. Holotype: ANSP 68655.

**Material Examined:** ECUADOR, Pastaza, Río Napo - Río Amazonas drainage: FMNH 70863, 4, 1 cs, 75.9–87.4, Cusuimi, on Rio Cusuimi, about 150 km SE of Puyo, 02°39'S, 077°43'W, col. by B. Malkin, 18–23 July 1971. PERU, Amazonas, Río Amazonas drainage: ANSP 68655, Holotype, 1, 90.7, Ucayali River basin, Contamana, W.C. Morrow, July–August 1937; MUSM 19052, 3, 122.8–153.5, Río Santiago ce.nn. Soledad, Río Marañon basin, 03°31'28"S, 77°46'20"W, col. by M. Hidalgo, 20 September 2001; FMNH 97023, 1, 105.9 and LACM 39864–10, 2, 1 cs, 92.7–98.9, Río Santiago, vicinity of Galilea, 1.5 km upstream of La Poza, Río Marañon basin, col. by Natives, 26–28 January 1980. PERU, Loreto, Río Amazonas drainage: SIUC 36691, 1, 139.4, Río Itaya, 10 km S of Santa Clara, ornamental fishermen, 25 July 1995.

**Diagnosis.** *Peckoltia furcata* is unique among *Peckoltia* and perhaps hypostomines by having a strongly forked caudal fin with the upper lobe longer than the lower (Fig. 15; vs. lower lobe longer); however, the condition of the caudal fin of most *Peckoltia* is poor with the tails either breaking in transit or eaten off by other fishes, making the utility of this character limited. *Peckoltia furcata* can be identified from all other *Peckoltia* except *P. bachi*, *P. brevis*, *P. caenosa*, *P. lineola*, and *P. oligospila* by having spots on the head; from *P. bachi* by having the spots on the head small (vs. large), the pelvic spines narrow (vs. wide), and the eye high on the head (vs. low); from *P. brevis*, *P. caenosa*, *P. lineola*, and *P. oligospila* by lacking spots on the abdomen at all ages (vs. present in large juveniles and adults); from *P. brevis* and *P. lineola* by having spots on the dorsal fin (vs. bands); from *P. caenosa* and *P. lineola* by having none of the spots on the head combining to form vermiculations; from *P. caenosa* by having dark spots in the dorsal fin (vs. light spots), and by having the dark and light bands on the caudal fin of about equal width (vs. light bands about 25% of width of dark bands); and from *P. oligospila* by having bands in the caudal fin (vs. spots).



**FIGURE 14.** Lateral view of holotype of *Chaetostomus furcatus*, ANSP 68655, 90.7 mm SL. Photograph by K. Luckenbill.

**Description.** Morphometrics in Table 3, counts based on 12 individuals unless otherwise stated. Largest specimen examined 153.5 mm SL. Body fairly narrow and elongate. Head gently sloped to parieto-supraoccipital. Parieto-supraoccipital with tall crest. Parieto-supraoccipital crest raised well above nuchal region. Nuchal region rises slightly to nuchal plate. Dorsal profile sloped ventrally to dorsal procurrent caudal-fin spines, then rising rapidly to caudal fin. Ventral profile flat to ventral procurrent caudal-fin spines and then sloping ventrally to caudal fin. Supraorbital ridge rounded, contiguous, but slightly offset medially from rounded ridge proceeding from anterior margin of orbit to anterolateral corner of anterior nare. Head contours smooth except parieto-supraoccipital crest. Eye medium-sized.

Keels absent. Mid-ventral plates bent at their midline above pectoral fin to form ridge. Dorsal plates bent dorsally below dorsal fin to form ridges that converge at preadipose plate, dorsal surface flat between ridges. Five rows of plates on caudal peduncle. Abdomen completely covered in small plates except for small areas at bases of pectoral and pelvic fins and occasionally on throat. First anal-fin pterygiophore exposed to form a platelike structure. A pair of lateral plates converging at midline between anus and exposed first anal-fin pterygiophore. 23–28 (mode 26) plates in the median series.

Frontal, infraorbitals, nasal, compound pterotic, sphenotic, and parieto-supraoccipital, supporting odontodes; opercle supporting odontodes in juveniles but not in adults, posterodorsal corner of opercle covered by one or two plates in adults. Odontodes on lateral plates not enlarged to form keels. Hypertrophied cheek odontodes 20–77, longest almost reaching first mid-ventral plate in adults. Cheek plates evertible to approximately 90° from head. Odontodes on tip of pectoral-fin spine slightly hypertrophied.

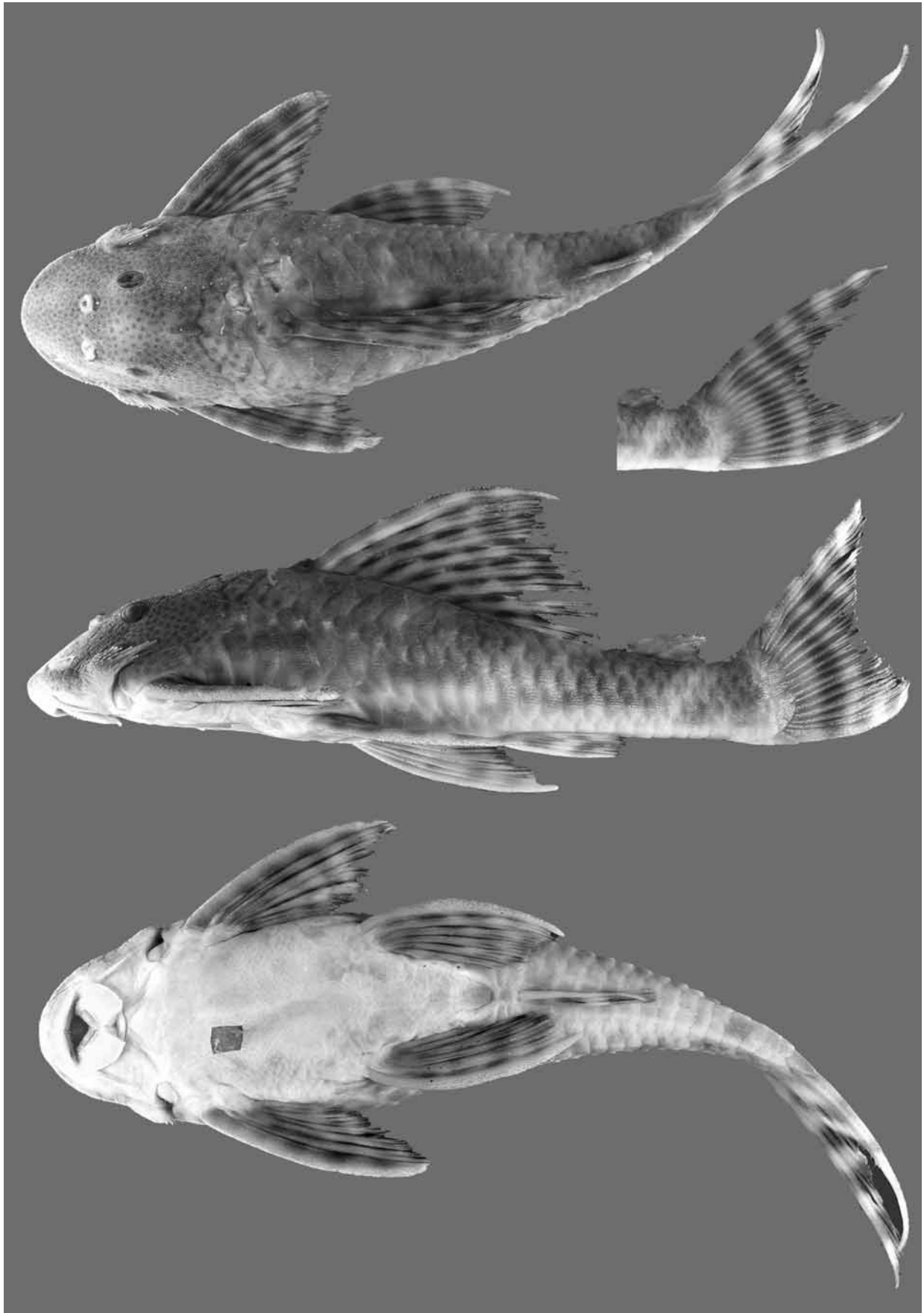
Dorsal fin short, not reaching preadipose plate fin when adpressed; dorsal-fin spine same length as proceeding rays making edge straight. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional. Dorsal fin II,7. Adipose fin with one preadipose plate and fairly long spine. Caudal fin forked, lower lobe longer than upper, I,14,I with four to five (mode four) dorsal procurrent caudal-fin rays and four to five (mode four) ventral procurrent-fin rays. Anal fin short with unbranched ray weak and about same length of first branched ray. Anal fin I,4, Pectoral-fin spine reaching beyond pelvic fin when adpressed ventral to pelvic fin. Pectoral fin I,6. Pelvic fin reaching to posterior insertion of anal-fin or further when adpressed. Pelvic fin I,5.

Iris operculum present. Flap between anterior and posterior nares short. Lips wide, fairly thin. Upper lip with small, round papillae. Lower lip with small papillae anteriorly and posteriorly, becoming larger medially. Maxillary barbel short, maximally reaching base of evertible cheek plates. Buccal papilla small. Jaws narrow, dentaries forming angle slightly greater than 90°, premaxillaries forming gentle arc greater than 135°. Teeth with small, moderately wide cusps, lateral cusp approximately half length of medial cusp, stalk of tooth long; 26–42 dentary teeth (mode 37), 28–58 premaxillary teeth (mode 30).

**Color:** Base tan with brown markings. Head with small spots anteriorly, becoming slightly larger posteriorly and fading between head and dorsal fin or continuing to get larger and fading anywhere before caudal fin. Body with four dorsal saddles (occasionally faint), the first below the middle rays of the dorsal fin, the second below the posterior rays of the dorsal fin and slightly posterior, the third below the adipose fin and slightly anterior, and the fourth at the end of the caudal peduncle. The first two saddles combine midbody. All fins with large spots, spots combining in all except dorsal fin to form bands (although the distal row will occasionally fuse in the dorsal fin). The light interspaces in all fins except the caudal are about half the width of the dark spots or bands. The light interspaces of the caudal fin about same width as dark bands. Dark spot between dorsal-fin spinelet and spine. Abdomen and ventral surface of caudal peduncle lighter than sides. Juveniles colored as adults, but spots significantly larger and fewer bands or spots in the fins.

**Sexual Dimorphism:** Nuptial males with hypertrophied odontodes on sides and posterior part of head; hypertrophied odontodes becoming larger posteriorly. Hypertrophied odontodes on upper caudal-fin spine and adipose spine. Upper caudal-fin spine not thickened. Odontodes on pectoral-fin spine noticeably larger.

**Range:** Known from the upper Río Amazon, Río Marañon, and Río Ucayali of Ecuador and Peru (Fig. 5).



**FIGURE 15.** Dorsal, lateral, and ventral views of *Peckoltia furcata*, SIUC 36691, 139.4 mm SL. Inset is of extended caudal fin to show that the dorsal caudal-fin spine is longer than the ventral. Photographs by J.W. Armbruster.

**Comments:** The placement of *Peckoltia furcata* is far from assured. The dentary angle never gets quite to 90°, and it appears intermediate in angle between *Hemiancistrus sabaji* and *Peckoltia*. In most conditions such as color and body shape, *P. furcata* seems intermediate between *H. sabaji* and the rest of *Peckoltia*, but given that the jaw angle is smaller in *P. furcata* than anything I have identified as *Hemiancistrus*, I consider it a *Peckoltia*. Certainly the phylogeny of *Peckoltia* must be better explored to determine the relationships of the species.

### ***Peckoltia lineola* new species**

(Figs. 2e and 16)

**Holotype:** MCNG 55684, VENEZUELA, Amazonas, Río Orinoco drainage, 88.3, Río Ventuari, 23 km NE of Macuruco, 94 km E of San Fernando de Atabapo, 04°04'50"N, 66°51'55"W, N.K. Lujan, D.C. Werneke, M.H. Sabaj, L.S. de Souza, and O. Leon, 5 April 2004.

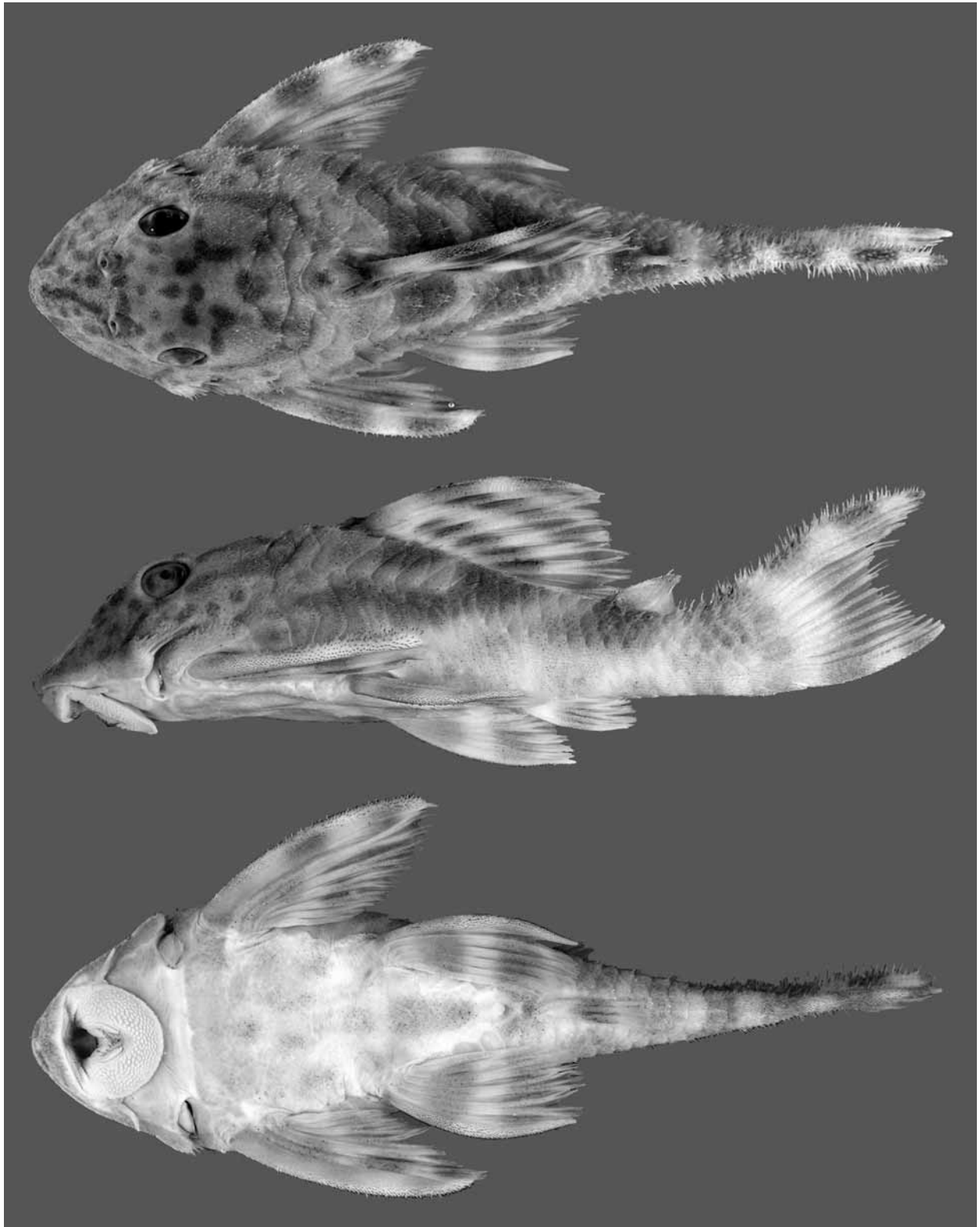
**Paratypes:** COLOMBIA, Guainia, Río Orinoco drainage: ICNMNH 9910, 2, 37.1–57.5, Inirida, Caño Bocon - Río Inirida, M.T. Sierra and M. Patiño, February - March 2004. VENEZUELA, Amazonas, Río Orinoco drainage: ANSP 185222, 2, 1 cs, 88.3–92.5, AUM 39245 2, 1 cs, 88.3–94.7, and MCNG 55685, 2, 83.8–96.9, same data as holotype; AUM 41561, 1 (not measured), 41.1, Río Manapiare, at Laja Pelada landing, 27 km SSW of San Juan de Manapiare, Río Ventuari basin, 05°07'27"N, 66°05'48"W, O. Leon, D.C. Werneke, and N.K. Lujan, 18 April 2004; MCNG 37054, 1, 58.3, Río Manapiare, 5–6 km above mouth, Río Ventuari basin, K. Winemiller, L. Nico, S. Walsh, and A. Barbarino, 15 January 1998.

**Diagnosis:** *Peckoltia lineola* can be identified from all other *Peckoltia* except *P. braueri*, *P. caenosa*, *P. cavatica*, and *P. vermiculata* by having vermiculations on the head and snout. *Peckoltia lineola* can be identified from *P. braueri*, *P. cavatica*, and *P. vermiculata* by having thick vermiculations almost as wide as the pupil on the compound pterotics and snout (vs. thin vermiculations much narrower than the pupil diameter and by also having large spots on the compound pterotics and snout (vs. no spots); from *P. braueri* and *P. cavatica* by lacking an orange band in the dorsal fin; from *P. cavatica* by having the vermiculations cross the bones like the compound pterotic (vs. dark lines only outlining the plates and bones of the head); from *P. caenosa* by having dark bands in the fins (vs. light spots), by having long, thick, longitudinal lines on the abdomen (vs. vermiculations with a random orientation), by having the light interspaces on the snout of about the same width of the black spots and lines (vs. light vermiculations narrower than dark ones), and by having the light bands of the caudal at least 50% width of dark bands (vs. 25%); and from *P. vermiculata* by not having the vermiculations coming from a central point on the parieto-supraoccipital. *Peckoltia lineola* is similar to *P. brevis* except that some of the spots on the head and snout combine to form lines (vs. all spots separate) and the spots on the abdomen combine to form long, thick longitudinal lines (vs. spots separate).

**Description:** Morphometrics in Table 4, counts based on eight individuals unless otherwise stated. Largest specimen examined 96.9 mm SL. Body stout, fairly wide. Head gently sloped to parieto-supraoccipital. Parieto-supraoccipital with tall, rounded crest. Parieto-supraoccipital crest barely raised above nuchal region. Nuchal region rises slightly to nuchal plate. Dorsal profile sloped ventrally to dorsal procurrent caudal-fin spines, then rising rapidly to caudal fin. Ventral profile flat to ventral procurrent caudal-fin spines and then sloping ventrally to caudal fin. Supraorbital ridge rounded, contiguous, but slightly offset medially from rounded ridge proceeding from anterior margin of orbit to anterolateral corner of anterior nare. Head contours smooth. Eye medium-sized.

Keels absent. Mid-ventral plates bent at their midline above pectoral fin to form ridge. Dorsal plates bent dorsally below dorsal fin to form ridges that converge at preadipose plate, dorsal surface flat between ridges. Five rows of plates on caudal peduncle. Abdomen covered in small plates except for small naked areas posterior to lower lip and at insertions of paired fins. First anal-fin pterygiophore exposed to form a platelike struc-

ture. A pair of lateral plates converging at midline between anus and exposed first anal-fin pterygiophore. 24–26 (mode 24) plates in the median series.



**FIGURE 16.** Dorsal, lateral, and ventral views of the holotype of *Peckoltia lineola* MCNG 55684, 88.1 mm SL. Photographs by J.W. Armbruster.

**TABLE 4.** Selected morphometrics of *Peckoltia lineola* and *P. oligospila*. Numbers in parentheses refer to landmark numbers in Armbruster (2003). Measurements are ratios of SL (predorsal l. to pelvic-dorsal l.) or head l. (head-eye l. to premaxillary tooth cup l.).

	<i>P. lineola</i>					<i>P. oligospila</i>				
	N	Avg.	SD	Min.	Max.	N	Avg.	SD	Min.	Max.
SL (1-20)	8	86.4	12.1	58.3	96.9	14	94.6	29.2	54.3	148.6
Predorsal L. (1-10)	8	44.1	0.8	42.7	45.0	14	42.0	1.2	38.7	43.9
Head L. (1-7)	8	36.2	0.7	35.0	37.1	14	35.0	1.4	32.7	37.1
Head-dorsal L. (7-10)	8	8.3	0.5	7.5	9.1	14	7.6	1.2	6.3	10.2
Cleithral W. (8-9)	8	28.8	2.3	26.1	31.9	14	27.5	2.2	24.7	31.4
Head-pectoral L. (1-12)	8	27.8	1.3	26.0	29.4	14	25.7	1.1	24.0	28.2
Thorax L. (12-13)	8	21.7	1.3	20.0	23.8	14	22.5	1.6	19.4	25.1
Pectoral-spine L. (12-29)	8	31.9	2.4	28.0	35.5	14	32.0	1.5	29.0	34.1
Abdominal L. (13-14)	8	22.9	1.3	20.7	24.7	14	22.7	1.1	20.8	24.0
Pelvic-spine L. (13-30)	8	25.5	1.8	23.6	28.4	14	27.4	1.6	24.7	29.5
Postanal L. (14-15)	8	32.9	1.0	31.4	34.6	14	35.7	1.2	34.3	38.8
Anal-fin spine L. (14-31)	8	13.9	0.6	12.9	14.9	14	15.0	1.2	13.3	17.5
Dorsal-pectoral D. (10-12)	8	30.0	0.8	28.9	31.1	14	29.2	0.7	28.2	30.6
Dorsal spine L. (10-11)	8	33.6	2.6	30.1	37.6	13	35.7	2.7	29.3	40.3
Dorsal-pelvic D. (10-13)	8	24.1	0.7	23.1	25.0	14	24.0	1.8	21.3	27.2
Dorsal-fin base L. (10-16)	8	27.6	0.5	26.7	28.2	14	27.7	1.4	25.3	29.5
Dorsal-adipose D. (16-17)	8	15.1	1.0	14.1	17.1	14	15.3	1.7	12.2	18.7
Adipose-spine L. (17-18)	8	9.7	1.4	7.6	11.4	14	10.8	1.8	7.7	13.1
Adipose-up. caudal D. (17-19)	8	19.0	2.5	14.9	21.9	14	18.4	1.7	15.8	21.1
Caudal peduncle Dp. (15-19)	8	12.9	1.2	10.6	14.5	14	12.6	1.5	8.0	14.9
Adipose-low. caudal D. (15-17)	8	24.2	2.4	20.7	27.4	14	24.6	1.6	21.3	26.7
Adipose-anal D. (14-17)	8	18.1	1.2	15.8	20.2	14	19.5	1.4	17.4	23.0
Dorsal-anal D. (14-16)	8	16.8	0.8	15.6	17.8	14	16.2	0.9	14.7	18.1
Pelvic-dorsal D. (13-16)	8	27.1	1.2	24.2	28.2	14	26.5	1.6	24.1	29.1
Head-eye L. (5-7)	8	36.9	0.9	35.9	38.5	14	36.2	2.1	32.4	38.8
Orbit Dia. (4-5)	8	21.6	0.8	20.3	22.7	14	19.9	1.6	17.3	23.0
Snout L. (1-4)	8	59.8	1.1	58.0	61.2	14	58.6	2.8	54.2	62.5
Internares W. (2-3)	8	14.8	1.8	12.6	18.5	14	13.6	1.2	11.2	16.1
Interorbital W. (5-6)	8	45.0	4.8	38.5	51.5	14	43.5	3.5	35.2	49.0
Head Dp. (7-12)	8	73.2	2.6	68.9	77.9	14	73.3	3.2	68.2	80.4
Mouth L. (1-24)	8	45.7	4.0	39.5	49.7	14	43.9	3.1	36.4	50.7
Mouth W. (21-22)	8	43.5	2.8	39.9	47.3	14	44.7	4.4	36.4	51.6
Maxillary barbel L. (22-23)	8	16.6	1.9	13.7	20.3	14	17.3	2.9	11.3	22.6
Dentary tooth cup L. (25-26)	8	11.2	2.1	7.4	14.0	14	12.5	2.2	8.4	16.0
Premax. tooth cup L. (27-28)	8	10.2	1.6	8.0	11.8	14	12.3	1.7	9.7	14.5

Frontal, infraorbitals, nasal, compound pterotic, sphenotic, and parieto-supraoccipital, supporting odontodes; opercle supporting odontodes in juveniles but not in adults, posterodorsal corner of opercle covered by one or two plates in adults. Odontodes on lateral plates not enlarged to form keels. Hypertrophied cheek odontodes 19–26 (N=5), longest almost reaching first mid-ventral plate in adults. Cheek plates evertible to approximately 90° from head. Odontodes on tip of pectoral-fin spine slightly hypertrophied.

Dorsal fin short, reaching preadipose plate fin when adpressed; dorsal-fin spine same length as proceeding rays making edge straight. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional. Dorsal fin II,7. Adipose fin with one preadipose plate and fairly long spine. Caudal fin forked, lower lobe longer than upper, I,14,I with four to five (mode four) dorsal procurrent caudal-fin rays and four to five (mode five) ventral procurrent-fin rays. Anal fin short with unbranched ray weak and approximately same length of first branched ray. Anal fin I,4, Pectoral-fin spine almost reaching just beyond pelvic fin when adpressed ventral to pelvic fin. Pectoral fin I,6. Pelvic fin reaching to posterior insertion of anal-fin when adpressed. Pelvic fin I,5.

Iris operculum present. Flap between anterior and posterior nares short. Lips wide, fairly thin. Upper lip with small, round papillae. Lower lip with small papillae anteriorly and posteriorly, becoming larger medially. Maxillary barbel short, maximally reaching base of evertible cheek plates. Buccal papilla small. Jaws narrow, dentaries forming very acute angle, premaxillaries forming angle of 90° to slightly greater than 90°. Teeth with small, moderately wide cusps, lateral cusp approximately half length of medial cusp, stalk of tooth long; 10–16 dentary teeth (N=6, mode 13), 10–19 premaxillary teeth (N=6, mode 12).

**Color:** Base color light tan with brown to black markings. Four dorsal saddles on the body, the first below the middle rays of the dorsal fin, the second below the posterior rays of the dorsal fin and slightly posterior, the third below the adipose fin and slightly anterior, and the fourth at the end of the caudal peduncle. Third and fourth bars may have anterior extensions or have an anterior projection making them *h*-shaped. Fourth bar combines with first band of caudal dorsally. The first two saddles combine midbody. All fins with dark bands with dark and light areas ranging from approximately equal width to dark bands wider, caudal bands may be irregular. Number of bands increases with size. Dark spot present between dorsal-fin spinelet and spine. Abdomen with large spots that combine to form thick longitudinal lines (usually one almost continuous central line and lines on each side). Lower surface of caudal peduncle with dark blotches formed from the lower extensions of the third and fourth dorsal saddle, the anterior extensions of the third and fourth saddles, and accessory blotch between the third and fourth saddles. Juveniles colored as adults, but without anterior extensions of the third and fourth dorsal saddles, without spots on the abdomen, and with the spots and lines on the head less numerous.

**Sexual Dimorphism:** The main collection consists of only nuptial males. Nuptial males with hypertrophied odontodes on sides and posterior part of head; hypertrophied odontodes becoming larger posteriorly. Hypertrophied odontodes on upper caudal-fin spine and adipose spine. Upper caudal-fin spine thickened. Odontodes on pectoral-fin spine not noticeably larger.

**Range.** Known from the Río Ventuari of Venezuela and the Río Iniridá of Colombia (Fig. 8).

**Habitat.** Specimens collected in Venezuela were from rocky riffles.

**Etymology:** *Lineola* is Latin for little line, refers to the short lines on the compound pterotic.

### ***Peckoltia multispinis* (Holly, 1929)**

(Fig. 17)

*Ancistrus multispinis* Holly, 1929: 119. Type locality: Mercado Bléin (Brasilien). Holotype: NMW 8952.





**FIGURE 17.** Dorsal, lateral, and ventral views of the holotype of *Ancistrus multispinis* NMW 8952, 115.2 mm SL. Photographs by M.H. Sabaj and K. Luckenbill.

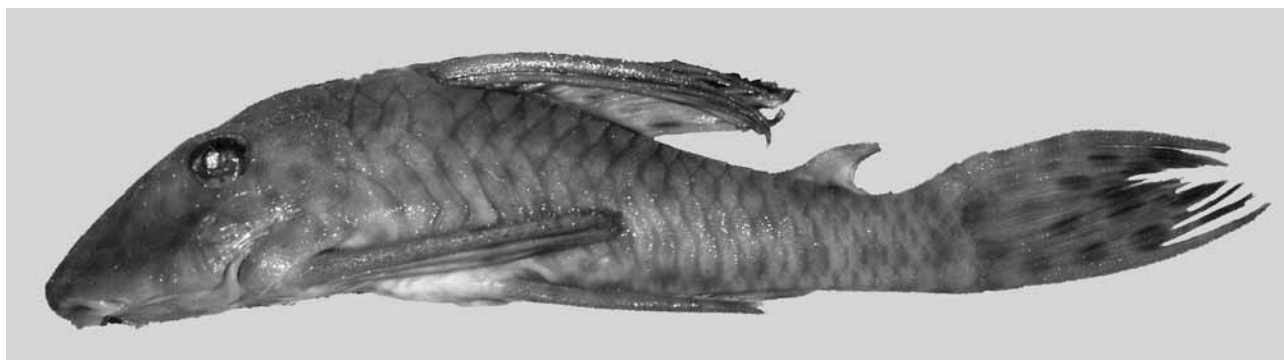
**Comments:** The type of *Ancistrus multispinis* had been lost for a long time until Mark Sabaj rediscovered it in 2007. The species had been considered a *Lasiancistrus* since Isbrücker (1980). Armbruster (2005) recognized that the original description was not entirely consistent with a *Lasiancistrus*, but placed the species into the synonymy of *L. schomburgkii* anyway. The label was clearly misread by Holly as it does say ÔMercado BelémÓ (Fig. 17). The species is most certainly a species of *Peckoltia*, but I have only examined photos provided by Mark Sabaj and Kyle Luckenbill. The species is relatively unique in that it has the lower lip consisting of short, multibranched fimbriae; however, some *P. vittata* approach the condition in *P. multispinis*. The only color remaining is some faint, irregular banding in the caudal fin that is consistent with most species of *Peckoltia*, including *P. vittata*, which is known from around Belém. The species may be valid or a synonym of *P. vittata*. I tentatively recognize it as valid, but with the color gone from the type specimen and little pertinent information in the original description, it is impossible to compare the species with other *Peckoltia*, and it is not included in diagnoses or the key.

***Peckoltia oligospila* (Günther 1864)**

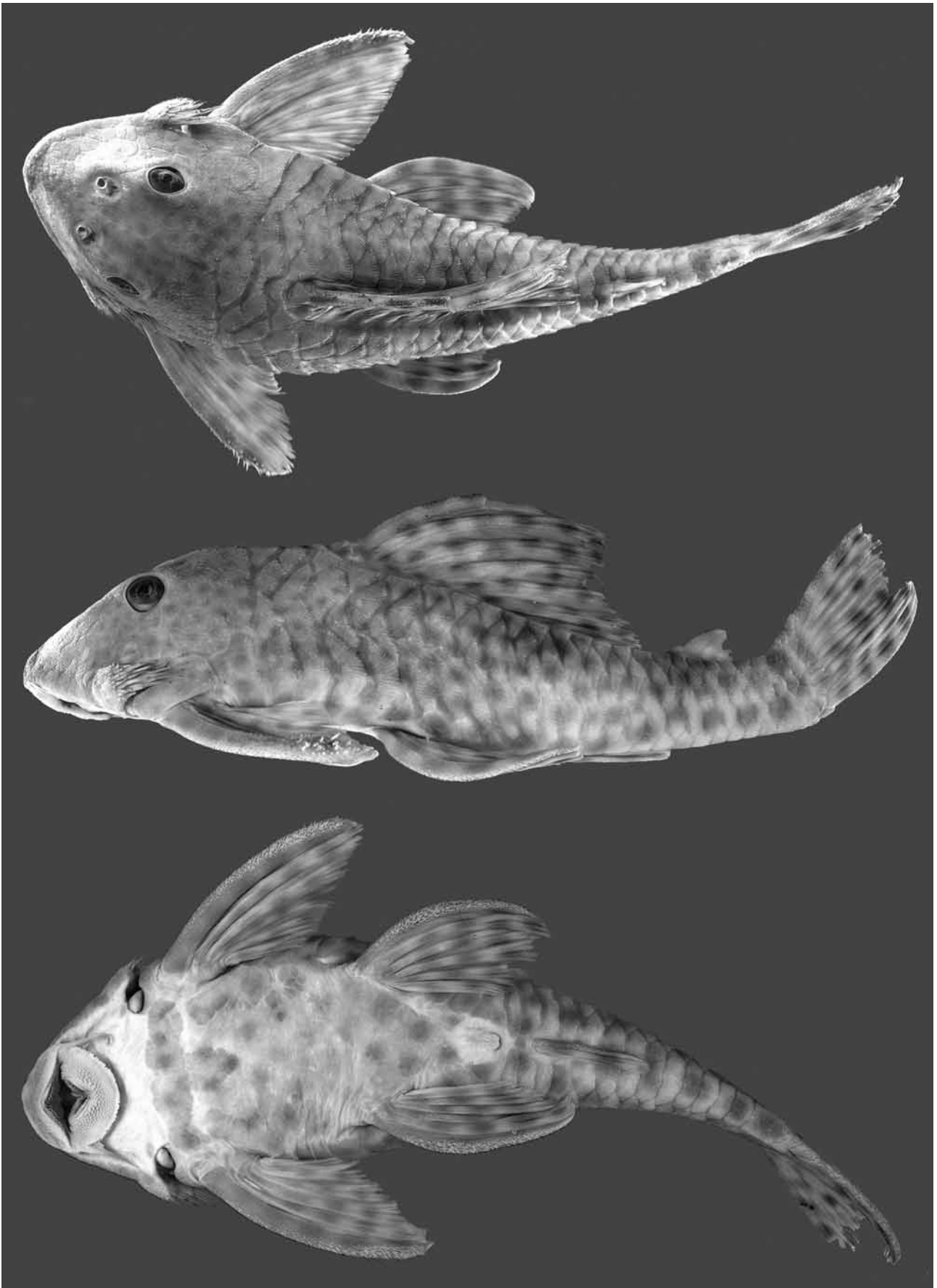
(Fig. 18–19)

*Chaetostomus oligospilus* Günther, 1864: 244. Type locality: River Capim [Brazil]. Holotype: BMNH 1849.11.8, illustrated in Regan (1904b: 232, pl. 12 fig. 1).

**Material Examined:** All Collections BRAZIL, Pará, Rio Tocantins – Atlantic Ocean drainage: BMNH 1849.11.8, Holotype, 1, 87.2, Rio Capim; INPA 6321, 1, 148.6, Rio Tocantins, Igarapé Jatobal, Equipe Ictiologia do INPA, 17 July 1981; MCP 14535, 5, 54.3–70.0, Rio Tocantins in the city of Cametá, M.T.C. Lacerda, 1988; MCP 21967, 1, 101.7, Rio Guamá in Urucuritêua on the road between São Miguel do Guamá and Ourém, Rio Capim basin, 01°35'28"S, 047°20'18"W, R. Reis, J. P. Silva, E. Pereira, J. Montoya, 22 July 1998; MCP 21970, Rio Jauara on the Belém/Brasília Road (BR 010) between Mãe do Rio and Irituia, Rio Capim basin, 01°55'29"S, 047°31'21"W, R. Reis, J. P. Silva, E. Pereira, J. Montoya, 19 July 1998; MCP 21971, 5, 93.4–104.2, Rio Guamá near Ourém, Rio Capim basin, 01°35'28"S, 047°20'18"W; MCZ 62116, 1, 136.1, Ríó Apeu at Boa Vista, Rio Capim basin, 01°18'S, 047°59'W, N.A. Menezes, July 1965; MZUSP 23872, 1, 83.6, Rio Capim, close to Caranan déua, EPA, 16–17 August 1970; MZUSP 53398, 1, 135.7, Igarapé Apeú, Boa Vista, 01°18'S, 047°58'W, P.E. Vanzolini, 3–4 February 1964; NMW 48065, 1, 111.8, Pará, Brasilien Expedition, 1903.



**FIGURE 18.** Lateral view of holotype of *Chaetostomus oligospilus*, BMNH 1849.11.8, 87.2 mm SL. Photograph by J.W. Armbruster.



**FIGURE 19.** Dorsal, lateral, and ventral views of *Peckoltia oligospila*, MCZ 62116, 136.1 mm SL. Photographs by J.W. Armbruster.

**Diagnosis:** *Peckoltia oligospila* can be identified from all other *Peckoltia* except *P. bachi* and some *P. furcata* by having spots on the body and the saddles faint; from *P. bachi* by having narrow pelvic-fin spines (vs. wide), the eye high on the head (vs. low), and by having the spots distinctly round (vs. appearing more as a mottling); and from *P. furcata* by having spots on the abdomen of larger juveniles and adults (vs. spots on abdomen always absent) and by having the spots separate in the caudal fin (vs. combining to form bands). *Peckoltia lineola* also has spots on the head. *Peckoltia oligospila* can be further separated from *P. lineola* by having spots in all fins (vs. bands in all fins) and by having none of the spots on the head combining to form vermiculations.

**Description.** Morphometrics in Table 4, counts based on 17 individuals unless otherwise stated. Largest specimen examined 148.6 mm SL. Body stout and fairly wide. Head gently sloped to parieto-supraoccipital. Parieto-supraoccipital with tall crest. Parieto-supraoccipital crest raised well above nuchal region. Nuchal region rises slightly to nuchal plate. Dorsal profile sloped ventrally to dorsal procurent caudal-fin spines, then rising rapidly to caudal fin. Ventral profile flat to ventral procurent caudal-fin spines and then sloping ventrally to caudal fin. Supraorbital ridge rounded, contiguous, but slightly offset medially from rounded ridge proceeding from anterior margin of orbit to anterolateral corner of anterior nares. Head contours smooth except parieto-supraoccipital crest. Eye medium-sized.

Keels absent. Mid-ventral plates bent at their midline above pectoral fin to form ridge. Dorsal plates bent dorsally below dorsal fin to form ridges that converge at preadipose plate, dorsal surface flat between ridges. Five rows of plates on caudal peduncle. Abdomen largely naked with a column of plates below pectoral girdle, rows of plates laterally, a patch of plates in front of the anus, and occasionally a small patch of plates medially just posterior to pectoral girdle. First anal-fin pterygiophore exposed to form a platelike structure. A pair of lateral plates converging at midline between anus and exposed first anal-fin pterygiophore. 24–26 (mode 26) plates in the median series.

Frontal, infraorbitals, nasal, compound pterotic, sphenotic, and parieto-supraoccipital, supporting odontodes; opercle supporting odontodes in juveniles but not in adults, posterodorsal corner of opercle covered by one or two plates in adults. Odontodes on lateral plates not enlarged to form keels. Hypertrophied cheek odontodes 13–50 (N=16), longest almost reaching first mid-ventral plate in adults. Cheek plates evertible to approximately 90° from head. Odontodes on tip of pectoral-fin spine slightly hypertrophied.

Dorsal fin short, not reaching preadipose plate fin when adpressed; dorsal-fin spine same length as proceeding rays making edge straight. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional. Dorsal fin II,7. Adipose fin with one preadipose plate and fairly long spine. Caudal fin forked, lower lobe longer than upper, I,14,I with three to five (mode five) dorsal procurent caudal-fin rays and two to four (mode four) ventral procurent-fin rays. Anal fin short with unbranched ray weak and about same length of first branched ray. Anal fin I,4, Pectoral-fin spine reaching just beyond pelvic fin when adpressed ventral to pelvic fin. Pectoral fin I,6. Pelvic fin reaching to posterior insertion of anal-fin when adpressed. Pelvic fin I,5.

Iris operculum present. Flap between anterior and posterior nares short. Lips wide, fairly thin. Upper lip with small, round papillae. Lower lip with small papillae anteriorly and posteriorly, becoming larger medially. Maxillary barbel short, maximally reaching base of evertible cheek plates. Buccal papilla small. Jaws narrow, dentaries forming very acute angle, premaxillaries forming gentle arc less than 135°. Teeth with small, moderately wide cusps, lateral cusp approximately half length of medial cusp, stalk of tooth long; eight to 25 dentary teeth (mode 15), 16–30 premaxillary teeth (mode 20).

**Color:** Base tan with brown markings. Head with small to medium faint spots slowly becoming larger posteriorly, none of the spots intense. Body with four faint dorsal saddles, the first below the middle rays of the dorsal fin, the second below the posterior rays of the dorsal fin and slightly posterior, the third below the adipose fin and slightly anterior, and the fourth at the end of the caudal peduncle. The first two saddles combine midbody or may fuse completely. Dorsal fin with very large, round spots not arranged in distinct rows. Spots in other fins arranged roughly into rows, but usually not fusing to form bands. In all fins, the light inter-

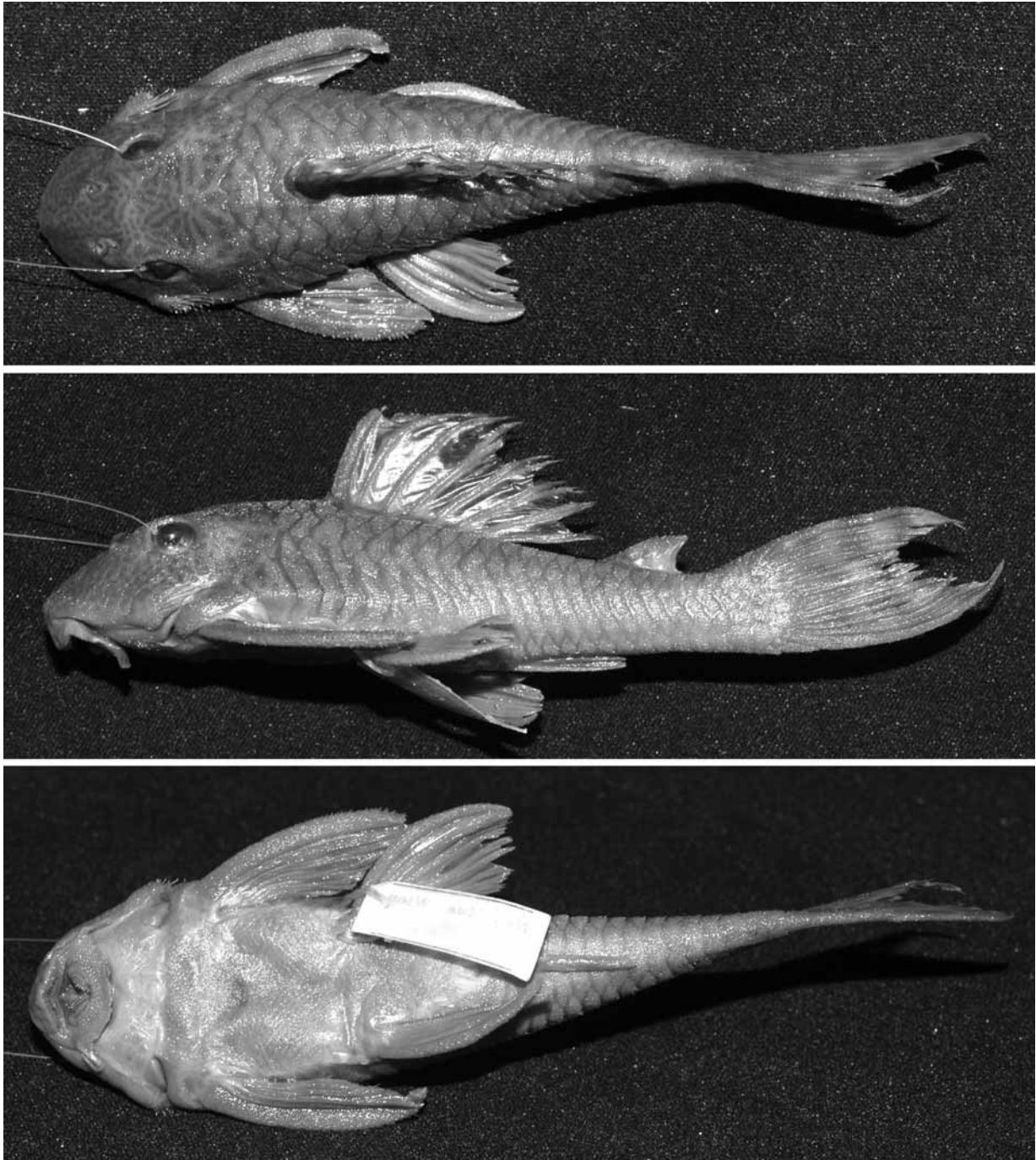
spaces are as wide or wider than the spots. Abdomen usually with medium spots. Ventral surface of caudal peduncle with a single, medial row of spots. Juveniles with much larger spots that contrast much better with lighter areas, no spots on abdomen.

**Sexual Dimorphism:** None observed, but even on the specimens available, the odontodes on pectoral-fin spine noticeably larger.

**Range.** Known from the Rios Tocantins and Capim drainages of eastern Brazil (Fig. 5).

*Peckoltia vermiculata* (Steindachner, 1908)

Fig. 20



**FIGURE 20.** Dorsal, lateral, and ventral views of the syntype of *Peckoltia vermiculata* NMW 48056, 107.9 mm SL. Photographs by J.W. Armbruster.

*Ancistrus vittatus vermiculata* Steindachner, 1908: 166. Type locality: dem mittleren Laufe des Amazonestrommes, den Gewässern um Pará, Brasiliens. Syntypes: NMW 48056 (1), NMW 48059 (1), NMW 48064 (1). Originally as *Ancistrus vittatus* var. *vermiculata*.

**Material Examined:** All syntypes, BRAZIL, Pará, no other locality information available: NMW 48056, 1, 107.9; NMW 48059, 1, 74.7; NMW 48064, 1 94.9.

**Diagnosis:** *Peckoltia vermiculata* can be identified from all other *Peckoltia* by having vermiculate lines radiating from a central point on the parieto-supraoccipital. Other *Peckoltia* with dark vermiculations on the head are *P. braueri*, *P. caenosa*, *P. cavatica*, and *P. lineola*, none of which have the vermiculations radiating from a central point. *Peckoltia vermiculata* can be further separated from *P. braueri* by lacking vermiculations on the compound pterotic; from *P. cavatica* by having markings across the bones and plates of the head (vs. just outlining the bones and plates); from *P. caenosa* by lacking markings on the abdomen (vs. having vermiculations), and by having dark bands at least on the caudal fin (vs. small white spots); and from *P. lineola* by having the vermiculations narrower than the pupil (vs. wider than the pupil) and by lacking spots on the abdomen (vs. spots combining to form longitudinal lines).

**Description.** Morphometrics in Table 5, counts based on three individuals. Largest specimen examined 107.9 mm SL. Body stout, fairly wide. Head gently sloped to parieto-supraoccipital. Parieto-supraoccipital with tall, rounded crest. Parieto-supraoccipital crest barely raised above nuchal region. Nuchal region rises slightly to nuchal plate. Dorsal profile sloped ventrally to dorsal procurent caudal-fin spines, then rising rapidly to caudal fin. Ventral profile flat to ventral procurent caudal-fin spines and then sloping ventrally to caudal fin. Supraorbital ridge rounded, contiguous, but slightly offset medially from rounded ridge proceeding from anterior margin of orbit to anterolateral corner of anterior nare. Head contours smooth. Eye medium-sized.

Keels absent. Mid-ventral plates bent at their midline above pectoral fin to form ridge. Dorsal plates bent dorsally below dorsal fin to form ridges that converge at preadipose plate, dorsal surface flat between ridges. Five rows of plates on caudal peduncle. Abdomen covered in small plates except for small naked areas posterior to lower lip and at insertions of paired fins. First anal-fin pterygiophore exposed to form a platelike structure. A pair of lateral plates converging at midline between anus and exposed first anal-fin pterygiophore. 25–26 (mode 26) plates in the median series.

Frontal, infraorbitals, nasal, compound pterotic, sphenotic, and parieto-supraoccipital, supporting odontodes; opercle supporting odontodes in juveniles but not in adults, posterodorsal corner of opercle covered by one or two plates in adults. Odontodes on lateral plates not enlarged to form keels. Hypertrophied cheek odontodes 28–35, longest almost reaching first mid-ventral plate in adults. Cheek plates evertible to approximately 90° from head. Odontodes on tip of pectoral-fin spine slightly hypertrophied.

Dorsal fin short, reaching preadipose plate fin when adpressed; dorsal-fin spine same length as proceeding rays making edge straight. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional. Dorsal fin II,7. Adipose fin with one preadipose plate and fairly long spine. Caudal fin forked, lower lobe longer than upper, I,14,I with five dorsal procurent caudal-fin rays and four to five (mode four) ventral procurent-fin rays. Anal fin short with unbranched ray weak and approximately same length of first branched ray. Anal fin I,4, Pectoral-fin spine reaching just beyond pelvic fin when adpressed ventral to pelvic fin. Pectoral fin I,6. Pelvic fin reaching to posterior insertion of anal-fin when adpressed. Pelvic fin I,5.

Iris operculum present. Flap between anterior and posterior nares short. Lips wide, fairly thin. Upper lip with small, round papillae. Lower lip with small papillae anteriorly and posteriorly, becoming larger medially. Maxillary barbel short, maximally reaching base of evertible cheek plates. Buccal papilla small. Jaws narrow, dentaries forming acute angle, premaxillaries forming gentle arc less than 135°. Teeth with small, moderately wide cusps, lateral cusp approximately half length of medial cusp, stalk of tooth long; seven to 10 dentary teeth (no mode available), nine premaxillary teeth.

**TABLE 5.** Selected morphometrics of *Peckoltia vermiculata* and *P. vittata*. Numbers in parentheses refer to landmark numbers in Armbruster (2003). Measurements are ratios of SL (predorsal l. to pelvic-dorsal l.) or head l. (head-eye l. to premaxillary tooth cup l.).

	<i>P. vermiculata</i>					<i>P. vittata</i>				
	N	Avg.	SD	Min.	Max.	N	Avg.	SD	Min.	Max.
SL (1-20)	3	92.5	16.8	74.7	107.9	128	77.8	15.2	44.6	113
Predorsal L. (1-10)	3	40.6	0.4	40.2	41.1	128	43.7	2.1	38.9	51.0
Head L. (1-7)	3	33.9	0.8	33.3	34.8	128	36.6	1.7	32.5	42.7
Head-dorsal L. (7-10)	3	7.0	0.7	6.6	7.9	126	7.3	1.3	3.8	10.3
Cleithral W. (8-9)	3	29.1	0.3	28.9	29.5	128	30.6	2.1	25.6	35.7
Head-pectoral L. (1-12)	3	26.3	1.0	25.5	27.4	128	28.0	1.2	24.7	31.5
Thorax L. (12-13)	3	23.3	1.8	21.2	24.7	128	23.0	1.8	17.5	28.4
Pectoral-spine L. (12-29)	3	29.1	0.5	28.6	29.7	128	31.9	1.8	27.1	36
Abdominal L. (13-14)	3	21.0	0.9	20.5	22.1	128	22.9	1.7	19.2	26.6
Pelvic-spine L. (13-30)	3	24.1	1.5	22.4	25.4	157	26.8	1.6	17.9	31.0
Postanal L. (14-15)	3	34.5	0.9	33.9	35.6	128	33.3	2.1	27.3	38.1
Anal-fin spine L. (14-31)	3	15.4	0.9	14.5	16.2	128	15.5	1.4	11.3	19.5
Dorsal-pectoral D. (10-12)	3	28.1	0.1	27.9	28.2	128	29.3	1.9	23.8	33.3
Dorsal spine L. (10-11)	2	32.0	0.7	31.6	32.5	107	33.8	2.5	27.1	40.3
Dorsal-pelvic D. (10-13)	3	24.5	0.8	23.8	25.4	127	25.2	2.6	18.8	31.0
Dorsal-fin base L. (10-16)	3	25.9	1.4	24.9	27.5	128	27.7	1.5	23.2	31.0
Dorsal-adipose D. (16-17)	3	16.4	0.8	15.5	16.9	128	15.6	1.9	8.4	19.9
Adipose-spine L. (17-18)	3	9.4	0.2	9.2	9.6	128	10.2	1.3	7.6	13.6
Adipose-up. caudal D. (17-19)	3	16.0	0.9	15.3	17.0	128	16.9	2.0	13.3	23.5
Caudal peduncle Dp. (15-19)	3	11.8	0.3	11.6	12.1	128	12.7	1.1	10.4	15.5
Adipose-low. caudal D. (15-17)	3	23.1	0.3	22.9	23.5	128	23.2	1.6	19.2	27.6
Adipose-anal D. (14-17)	3	20.0	0.8	19.1	20.6	128	20.0	1.4	15.9	23.3
Dorsal-anal D. (14-16)	3	16.9	1.1	16.1	18.2	128	17.0	1.6	14.2	21.4
Pelvic-dorsal D. (13-16)	3	25.5	0.9	24.8	26.5	128	26.2	2.9	19.2	31.9
Head-eye L. (5-7)	3	38.1	1.0	37.0	39.0	123	37.5	2.6	32.1	55.1
Orbit Dia. (4-5)	3	21.1	0.9	20.2	21.8	128	20.6	1.9	13.6	25.3
Snout L. (1-4)	3	59.4	3.1	55.9	61.8	128	58.1	2.6	52.3	64.5
Internares W. (2-3)	3	15.6	0.8	14.9	16.4	128	14.5	2.5	9.1	20.9
Interorbital W. (5-6)	3	40.3	1.9	38.2	41.8	123	45.8	5.1	32.1	56.4
Head Dp. (7-12)	3	73.5	2.6	70.5	75.6	128	71.4	4.1	63.5	87.7
Mouth L. (1-24)	3	41.2	3.4	37.7	44.3	128	45.3	3.8	37.1	55.6
Mouth W. (21-22)	3	41.4	1.5	40.1	43.1	128	43.9	3.7	36.0	54.7
Maxillary barbel L. (22-23)	3	19.4	5.4	13.7	24.5	128	16.7	3.0	6.8	24.5
Dentary tooth cup L. (25-26)	3	11.2	0.4	10.7	11.5	126	12.4	2.4	7.3	19.0
Premax. tooth cup L. (27-28)	3	12.1	0.8	11.2	12.7	127	12.6	2.2	8.7	19.3

**Color:** Color of all specimens faded. Base color light tan with slightly darker markings. Four dorsal saddles weakly evident on body, the first below the middle rays of the dorsal fin, the second below the posterior rays of the dorsal fin and slightly posterior, the third below the adipose fin and slightly anterior, and the fourth

at the end of the caudal peduncle. The first two saddles might combine midbody. Anterior body plates may have been outlined with darker pigment. Head with short, dark lines radiating from central point on parieto-supraoccipital, lines narrower than pupil diameter; snout with small spots or spots combining to form network of vermiculations; spots mostly separate below eye and on compound pterotic, dorsal process of cleithrum, and first column of lateral plates. Dorsal and pectoral fins dark, pelvic fins with faint bands, caudal with 3–5 bands. Abdomen without markings. Lower surface of caudal peduncle tan.

**Sexual Dimorphism:** None observed.

**Range.** Locality only given as Pará, Brazil.

***Peckoltia vittata* (Steindachner, 1881)**

(Figs. 2f and 21–22)

*Chaetostomus vittatus* Steindachner, 1881: 115, pl. 2 (fig. 5). Type locality: Amazonen-Strom, Tajapouru, Xingu bei Porto de Moz, Rio Madeira [Brazil]. Syntypes: MCZ 7999 (1), MCZ 8017 (1), NMW 47225 (1), NMW 47226 (1), NMW 47227 (1), NMW 47228 (2).

*Peckoltichthys kuhlmanni* Miranda Ribeiro, 1920: 10, pl. 5 (middle). Type locality: Tapajóz [Brazil]. Lectotype: MNRJ 2044A, designated by Miranda Ribeiro (1953: 401), but specimen not isolated.



**FIGURE 21.** Lateral views of types of species assigned to *Peckoltia vittata*, A. syntype of *Peckoltichthys kuhlmanni* MNRJ 2044, 90.8 mm SL and B. syntype of *Chaetostomus vittatus*, NMW 47228, 91.1 mm SL. Photographs by J.W. Armbruster.

**Material Examined:** BOLIVIA, unknown state, Río Madeira - Río Amazonas drainage: FMNH 59718, 4, 89.9–100.2, San Joaquín, J.D. Haseman, 6 September 1909. BOLIVIA, Beni, Río Madeira - Río Amazonas drainage: USNM 305554, Ballivia Province, Rio Curiraba at 10 km NE El Porvenir Biol. Sta., at 40 Air Km E San Borja., 14°55'S, 066°17'W, W.C. Starnes, T. Munroe, and J. Sarmiento, 28 August 1987. BOLIVIA,



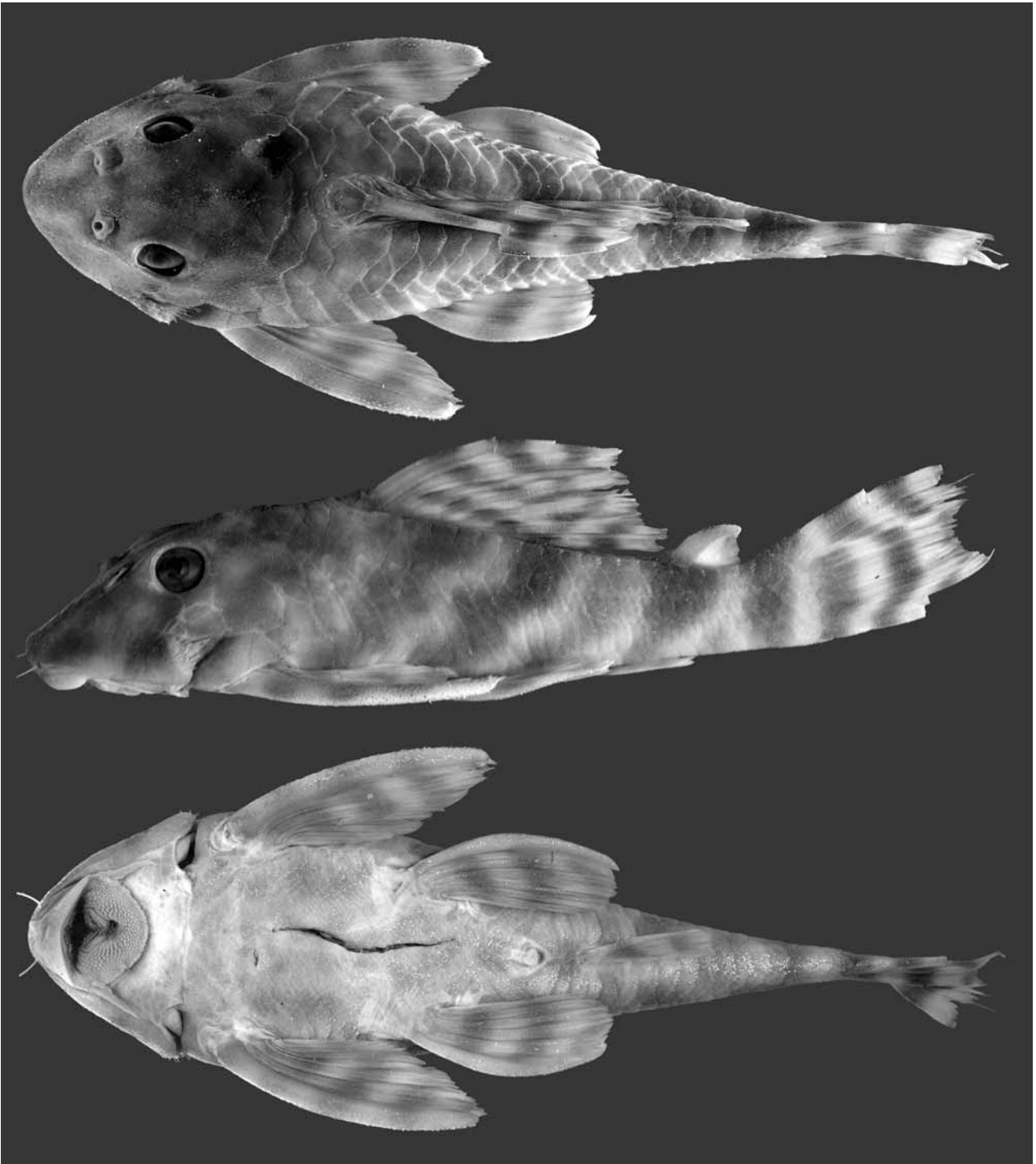
Pando, Río Madeira - Río Amazonas drainage: FMNH 107073, 2, 69.5–71.6, Nareuda rapids, +/- 6 km from the mouth of the Tahuamanu, 11°18'18"S, 068°45'25"W, J. Sarmiento, H. Ortega, S. Barrera, and F. Yapur, 11 September 1996; FMNH 107074, 1, 85.2, a small rapids in Río Tahuamanu just above Boca Nareuda, 0.44 km above, 11°18'51"S, 068°44'35"W, H. Ortega, B. Chernoff, N. Menezes, T. Bert, and R. Coca, 12 September 1996.

BRAZIL, unknown locality: CU 76567, 1, 107.3. BRAZIL, Amapá, Rio Amazonas drainage: MNRJ 20973, 10, 73.6–104.3, Queimada, near Mazangão, G.W. Nunan, D.F. Moraes, and W.D. Bandeira, April 1981; MNRJ 20990, 1, 71.0, Rio Miri, near Mazagão-Macapá, G.W. Nunan and D.F. Moraes Jr., April 1981. BRAZIL, Amazonas, Rio Amazonas drainage: INPA 4741, 1, 113.0, Rio Uatumã, S. Amadio, 1 April 1985. BRAZIL, Pará, Rio Amazonas drainage: CAS 6476, 1 cs, Belem fish market, C. Ternetz, April 1924; FMNH 59717, 3, 53.1–91.5, Pará, J.D. Haseman, 15 January 1910; FMNH 70113, 1, Rio Tapajos, Pindobal, H. Sioli, 28 October 1947; INPA 11143, 3, 84.0–89.6, Rio Tocantins, Itupiranga, Equipe Ictilogia do INPA, 1 November 1980; INPA 4028, 1, 86.8, Rio Xingu, Altamira province, L. Rapp Py-Daniel & J. A. Zuanon, 1 October 1990; INPA 4029, 1, 68.1, Rio Xingu, Cachoeira de Kaituka, L. Rapp Py-Daniel & J. A. Zuanon, 10 October 1990; INPA 5726, Rio Trombetas, Porto Trombetas, E. G. Ferreira & J. A. Zuanon, 30 August 1990; INPA 6315, 3, 93.4–112.0, Rio Tocantins, Acari-pucu, Equipe Ictilogia do INPA, 30 January 1985; INPA 6326, 3, 88.2–93.8, Rio Tocantins, Breu Branco, 05°04'04"S, 049°38'13"W, Equipe Ictilogia do INPA, 13 July 1982; INPA 6337, 2, 45.9–100.4, Rio Tocantins, 50 km above the dam, Equipe Ictilogia do INPA, 30 January 1985; INPA 7274, 1, 75.6, Rio Tapajos, Ilha da Pedra in the village Vila de Bui, L. Rapp Py-Daniel & J. A. Zuanon, 28 October 1991; MCP 30027, 4, 57.7–68.0, Rio Tapajós, left margin, 04°17'S, 055°59'W, J. G. de Frota & M. L. de Sousa Abreu, 29 July 2002; MNRJ 2044, 2, Syntypes of *Peckoltia kuhlmanni*, Rio Tapajos, G. Kuhlmann, November 1915; MNRJ 19374, 3, 44.6–51.8, Rio Tocantins near Tucuruí, L.C. Alvarenga; MZUSP 23988, 1, 100.3, Igarapé Sororoca, Furo de Panaquera, 07°50'S, 049°07'W, EPA, 31 August 1970; MZUSP 23999, 6, 85.3–103.0, Igarapé Inó, Furo de Panaquera, EPA, 1 September 1970; MZUSP 24122, 6, 68.1–77.3, Lagoon near Jatobal, Rio Tocantins, 04°32'S, 049°32'W, Expedição Permanente à Amazônia, 16 September 1970; MZUSP 34188, 0, 41.6, Rio Tapajos, Pederneiras, near the Itaituba, poço de pedral, 04°12'S, 055°10'W, M. Goulding, 24 October 1983; MZUSP 34189, 1, 78.7, Rio Tapajós, near Alter do Chão, M. Goulding, 25 November 1983; MZUSP 34190, 5, 64.2–86.4, Rio Tapajos, São Luis, above the Itaituba, 04°12'S, 055°50'W, M. Goulding, 22 October 1983; MZUSP 3590, 5, 79.3–86.1, Santarém; MZUSP 61995, 1, 102.4, Rio Tocantins, from immediately below to ca. three km below of the spillway of the reservoir, 03°42'S, 049°27'W, Equipe CPA-Eletronorte and F.C.T. Lima, 17 May 2000; MZUSP 75226, 1, 83.6, Bank of Ilha das Araras, Currelino, Rio Para, R.B. Barthem, 24 July 1984; NMW 46360, 3, 95.0–99.8, Pará, Brasilien Expedition; NMW 46361, 1, 93.3, Pará, Brasilien Expedition; NMW 47228, Syntype, 2, 58.1–91.1, Tajapurú, Thayer Expedition, January 1874; NMW 48055, 1, 51.3, Santarem, J.D. Haseman; NMW 48057, 1, 57.6, Pará, Brasilien Expedition; NMW 48058, 1, 83.4, Pará, Brasilien Expedition; NMW 48060, 1, 98.0, Pará, Brasilien Expedition; NMW 48061, 1, 95.1, Pará, Brasilien Expedition; NMW 48062, 1, 89.4, Pará, Brasilien Expedition; Rio Amazonas, NMW 48063, 1, 71.6, Rio Tapajos, Villa Braga, Museum Goldi, Snethlage; USNM 52593, 2, 98.1–99.2, Pará to Manaus, Rio Amazonas, J.B. Steere, 1901. BRAZIL, Rondônia, Rio Madeira - Rio Amazonas drainage: INPA 11135, 1, 69.0, Rio Machado 20 km below Ji-Paraná, Equipe Ictilogia do INPA, 4 June 1984; MCP 35634, 10, 65.8–73.6, Rio Machado upstream of bridge to Ji-Paraná, 10°53'S, 067°56'21"W, 15 July 2004; MNRJ 15619, 2, 76.7–77.9, Rio Urupá (tributary of the Rio Machado), Gleba G, linha 24 (between Ouro Preto do Oeste and Ji-Paraná, W.D. Bandeira and G.W. Nunan, 15 July 1986; UF 100630, 1, 74.8, Jamari River, ca 20 km downstream from Samuel dam, locally called Pedra de Santa Ana, J.P. Viana, 15 August 1993.

COLOMBIA, Meta: ICNMNH 7954, Rio Duda, tributary of Rio Guyabero - Rio Guaviare, Mesetas Veleda, San Isidro.

VENEZUELA, Amazonas, Río Orinoco drainage: AUM 39248, 1, 63.2, Río Ventuari, Moriche (beach)

116 km NE of Macuruco, 169 km NE of San Fernando de Atabapo, 04°45'09"N, 066°21'17", D.C. Werneke, N.K. Lujan, M.H. Sabaj, L.S. de Souza, 7 April 2004; AUM 39313, 26, 2 cs, 56.8–87.3, Rio Manapiare, 14.5 km NW of San Juan de Manapiare, 05°25'43"N, 066°08'10"W, N.K. Lujan, M.H. Sabaj, L.S. de Souza, and D.C. Werneke, 12 April 2004.



**FIGURE 22.** Dorsal, lateral, and ventral views of *Peckoltia vittata* NMW 48063, 71.6 mm SL. Photographs by J.W. Armbruster.

**Diagnosis:** *Peckoltia vittata* can be identified from all other *Peckoltia* by having the dorsal color of the head with a wedge of dark pigment on the snout and a bar from the posterior edge of the frontal to just behind

the parieto-supraoccipital (the pigment may alternatively appear as dark mottling and/or the anterior marking may appear, particularly in juveniles, in the form of a dark *E* on the snout). All other *Peckoltia* either have spots or vermiculations on the head, or the head plates and bones outlined in black.

**Description.** Morphometrics in Table 5, counts based on 155 individuals unless otherwise stated. Largest specimen examined 113.0 mm SL. Body stout but slightly narrower in appearance than other *Peckoltia*. Head gently sloped to parieto-supraoccipital. Parieto-supraoccipital with tall, rounded crest. Parieto-supraoccipital crest raised slightly above nuchal region. Nuchal region rises slightly to nuchal plate. Dorsal profile sloped ventrally to dorsal procurrent caudal-fin spines, then rising rapidly to caudal fin. Ventral profile flat to ventral procurrent caudal-fin spines and then sloping ventrally to caudal fin. Supraorbital ridge rounded, contiguous, but slightly offset medially from rounded ridge proceeding from anterior margin of orbit to anterolateral corner of anterior nares. Head contours smooth. Eye medium-sized.

Keels absent. Mid-ventral plates bent at their midline above pectoral fin to form ridge. Dorsal plates bent dorsally below dorsal fin to form ridges that converge at preadipose plate, dorsal surface flat between ridges. Five rows of plates on caudal peduncle. Abdomen ranging from naked to fully covered in small plates except for small naked areas posterior to lower lip and at insertions of paired fins. First anal-fin pterygiophore exposed to form a platelike structure. A pair of lateral plates converging at midline between anus and exposed first anal-fin pterygiophore. 22–26 (mode 24) plates in the median series.

Frontal, infraorbitals, nasal, compound pterotic, sphenotic, and parieto-supraoccipital, supporting odontodes; opercle supporting odontodes in juveniles but not in adults, posterodorsal corner of opercle covered by one or two plates in adults. Odontodes on lateral plates not enlarged to form keels. Hypertrophied cheek odontodes 13–57 (N=101), longest almost reaching first mid-ventral plate in adults. Cheek plates evertible to approximately 90° from head. Odontodes on tip of pectoral-fin spine slightly hypertrophied.

Dorsal fin short, reaching preadipose plate fin when adpressed; dorsal-fin spine same length as proceeding rays making edge straight. Dorsal-fin spinelet V-shaped, dorsal-fin spine lock functional. Dorsal fin II,7. Adipose fin with one preadipose plate and fairly long spine. Caudal fin forked, lower lobe longer than upper, I,14,I with two to five (mode four) dorsal procurrent caudal-fin rays and two to five (mode four) ventral procurrent-fin rays. Anal fin short with unbranched ray weak and approximately same length of first branched ray. Anal fin I,4, Pectoral-fin spine almost reaching just beyond pelvic fin when adpressed ventral to pelvic fin. Pectoral fin I,6. Pelvic fin reaching to posterior insertion of anal-fin when adpressed. Pelvic fin I,5.

Iris operculum present. Flap between anterior and posterior nares short. Lips wide, fairly thin. Upper lip with small, round papillae. Lower lip with small papillae anteriorly and posteriorly, becoming larger medially. Maxillary barbel short, maximally reaching base of evertible cheek plates. Buccal papilla small. Jaws narrow, dentaries forming very acute angle, premaxillaries forming angle of 90° to slightly greater than 90°. Teeth with small, moderately wide cusps, lateral cusp approximately half length of medial cusp, stalk of tooth long; seven to 32 dentary teeth (mode 15), 10–35 premaxillary teeth (mode 18).

**Color:** Base color light tan with brown markings. Intensity of color is variable, but always consists of four dorsal saddles on the body, the first below the middle rays of the dorsal fin, the second below the posterior rays of the dorsal fin and slightly posterior, the third below the adipose fin and slightly anterior, and the fourth at the end of the caudal peduncle. The first two saddles may or may not combine at the midline. There may be secondary bars slightly lighter than the main saddles and not or barely reaching the dorsal midline between the second and third and third and fourth saddles. There may be a faint, broad stripe that covers the lower half of the sides from first to last saddle. Two additional saddles are present on the head of adults, the first forming a wedge on the snout from the tip of the snout to the anterior margins of the orbits and the second from the posterior edge of the frontal to just behind the parieto-supraoccipital; the intensity of the head saddles varies, and sometimes they appear more like mottling; occasionally, the first head saddle will appear as diffuse *E*-shaped blotch. All fins with dark bands with dark and light areas of approximately equal width, dorsal and caudal bands may be irregular; intensity of the bands varies greatly with some specimens having the

pectoral-fin and pelvic-fin bands faint. Number of bands increases with size. Dark spot present between dorsal-fin spinelet and spine. Abdomen either without spots or with large, faint spots. Lower surface of caudal peduncle mottled. Juveniles colored as adults except that the smallest individuals usually have a dark *E* on the snout (vs. a dark wedge).

**Sexual Dimorphism:** Few breeding males examined, and they are not fully developed. Appears to be the same as in *P. brevis*: nuptial males with hypertrophied odontodes on sides and posterior part of head; hypertrophied odontodes becoming larger posteriorly. Hypertrophied odontodes on upper caudal-fin spine and adipose spine. Upper caudal-fin spine thickened. Odontodes on pectoral-fin spine not noticeably larger.

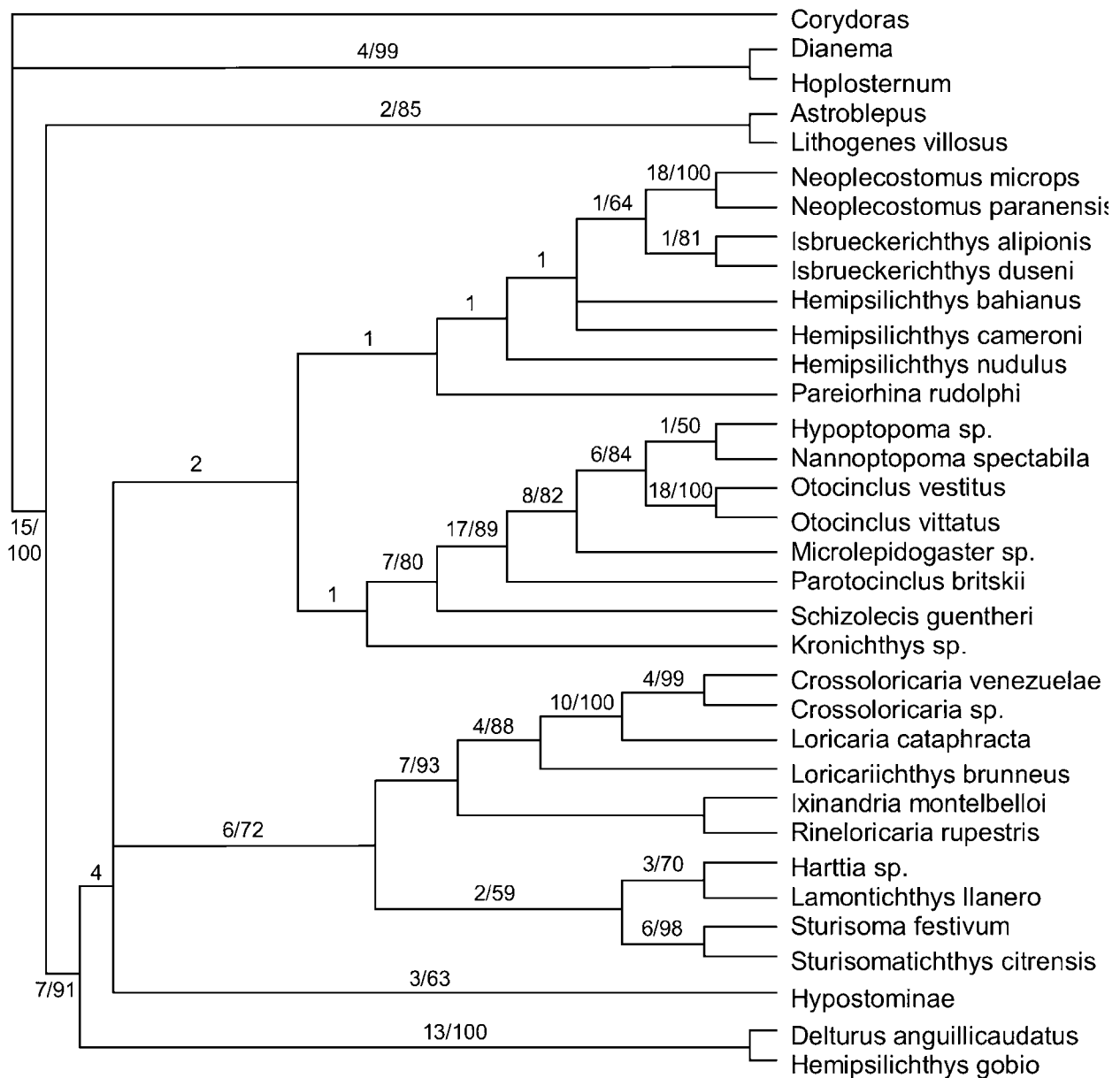
**Range.** Described from the Brazilian Amazon and lower reaches of the Rio Tapajos, Rio Madeira and Xingu. Also known from the Río Ventuari of Venezuela, southern tributaries of the Amazon from the Madeira to the mouth, and the Rios Uatumã, Trombetas, Capim, and Maranhão (Fig. 11). One collection of what appears to be *Peckoltia vittata* was also identified from the upper Río Guaviare of Colombia (Fig. 11). Armbruster and Werneke (2005) suggest that the specimen pictured in Le Bail *et al.* (2000) and labeled as *Hemiancistrus aff. braueri* from the Maroni River of French Guiana could be *Peckoltia vittata*. In appearance, it is closest to *P. vittata*; however, it is difficult to discern its identity from photographs, and its color pattern seems different enough that the Maroni population may represent an undescribed species.

**Habitat.** Specimens collected in Venezuela were from rocks in runs.

#### Key to the Species of *Peckoltia* (excludes *P. multispinis*, see species description)

- 1 Spots present on head .....2
  - Color pattern on head consisting of large blotches, saddles or lines without any individual spots.....7
- 2 Spots on head very large, sometimes appearing as mottling; body mottled; eye set low on head with a weak supraorbital crest that is not higher than the interorbital space; pelvic-fin spines widened and can be adducted ventral to the abdominal surface of the body; plates on the abdomen rather large .....
  - ..... *Peckoltia bachi*
  - Spots on head small; body with spots or distinct saddles; eye set high on the head with a prominent supraorbital crest that is higher than the interorbital space; pelvic-fin spines narrow and cannot be adducted ventral to the abdominal surface of the body; plates on the abdomen small.....3
- 3 Some of the spots combining to form lines on the parieto-supraoccipital and/or compound pterotic.....4
  - None of the spots combining to form lines.....5
- 4 Lines on head most prominent on compound pterotic, not radiating from a central point on the parieto-supraoccipital; lines on head approximately same width or wider than pupil ..... *Peckoltia lineola*
  - Lines on the head most prominent on the parieto-supraoccipital where they radiate from a central point; lines on head narrower than pupil..... *Peckoltia vermiculata*
- 5 Spots present on caudal fin ..... *Peckoltia oligospila*
  - Bands present on caudal fin .....6
- 6 Spots on the dorsal fin; no spots on the abdomen; upper caudal-fin spine longer than lower spine (usually the tail is broken and this character is not present)..... *Peckoltia furcata*
  - Bands on the dorsal fin; spots on abdomen of large juveniles and adults; lower caudal-fin spine longer than upper ..... *Peckoltia brevis*
- 7 Caudal fin with dark bands much wider (approximately four or more times) than light bands; dorsal fin with white spots; abdomen with large dark spots with at least some of the spots combining to form vermiculations..... *Peckoltia caenosa*
  - Caudal fin with dark and light bands of approximately equal width; dorsal fin with bands or uniformly colored; abdomen with faint dark spots, spots that do not combine to form vermiculations, or uniformly light .....8

- 8 Dark blotch between eyes and on snout, head mottled, or a bold patch of pigment in the form of an *E* on the snout with the central branch of the *E* located mid-dorsally, the top and bottom branches located just lateral to the nares, the three branches extending anteriorly, and the main stem of the *E* running transversely centered on the nares; none of the plates of the head or nape outlined in black; dorsal and caudal fins without orange edge in life ..... *Peckoltia vittata*
- Head and snout uniformly brown or with the plates outlined in black; the posterior plates of the head and nape outlined in black; dorsal and caudal fins with an orange band at the edges in life.....9
- 9 Vermiculations on compound pterotic; plates of head and nape not completely outlined in dark black lines; caudal fin with at least one broken band; marginal orange bands of dorsal and caudal fins narrow (Fig. 2b) ..... *Peckoltia braueri*
- No markings on compound pterotic; all bones of head and nape outlined in faint black lines; caudal fin without bands; marginal orange bands of dorsal and caudal fins wide (Fig. 2d) ..... *Peckoltia cavatica*

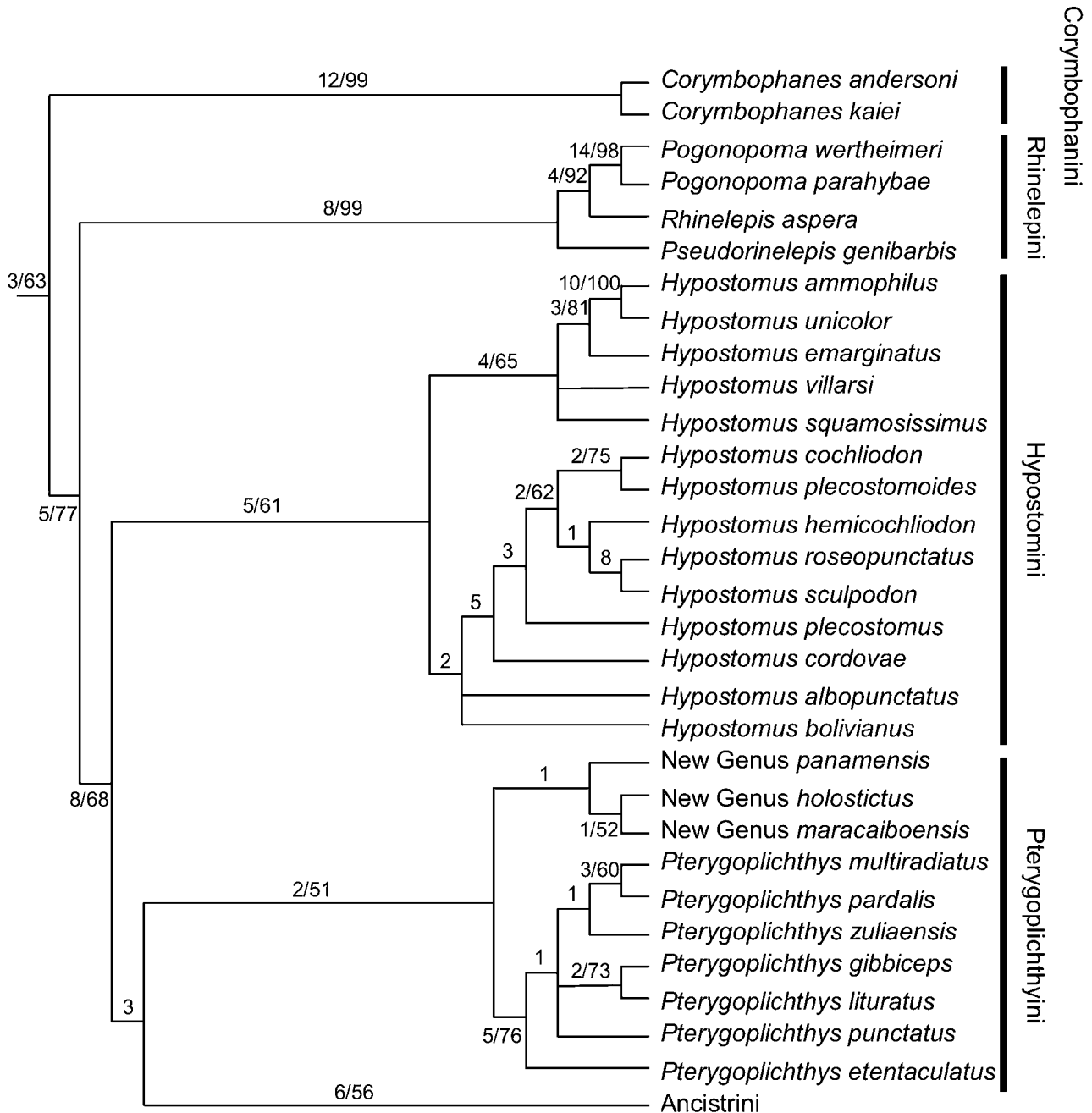


**FIGURE 23.** Part of the strict consensus of 1148 trees of 1388 steps, CI = 0.19, RI = 0.75 showing relationships of loricariid subfamilies. Numbers are decay indices followed by bootstrap values (when bootstrap values are greater than 50%). The remainder of the tree is in figures 24–26.

## Results and Discussion

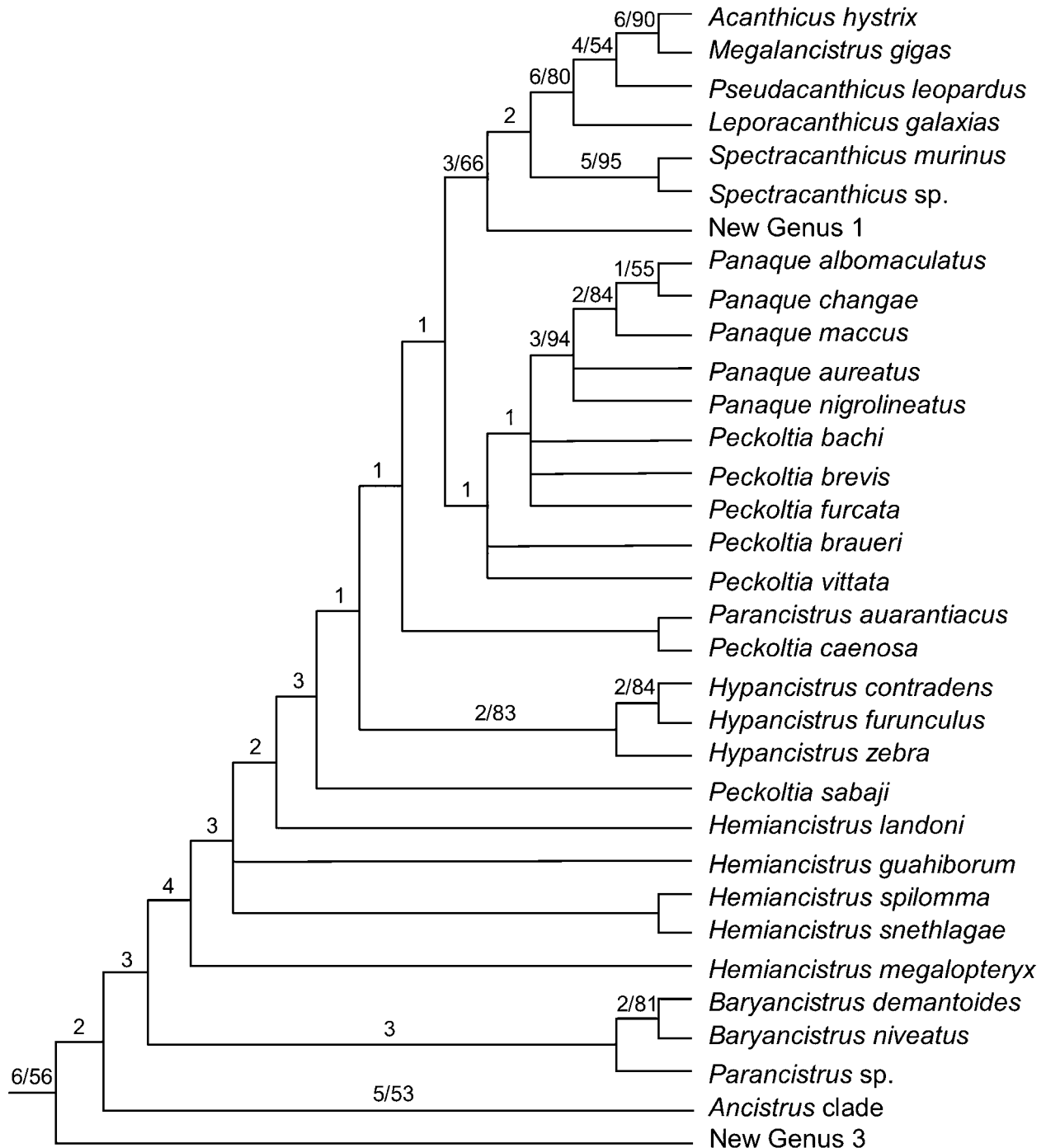
### Phylogenetic Analysis

The result of the phylogenetic analysis was 1148 trees of 11388 steps, CI = 0.19, RI = 0.75 (Figs. 23–26). The phylogeny largely corresponds with Armbruster (2004) with most of the major differences being found in the Ancistrini. Outside of the Ancistrini, Armbruster (2004) had found a weak sister group relationship between the Loricariinae and the Hypostominae. This was not recovered in this analysis (Fig. 23). Using fewer taxa of *Pareiorhaphis* (formerly *Hemipsilichthys*) returned a monophyletic Neoplecostominae (although weakly supported) with the exclusion of *Kronichthys*, which was found to be the sister to the Hypoptopomatinae; these results demonstrate that the Neoplecostominae still needs further study.

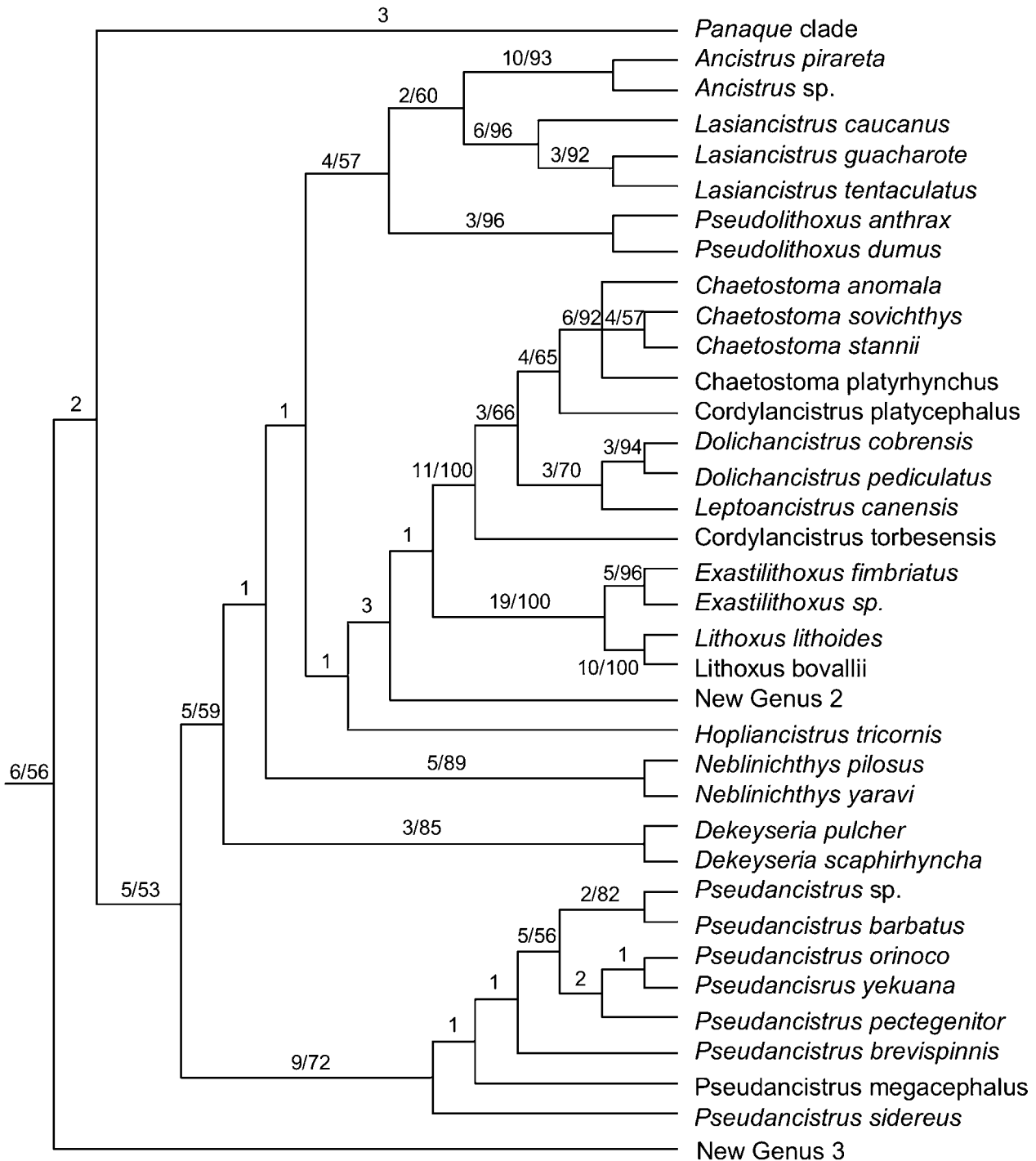


**FIGURE 24.** Part of the strict consensus of 1148 trees of 11388 steps, CI = 0.19, RI = 0.75 showing relationships of hypostomine tribes and the genera of the Corymbophanini, Rhinelepidini, Hypostomini, and Pterygoplichthyini and the two clades of the Ancistrini. Numbers are decay indices followed by bootstrap values (when bootstrap values are greater than 50%). The remainder of the tree is in figures 23 and 25–26.

Isbrücker *et al.* (2001) described the genus *Watawata* for *Hypostomus carinatus*, *H. microstomus*, and *H. roseopunctatus* due to the number of teeth (16 or fewer per jaw ramus vs. 21 or greater in the remainder of *Hypostomus* except the *H. cochliodon* group) and long teeth (vs. spoon-shaped in the *H. cochliodon* group). The new analysis included *H. roseopunctatus*, and it grouped within the *H. cochliodon* group of Armbruster (2003b) supporting Weber (2003) and Armbruster (2004) in recognizing *Watawata* as a synonym of *Hypostomus* (Fig. 24). Further, the tooth count does not work as some specimens of the type species of *Hypostomus* (*H. plecostomus*) have fewer than 20 teeth (pers. obs.).



**FIGURE 25.** Part of the strict consensus of 1148 trees of 1388 steps, CI = 0.19, RI = 0.75 showing relationships of the *Panaque* clade of the Ancistrini. Numbers are decay indices followed by bootstrap values (when bootstrap values are greater than 50%). The remainder of the tree is in figures 23–24 and 26.



**FIGURE 26.** Part of the strict consensus of 1148 trees of 1388 steps, CI = 0.19, RI = 0.75 showing relationships of the *Ancistrus* clade of the Ancistrini. Numbers are decay indices followed by bootstrap values (when bootstrap values are greater than 50%). The remainder of the tree is in figures 23–25.

The Ancistrini was resolved into three clades (Figs. 25–26). The first is a single undescribed genus and species (New Genus 3) from the Marañon of Peru. This species will be discussed in a future paper. The second is termed the *Panaque* clade (Fig. 25) and is defined here as New Genus 1, *Acanthicus*, *Baryancistrus*, *Hemiancistrus*, *Hypancistrus*, *Leporacanthicus*, *Megalancistrus*, *Panaque*, *Peckoltia*, *Pseudacanthicus*, and *Spectracanthicus*. In Armbruster (2004), *Hemiancistrus megalopteryx* (as *Hemiancistrus* sp. Brazil) was the sister to all other ancistrins, and *H. landoni* was in a trichotomy with the remainder of the *Panaque* clade



minus *Baryancistrus* and the *Ancistrus* clade. In the new analysis, *Baryancistrus* is in the *Panaque* clade as it was found to lack odontodes on the opercle in adults (only juveniles were available in Armbruster, 2004). *Hemiancistrus megalopteryx* was coded as lacking the derived ancistrin opercle in Armbruster (2004); however, examination of an adult specimen reveals that it does have the derived opercle found in the *Panaque* clade and *Pseudancistrus* and that adults also lack odontodes on the opercle.

More resolution was also found in the *Ancistrus* clade (Fig. 26) due to the addition of *Hopliancistrus* (the only hypostomine genus not represented in Armbruster, 2004). *Cordylancistrus* was again found to be polyphyletic. Armbruster (2004) placed *Cordylancistrus platyrhynchus* into *Chaetostoma*, and now *Cordylancistrus platycephalus* is sister to other *Chaetostoma* while the type of the genus, *Cordylancistrus torbesensis*, is sister to all other members of the *Chaetostoma* group (*Chaetostoma*, *Cordylancistrus*, *Dolichancistrus*, and *Leptoancistrus*). *Cordylancistrus platycephalus* shares with *Chaetostoma* the derived presence of dentary papillae (a single papilla or clump of papillae located proximally on the dentary interior to the tooth cup). Given that there are others interested in the phylogeny of the *Chaetostoma* group (Salcedo, pers. comm. and Milani and Provenzano, pers. comm.), I do not make any changes to these taxa; however, the *Chaetostoma* group is a very well-diagnosed clade, but none of the genera within it are, and all species should likely be placed in *Chaetostoma* and at best subgenera should be recognized.

#### Defining *Peckoltia* and *Hemiancistrus*

*Peckoltia* and *Hemiancistrus* have been confusing for some time, and the phenetic definitions provided here make the situation only slightly better. *Hemiancistrus* is typically treated as a receptacle for unrelated forms, and neither *Peckoltia* nor *Hemiancistrus* were found to be monophyletic (Fig. 25). For the purposes of advancing the taxonomy of the genera forward, it is necessary to develop a definition for *Peckoltia* and *Hemiancistrus* at this time, and await further phylogenetic analyses that will diagnose the genera or suggest ways to split them. For that reason, I am defining *Peckoltia* phenetically as those ancistrins that have a lateral ridge on the opercle that typically does not support odontodes (although odontodes may occasionally be present in males, juveniles, and *P. bachi*) and jaws that approach or form an acute angle but that lack the derived characteristics of *Hypancistrus* (partially diagnosed by having dentary teeth nearly twice as long and wide as premaxillary teeth; Armbruster, 2002), *Panaque* (partially diagnosed by having spoon-shaped or greatly elongate, spatulate teeth; Armbruster, 2004), and *Parancistrus* (partially diagnosed by having the dorsal-fin connected to the adipose fin and enlarged gill openings; Rapp Py-Daniel, 1989; Armbruster, 2004). Those basal species in the *Panaque* clade except *Baryancistrus* are attributed to *Hemiancistrus*, which is defined as lacking acutely angled dentaries (the dentaries instead form an angle greater than 100°), due to the lack of the above apomorphies, and due to the lack of an expansion of the posterior dorsal-fin membrane that normally attaches to the adipose fin or preadipose plate as in *Baryancistrus*. Additionally, *H. medians*, *H. snethlageae*, *H. spilomma*, *H. guahiborum*, and *H. subviridis* share with *Baryancistrus* and a few other ancistrins not closely related to *Hemiancistrus* the presence of a condyle on the quadrate for articulation with the canal plate; however, the condyle is extremely small in these *Hemiancistrus* and *Baryancistrus*, and could be at best considered a dubious potential synapomorphy.

Use of a continuous character such as jaw angle is clearly not a perfect solution in defining genera. *Peckoltia furcata* often has a slightly oblique angle of the dentaries and *Hemiancistrus spilomma* and a few undescribed *Hemiancistrus* with color patterns close to the species of *Peckoltia* can approach a right angle. Clearly, this is far from the final word on the identity of *Peckoltia* and *Hemiancistrus*, and more work needs to be completed. Further elucidation of relationships using morphology seems to be impossible because there seems to be little pertinent or discreet variation in the problematic taxa.

The phenetic definitions of *Peckoltia* and *Hemiancistrus* are unsatisfactory for many reasons, but the current analysis offers no clues as to how to break up the genera or combine them. The entire *Panaque* clade could be sunk into a single genus (the oldest name would be *Acanthicus*), but this would probably not be

readily accepted by the scientific community and certainly would not be accepted by the public where these fishes have become a staple of the aquarium trade. Such a move would not increase taxonomic stability. It would also cause the lumping of very disparate groups of organisms. A simpler solution for just *Peckoltia* would be to place the species of *Peckoltia* (except *P. caenosa*) into *Panaque* because the clade was found to be monophyletic; however, the support for the clade is very weak, there are no adequate synapomorphies, and such a move would be premature.

A second possibility is to break the *Panaque* clade up into even more genera. This may be warranted in the case of New Genus 1 because it is very well diagnosed (to be discussed in a future paper), but the other taxa between basal *Hemiancistrus* and *Peckoltia/Panaque* would have inadequate diagnoses. For the stability of the other genera and to avoid introducing yet more genus names into the overcrowded Ancistrini, it seems best at this time to recognize two potentially paraphyletic genera (*Peckoltia* and *Hemiancistrus*) and to await molecular and perhaps more complex morphological analyses.

Isbrücker *et al.* (2001) described *Sophiancistrus* for *Hemiancistrus arenarius* and *H. ucayalensis*. These two species are identical to *P. bachi* and *P. filicaudata*. With *P. filicaudata* being the type of *Peckoltichthys*, if *P. bachi* were to be recognized in its own genus, it would be *Peckoltichthys*. *Peckoltia bachi* has a very strange morphology with the eye set low on the head, relatively large plates on the abdomen, and hypertrophied pelvic adductor muscles set into deep recesses of the pelvic basipterygium. These characteristics are reminiscent of *Hypoptopoma* of the Hypoptopomatinae. Although there would be a lot of synapomorphies to recognize *Peckoltichthys*, the phylogeny does not provide enough evidence to break off this single species into its own genus at this time.

Isbrücker *et al.* (2001) also describe *Ancistomus* with the basic definition that the single species assigned to it at that time (*Hemiancistrus snethlageae*) is intermediate between *Hypostomus* and the Ancistrini. This can be said for all basal members of the *Panaque* clade, including *Hemiancistrus medians*, and this is not an adequate diagnosis for a genus. The splitting of *Hemiancistrus* and *Peckoltia* by Isbrücker *et al.* (2001) was premature, and erroneous in the case of *Sophiancistrus*.

*Ancistrus yaravi* was considered to be in *Peckoltia* by Fisch-Muller (2003). The type of *A. yaravi* is lost (Mikschi, pers. com.) and the original description (Steindachner, 1915) does not have an illustration. The holotype was collected in the Río Coquenán of Venezuela, an area with very few ancistrin species. Besides species of *Ancistrus*, the only species of the Ancistrini I have examined from the region are *Pseudancistrus coquenani*, *Neblichthys roraima*, and *Exastilithoxus fimbriatus*. An undescribed *Hemiancistrus*, *Pseudancistrus reus*, and an undescribed *Pseudancistrus* are also now known from the lower Caroni (pers. obs.). The description of *A. yaravi* in Steindachner (1915) provides two major clues as to the identity of this species. The first is the peculiar description of the color of the specimen as being violet-gray-brown. The second is that the pectoral- and pelvic-fin spines are the same length. These two characteristics fit *N. roraima*. *Pseudancistrus reus* from the lower Caroni also has the pectoral- and pelvic-fin spines of approximately the same length, but it has bands on the body. It is unlikely that Steindachner would mistake *P. coquenani* and *E. fimbriatus* with *A. yaravi* as all three are described in the same publication (Steindachner, 1915). None of the *Peckoltia* or *Hemiancistrus* examined had the pectoral- and pelvic-fin spines of equal length. Freshly preserved specimens of *N. roraima* also have a peculiar color that could be described as violet-gray-brown (Fig. 27). For these reasons, I am recognizing *Neblichthys yaravi* as the senior synonym of *N. roraima*.

## Morphometry

The analysis of morphometry of the species of *Peckoltia* provided no useful characters. Although there were a few trends in morphometrics, no character provided complete separation between the species with the exception of minimum interorbital width vs. HL, which separated *P. bachi* from all other species (this analysis was only of a subsample of the specimens and does not deserve further reporting here). Although occasional minor differences could be found between species pairs, *P. vittata* spanned nearly the entire range of all spe-

cies. In a PCA, there was very little separation between species and *P. vittata* spanned nearly the entire morphospace occupied by *Peckoltia*.

In the vast majority of morphometric and meristic studies on loricariids that find differences between species, the studies are based on few individuals from few localities [for example see Armbruster and Provenzano, 2000; Armbruster 2003a, b (difference between *Hypostomus hemicochliodon* and *H. sculpodon*); Fisch-Muller *et al.* (2005a,b)]. In the few, wide-ranging morphometric analyses on hypostomines to date (for example see Armbruster, 1998a, 2003b, 2005, this study) little morphometric information is found to separate species. This may mean that morphology is conserved in many loricariid genera and that small morphometric studies are likely to lead to errors.



**FIGURE 27.** Dorsal view of *Neblinichthys yaravi*, AUM 36669 mm SL. Photograph by J.W. Armbruster.

#### Color

With no morphometric or meristic differences and no obvious differences in morphology (except the longer upper lobe of the caudal fin in *Peckoltia furcata* and the derived conditions of *P. bachi* mentioned above), the only difference between the species of *Peckoltia* is color. Color is obviously something that can evolve quickly. As with any study on South American fishes, sampling is incomplete, and reliance on color is problematic. This is especially true in *Peckoltia* where the only species that has been collected in any number is *P. vittata*, and then mainly at the edges of its range where the specimens do seem a little different from typical *P. vittata*. Color would be especially problematic if it is sexually selected as this would cause it to evolve rapidly; however, there is no dimorphism in color in *Peckoltia*.

Finding specimens that look like *Peckoltia brevis* in the Orinoco makes the situation with color even more difficult in *Peckoltia*. The range of *P. brevis* is bisected by the range of *P. lineola*, a similar species that has the spots combining to form short lines on the head vs. having the spots separate. The situation in the Orinoco with *P. brevis* and *P. lineola* could lead to at least three conclusions: that *P. brevis* has a wide range that just hasn't been determined yet, that color is so plastic, and the color patterns of *Peckoltia* fairly simple that a particular color pattern can evolve more than once, or that perhaps the Colombian Orinoco specimens are introduced. The distinction between these ideas would need to be explored using molecular techniques and more collections. Curiously, the collections of *P. brevis* in Colombia were from the same area as the collection of *Lepidosiren paradoxa*, the only known locality of the South American Lungfish in the Orinoco basin (Bogotá-Gregory and Maldonado-Ocampo, 2006).

Certainly this study is not the last word on *Peckoltia*. More collecting is needed to determine the extent of the ranges of the species. The descriptions of the species above provide a hypothesis to be tested by further

collecting and via molecular techniques, and it seems preferable to recognize species like *P. lineola* at this time to best demonstrate the known color diversity of the species, and certainly the color difference between *P. lineola* and *P. brevis* is on par with that found between any two species of *Peckoltia*.

The wide-ranging *Peckoltia vittata* does vary slightly in color across its range, but this was considered inadequate to split the species given that a very similar color pattern is seen in its far eastern and far western Brazilian range, and because not enough specimens are available in the center of its range with good color to understand the full extent of color variation in the species. It is likely that *P. vittata* as described above represents more than one species.

### Biogeography

Analysis of biogeography using *Peckoltia* is problematic because there are no useful morphological differences that could be found upon which to derive a phylogeny; however, some trends can be noted. As noted in Armbruster and Werneke (2005), of the loricariids examined, only *Peckoltia* had different species in the Branco and Essequibo. This suggests that the seasonably flooded Rupununi savannah does not serve as a conduit between the two basins for species of *Peckoltia*. The other major portal region of the western Guyana Shield, the Río Casiquiare that connects the Upper Orinoco and the Río Negro; however, does serve as a conduit for *P. vittata* and possibly *P. brevis* into the Orinoco. The range of *P. vittata* suggests a connection between the Guyana and Brazilian Shields. The wide range of *P. vittata* further suggests that the lowlands of the Amazon basin might not provide sufficient barriers to speciation in species of loricariids that like slow- or moderate-flowing water. A similar result was found for *Hypostomus hemicochliodon* (Armbruster, 2003b) and *Lasiancistrus schomburgkii* (Armbruster, 2005), which were both found throughout the Amazon basin and into the Orinoco (with *L. schomburgkii* also being found in the Essequibo).

### Material examined

In addition to the specimens examined in Armbruster (1998b; 2003a; 2004, 2005), Armbruster et al. (2007), and Lujan et al. (2007), the following specimens were examined (only numbers of cleared and stained specimens provided: *Baryancistrus demantoides* – AUM 42169, 1; *B. niveatus*, MNRJ 19344 (1), *Baryancistrus* sp., AUM 39227 (2); *Cordylancistrus platycephalus*, AUM 21714 (1); *Hemiancistrus megalopteryx*, MCP 35592 (1); *H. snethlageae*, MCP 15151 (1); *H. subviridis*, AUM 29231 (1); *Hoplancistrus tricornis*, AUM 39853 (3); *Hypostomus roseopunctatus*, MCP 22674 (1); *H. sculpodon*, AUM 39476 (1); *Panaque changae*, AUM 28908 (2); *Pseudolithoxus anthrax*, AUM 39229 (1), AUM 39232 (1); *P. dumus*, AUM 39508 (1); New Genus 1, AUM 42205 (2); New Genus 2, AUM 39476 (1); New Genus 2, AUM 45538 (2) and AUM 45571 (2).

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**Appendix 1. Character state matrix.** A: 0 and 1, B: 1 and 2, C: 2 and 3

OUTGROUP - Callichthyidae

*Corydoras*

000000000000000000000000000000110000000000000000010000000000000300010100000000000000000??00?0000000  
0000?000000030000000000010000000001000000010000000000A0011000000000000000010000000000000000000  
0001100000000000000000000

*Dianema*

10000000000000000000000000001100000001000000001000000000000000102000000000000000000??00?0000000  
0000?00001003000000000101000000000000000010000000000A00010000001000000?000000000000000000000000  
0001100000000000000000000

*Hoplosternum*

100000000000000000000000000010000000011000000000000000010000000000000000102000000000000000000??00?00001000  
0000?0000100300000000010100000000000000000010000000000A00010000001000000?000000000000000000000000  
0001100000000000000000000

INGROUP

Astroblepidae

*Astroblepus*

102000000000000000000000110110000000000000000000?0000000000000000001001000000100001100??000021000020  
0010000000000000000000000000000010000002000000000121000021?1?00010001201011110110001014100000100000000001  
0100000000000000000000000

Loricariidae-Delturinae

*Delturus anguillicauda*

1010001100100100010100100001110000010000001000000110000000000201000001000000110??001012000001  
102000010000000001000012000001200001100020011010100A0000010201011010210101002000000110000100111  
0132000100000000000000

*Hemipsilichthys gobio*

1010001100000100010110100001110000010000001000000110000000000201000001000000110??001011000002  
1020000100000000010000100000101200101100020000010110A0100001201011010210100002000000110000100111  
0132000100000000000000

Loricariidae-Hypoptopomatinae

*Hisonotus* sp.

0020001100000011110000000020110000010000001100000012101020000011000000000100000101000011011010111  
1020010101021000000000?110011000010011011200000000101000200000010010000?000002000000100000000101  
0021000111000000000000

*Hypoptopoma* sp.

00200011010000111100000000201100000100000010?0000012110000000011000000000100000101000010011010111  
002001020000000000000011100110010000010012010000001?10002000000100100010000002000000100000000101  
0022000111000000000000

*Nannoptopoma spectabila*

00200011000000111100001000200000001100000010?0000012110000000011000000000100000101000010011010111  
002001020002000000000011100110000000110112010001001?1000200000010010000?0000120000001000000001010  
0220001110000000000000

*Otocinclus vestitus*

00200011011001111100000000201100001100000010?000000000000000212000000000100000001000011011010110  
0020010201020000000000?1100110100100010112000001000010002010010100100010001002000000100000000101  
0022000111000000101000

*Otocinclus vittatus*

00200021011001111100000000201100001100000010?000000000000000212000000000100000001000011011010110  
0020010201020000000000?1100110100100A10112000001000010002010010100100010001002000000100000000101  
0022000111000000101000

*Parotocinclus britskii*

0020001100000011110000000020110000010000000100000012101020001011000000000100000001001001011010111  
10200101000210000000001110011010010011001200000100001000200010010010000?000002000000100000000101  
0022000101000000000000

*Schizolecis guentheri*

002000110000000111000000002000000001000000010000001210002000001100000000010000000100000101101001  
21020010100021100000000?1100100000100110112010001001?1010101020110010000?001002000000100000000101  
0022000101000000000000

Loricariidae-Hypostominae-Ancistrini

*Acanthicus hystrix*

1000002201100101110100100010010011000000000200000012200020001001000100000010000121101003011110001  
0021000001011200000000?BA10000121100110112001001000010000010210011100111010102000000122000101101  
01311001010000000000001

*Ancistrus pirareta*

0010002201000101110110000210110111010011010200010012200020001100010000000121200121101002011010001  
102100020000120000100111010000020000100012000001000020000010200011100010010102000000122000001101  
0122000000000032000000

*Ancistrus* sp.

0010002201000101110110000210110111010011010200010012200020001100010000000121200121101002011010002  
102100020000120000000112010000020000100012000001010020000010200011100010010102000000122000001101  
0122000000000032000000

*Baryancistrus* sp.

0010002201000101110100000210010011010000000200000012200020001101110000000110001111101003012010002  
002000010000120100000102010000020000000012000101000020000000100011100110010102000000122000001101  
0131000101000000000000

*Baryancistrus* sp. (called *B. niveatus* in Armbruster, 2004; not used in this analysis)

0010002201000101110100000210010011000000010200000012210020001101110000000110001111101003011010001  
002100010000120100000112010000020000000012000101000020000000100011100010010102000000122000001101  
0131010100000000000000

*Baryancistrus demantoides*

0010002201000101110100000210010011010000000100000012200020001101110000000110001111101003012010001  
002000010000121100000102010000020000000012000101000020000000100011100010010102000000122000001101  
0131000101000000000000

*Baryancistrus niveatus*

0010002201000101110100000210010011010000000200000012200020001101110000000110001121101003012010001  
002000010000121100000102010000020000000012000101000020000000100011100110010102000000122000001101  
0131000101000000000000

*Chaetostoma anomala*

0100012201000111110110000200010010010110000200000012101020001102111000000121100111111002011010002  
10201000000010000000001201000002000100012001001010110000001201011000111010102010010122000001101  
0132000000000000000000

*Chaetostoma pearsei*

0100012201000111110110000200010010010110000200000012101020001101111000000121200111111002011010002  
10201000000010000000001201000002000100012001001010110000000201011000111010102010010122000001101  
0132000000000000000000

*Chaetostoma sovichthys*

0100012201000111110110000200010010010110000200000012101020001101111000000121000111111002011010002  
102010000000100000000011010000020000110012001001010120000000201011000111010102010010122000001101  
0132000000000000000000

*Chaetostoma stannii*

0100012201000111110110000200010010010110000200000012101020001102111000000121000111111002011010002  
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0132000000000000000000

*Chaetostoma platyrhynchus*

0100012201100111110110000200010010010110000200000012101020001102111000000121100111111002011010002  
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0132000100000001000000

*Cordylancistrus platycephalus*

0100012100000101110110000200000011010110010200000012101020001102111000000121200111111002011010002  
102010000000110000100001010000020000010012001001010010000000201011000111010102010010122000001101  
0132000100000000000000

*Cordylancistrus torbesensis*

0000012200000101110000000200110011010110010200000012100020001101111000000121100111111002012010002  
102010000000110000100012010000020010110012001001010110000000201011000211010102010000122000001101  
0132000100000000000000

*Dekeyseria pulcher*

001000220100010111010000001001000101001001010000001220012000110101000000012110012110100301101000  
1102000010000120000000111010100020000100012000001000010000110201011100211011102000000122000101101  
0121100100000011000000

*Dekeyseria scaphirhyncha*

001000220110010111000000001001000101001001010000001220002000110001000000012100011110100301201000  
11020100100001200000000120101000200001A001200000100001000011020A0111002110101020000001220001011  
010121100100000011000000

*Dolichancistrus cobrensis*

0000012101000101110100000200010011010110010200000012101020001101111000000121100111111002011010002  
1020100000001100001000121101000200001100120010010101100000012010110011110101020000001221001011010  
1320001000000000000000

*Dolichancistrus pediculatus*

0100012201000101110110000200010011010110010200000012101020001101111000000121100111111002011010002  
1020100000001100001000121101000200001100120010010101B0000001201011001111010102000000122100101101



0132000100000000000000

*Exastilithoxus fimbriatus*

0110?01100000000010000100010000101010011100210010011000010001101000110100121?0010110100?012010002  
100?00010000120000100012110100020000110012000001000010000001201011000001000002000000122000000101  
0122000100020100000000

*Exastilithoxus* sp.

0?100011000000000101101000100001010100111002?00100110000100011010?0110100121000101101002011010002  
100?00010000120000100011110100020000110012000001010010000001201011000001000002000000122000001101  
0122000100020100?000?0

*Hemiancistrus guahiborum*

0010002201100101110100000210010011010000010200000012200020001101110100000110101111101003012010001  
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0131010101000000000000

*Hemiancistrus landoni*

0010002201100100110100000210010011010000010200000012200020001101010101000110001111101003012010001  
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0131000101000000000000

*Hemiancistrus megalopteryx*

001000220110010011000000021001001101000000200000012200020001101110100000110001111101003011010001  
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0132000101000000000000

*Hemiancistrus micromattos*

0020002201100101110100000210010011010000010200000012200020001101110100000110001111101003012011001  
002000010000120000000112010000020001000012000001000020000010100011100010010102000000122000001101  
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*Hemiancistrus sabaji*

0010102201000101110110000110010011010000011200000012200020000001010101000110001111101003012011001  
002000010000120000000111010000020000000012000001000020000010100011100010010102000000122000001101  
0131010101000000000000

*Hemiancistrus snethlageae*

0000002201100101110100000210010011010000010200000012200020001101110100000110001111101003012010001  
002000010000120000000112010000020000000012000001000020000010100011100110010102000000122000001101  
0131010101000000000000

*Hemiancistrus subviridis*

0010002201000101110100000210010011010000010200000012210021001101110100000110001111101003012010002  
002000010000120000000112010000020000000012000001000020000010100011100010010102000000122000001100  
0131000101000000000000

*Hopliancistrus tricornis*

0010002201000101110110000110010111010011010100000012200020001101110000000121200111101003011010001  
10200001000012000000012010000120000110012000001000010000000201011100110011102000000122000101101  
0131000100000011100000

*Hypancistrus contradens*

0010002201100100110100000210110011000000010200001001000010000000010111000110001111101003012010001  
002000010000120100000112010000020000000012000001000020000010100011100010010102000000122000001101  
0131010101000000000000

*Hypancistrus furunculus*

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01310?0101000000000000

*Hypancistrus lunaorum*

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002000010000120100000112010000020000000012000001000020000010100011100010010102000000122000001101  
0131010101000000000000

*Hypancistrus zebra*

0010002201100100110100000210110011010000010200001001000020000000010111000110001111101003012010001  
002000010000120100000112010000020000000012000001000020000010100011100010010102000000122000001101  
0131000101000000000000

*Lasiancistrus caucanus*

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002000010000120110010101010000020000100012000001000010000010200011100010010102000000122010101101  
0122000100000012000000

*Lasiancistrus guacharote*

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10122000100000012000000

*Lasiancistrus tentaculatus*

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002000010000120110010112010000120000100012000001000010000010200011100010010102000000122010101101  
0122000100000022000000

*Leporacanthicus galaxias*

100000110000010101010010001000001100000000020100101220001000000100111010001000011100100302211000  
100210001000011100000101201000002000010001200100100001000001020001110001001010200000012200010110  
10132100101020000000000

*Leptoancistrus canensis*

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1020100000001100001000?201000002000011010200100101014000001201011000010010102010000122100101111  
0132000100000000000000

*Lithoxus bovallii*

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1011000110001200001000111101001200001100120000010000100101012010110000100100020000001220000011010  
122000100020000100010

*Lithoxus lithoides*

0020001100000000010000100010000101010A1111010011001100001200110111110100121200111101002011000002  
10110001000012000010001B110100120000110012000001000010010101201011000010010002000000122000001101  
0122000100020000100010

*Megalancistrus gigas*

100000210110010011010000011001000101000000020100101200102000100100011000011000012110100301201000  
110210001010112000000001201000012110001001200100100001000001020001110011001010200000012200010110  
10131100101020000000001

*Neblichthys pilosus*

1010002201000111110100000210010111011010010101000012200020001101110000000121100111101003011010002  
10200001000012000000011201000012000010001200000100001000000200011100011010102000000122000101101  
0122011100000011000000

*Neblichthys yaravi*

10100022010001?1110100000??010101011010010101000012200020001101110000000121000111101003011010001  
10200001000012000000011101000012000011001200000100001000000201011100010010102000000122000101101  
0122011100000011000000

*Panaque albomaculatus*

001000220110011111010000021011001100000001020100001210002000010101111000110001111101003012011002  
012100010000121000010112010000020000001012000001000020000010000011100010010102000000122000001101  
0131010101010000000000

*Panaque aureatus*

000000220110011111010000021011001100000001020100001100002000010101111000110001121101003012011001  
012100010000121000000111010010020011000012000001000020000010100011100011010102000000122000001101  
0131000101020000000000

*Panaque changae*

001000220110011111010000021011001100000001020100001210002000110101111000110001101101003012011002  
012100010000121100010101010000020000001012000001000020000010000011100010010102000000122000001101

0131010101010000000000

*Panaque maccus*

001000220110011111010000021011001100000001020100001210002000010101111000110001111101003012011002  
01210001000012100001011B010000020010001012000001000020000010000011100010010102000000122000001101  
0131010101010000000000

*Panaque nigrolineatus*

000000220100011111000000021011001100000001020100001220002000110101111000110001111101003122011002  
01210001010012100001011B010000021010000012000001000020000010000011100010010102000000122000001101  
0131000101010000000001

*Parancistrus auarantiacus*

100000220110010011010100001011000101000101010001001220101000010101011000110001121101003011010001  
002100010001120100100112010000020000000012000101000020000000000011100010010102000000122000001101  
0131010101000001000000

*Peckoltia bachi*

0010002201100110110000000110110011010100010101000012200020000002010110000110000111101003012111001  
002100010000120100000111010000020010000012000001000020000010000011100010010102010000122000001101  
0131010101000000000000

*Peckoltia braueri*

0010002201100111110100000210110011010000010201000012200020000001010111000110001111101003012011001  
002100010000120000000112010000020000000012000001000020000010000011100010010102000000122000001101  
0131010101000000000000

*Peckoltia cavatica*

0010002201100111110100000210110011010000010201000012200020000001010111000110001111101003022011001  
002100010000120000000112010000020000000012000001000020000010000011100010010102000000122000001101  
01310?0101000000000000

*Peckoltia caenosa*

0010002201100101110100000210110011010000010200000012200010000001010111000110001111101003012011001  
002100010000120100100111010000020000000012000001000020000010000011100010010102000000122000001101  
01310?0101000000000000

*Peckoltia brevis*

0000002201100111110100000210110011010000010201000012200020000001010111000110001111101003012011001  
002100010000120000000111010000020000000012000001000020000010000011100010010102000000122000001101  
0131010101000000000000

*Peckoltia furcata*

00000022011001011101100000210110011010000010101000012200020000001010111000110001111101003011011001  
002100010000120100000111010000020000000012000001000020000010000011100010010102000000122000001101  
01310?0101000000000000

*Peckoltia lineola*

0010002201100111110100000210110011010000010201000012200020000001010111000110001111101003012011001  
002100010000120000000112010000020000000012000001000020000010000011100010010102000000122000001101  
0131010101000000000000

*Peckoltia vittata*

0010002201100111110100000210110011010000010201000012200020000001010111000110001111101003012011001  
00210001000012000000011201000002001000012000001000020000010000011100010010102000000122000001101  
0131010101000000000000

*Pseudacanthicus leopardus*

1000002101100110110100000110010001000000000200001012200020000001000110000010000111101002012010001  
002100010001110000000112010000020000110012001001000010000010201011100010010102000000122000101101  
0132100101020000000000

*Pseudancistrus* sp.

1010002201100101110110000210010010110000000101000012200121000001010000000110000111101003011010001  
1020000000001110000101120100101200001000120000010000100000002010111002110111020000001210001011010  
131000100000010000000

*Pseudancistrus barbatus*

1010002201100101110110000210010010110000000101000012200121000001010000000110000111100003012010002  
1020000000001110000101120100001200001000120000010000100000002010111001110111020000001210001011010  
131000100000010000000

*Pseudancistrus brevispinnis*

0010002201000000110110000110010000110000000101000012200021001101010000000110000111101003011010002  
102000000000110000010112010000020000100012000001000010000000201011000211011102000000122000001101  
0131000100000000000000

*Pseudancistrus megacephalus*

0010002201100001110110000210010010110000000100000012200121001101010000000110000111101003011010001  
1021000000001200000101120100000200001000120000010000200000002000111001110111020000001220000011010  
1310001000000000?????0

*Pseudancistrus orinoco*

0100102201100101110110000200010010110000000101000012200021000001010000000110000101101003011010001  
1020000000001200000101120100A0020000110012000001000010000000201011000111011102000010122000101101  
0132000100000011000000

*Pseudancistrus sidereus*

0000002201100100110100000200010010110000000100000012200121001100000000000110000111101002022010001  
1020100000001210000101110100000200001000120000010000100000002010111002110111020000001220000011010  
1310001000000000000000

*Pseudancistrus yekuana*

001000220000010111010000021001000111000000020100011220002100000101000000011000010110000201201000  
2102010000000110000010102010000120000110012000001000010000000200011000211011102000010121000?01101  
01320001000000?1000000

*Pseudolithoxus anthrax*

0010002201100101110110000210010101010011010200010012200020001101010000000121200121101003011010001  
102000010000120101000101010000020000100012000001000010000010200011100010010102000000122000101101  
0121000100000011000000

*Pseudolithoxus dumus*

1010002201100101110110000110010101010011010200010012200020001101010000000121200121101003011010001  
102000010000120101000101010000020000100012000001000010000010200011100010010102000000122000101101  
0121000100000011000000

*Spectracanthicus murinus*

1010002200100101110100000210010001000000010201000012301021000001011110100100010111100002011010001  
102100010000101000000112010000020000100012000101000030000010200011100010010102000000101000001101  
0132000100020000000000

*Spectracanthicus sp.*

1010A0220000010111010000021001001100000001020100001220102100000101011000011000011110100301101000  
11021000100001110000001120100001200001A001200010100002000001020001110001001010200000012200000110  
10132000101020000000000

New Genus 1

1010002200100101010100000110110011000000010201001001000000000001010110000110001111101003012010000  
002100010101120100100102010000020100000012000001000020000010201011100010010102000000122000001101  
01321001000200000000001

New Genus 2

0010002201000110110100000020110101010011010200000012210120001101110000000121200121101002011010001  
102110000000110000000001010000010000110012000001010020000010201011000110010102000000122000001101  
0121000000000001000000

New Genus 3

0010002201100101110100000210110011010000000100000012200020000101010000000110000111101003012010001  
002000010000110100010102010000020011000012000001000020000010100011100010010102000000122000001101  
0131000101000000000000

Loricariidae-Hypostominae-Corymbophanini

*Corymbophanes andersoni*

1010002100000111110000000110100001010000000201000012200021000111010000000100000101101001011010001

1010100100001000000000111100000000001010200000100001000000201011100111010102000000100000001110  
1220001000000000000000  
*Corymbophanes kaiei*  
1010002100001111100000001100000010100000010100001220002100011101000000100000101101001011010001  
10100001000010000000001111000010000000010200000100002000000101011100011010102000000100000001110  
1220001000000000000000  
Loricariidae-Hypostominae-Hypostomini  
*Hypostomus ammophilus*  
00210021010001011100001100200100110100000001000000122000100000010100000001000101B110000202211100  
101200001000010100000010001000000001100001200000100002000001010001110011001010200110010100000110  
101310101011000000000000  
*Hypostomus unicolor*  
0021002101000101110000110020010011010000000100000012200010000001010000000100010111100002022111001  
012000010000101000000100010000000011000012000001000020000010100011100110010102001100101000001101  
0131010101100000000000  
*Hypostomus cochliodon*  
101000220100011011010000A21001001100000000020100001220002000000101001100010001011110000201101100  
2002000010000111000000111010000000011001012000001000020000010000011100110010102000000101000001101  
0131000101010000000000  
*Hypostomus hondae*  
100000220100010011010000121001001100000000020100001220002000000101011100000001012110000201101100  
1002000010000111000000111010000000011001012000001000020000010000011100110010102000000101000001101  
0131000101010000000000  
*Hypostomus plecostomoides*  
101000220100010011010000121001001100000000020100001220002000000101011100000001012110000201101100  
20020000100001110000001A101000000001100001200000100002000001000001110011001010200000010100000110  
101310001010100000000000  
*Hypostomus hemicochliodon*  
101000220110010011010000121001001101000000020100001220002000000101011000000001012110000201101100  
2002000010000111000000111010000000011000012000001000020000010000011100110010102000000101000001101  
0131000101000000000000  
*Hypostomus albopunctatus*  
101000220100010011010000021001001101000000020000001220002000000101000000010001011110000201201100  
1102000010000111000000111010000000011000012000001000020000010100011100111010102000000101000001101  
0132000101000000000000  
*Hypostomus villarsi*  
002000220100010011000000121001001101000000010000001220001000000101000100010001011110000201101100  
200200001000011100000011101000000000000012000001000020000010100011100110010102001000101000001101  
0131010101000000????0  
*Hypostomus bolivianus*  
1010002201100100110100000210010011010000000200000012200020000001010000000100010111100002011011001  
0020000100001110000001110100000000110000120000010000200000101000111001100101020000001010000011010  
1310001010000000000000  
*Hypostomus boulengeri*  
10100022010001001101000012100100110100000001000000122000200000010100010001000100101  
1110000201101100100200001000011100000011101000000000000012000001000020000010000  
0111001100101020000001010000011010131000101000000000000  
*Hypostomus round snout1*  
1010002201100100110100000210010011010000000201000012200020000001010000000100010111101002011011001  
0020000100001110000001120100000000111000120000010000200000101000111001100101020000001010000011010  
1310001010000000000000  
*Hypostomus round snout2*  
101000220100010011010000121001001101000000010000001220002000000101000000000001011110000201101100  
10020000100001110000001110100000000A100001200000100002000001010001110011001010200000010100000110

1013100010100000000000

*Hypostomus cordovae*

1010002201000100110100001210010011010000002000000122000200000010100000000001011110000201101100  
2002000010000111000000111010000000011100012000001000020000010100011100110010102000000101000001101  
0131000101000000000000

*Hypostomus emarginatus*

00100022010001111100001002100100110100000001000000122000100000010100000000001011110000201211000  
0120000100001110000001110100000000110000120000010000200000100000111001100101020010001010000011010  
1310101010000000000000

*Hypostomus emarginatus2*

001000220100011111000010021001001101000000010000001220001000000101000000010001011110000202211001  
012000010000111000000100010000000011000012000001000020000010100011100110010102001000101000001101  
0131010101000000000000

*Hypostomus francisci*

101000220100010011010000A21001001101010000020100001220002000000101000000010001011110000201201100  
100200001000010100000011101000000001100001200000100002000001010001110011001010200000010100000110  
101310001010000000000000

*Hypostomus r Santos*

101000220110010011010000121001001101000000010000001220002000000101000000000010111100002011011001  
002000010000101000000112010000000011000012000001000020000010000011100110010102000000101000001101  
0131000101000000000000

*Hypostomus plecostomus*

101000220100010011010000121001001101000000020000001220002000000101010000000001011110000201101100  
100200001000010100000011101000000001100001200000100002000001000001110011001010200000010100000110  
101310001010000000000000

*Hypostomus plecostomus2*

10100022010001001101000012100100110100000002000000122000200000010100000000001011110000201101100  
200200001000010100000011101000000001100001200000100002000001000000110011001010200000010100000110  
101310001010000000000000

*Hypostomus punctatus*

1010002201100100110100000210010011010000000200000012200020000001010100000100010111100002011011001  
0020000100001010000001A1010000000011000012000001000020000010A0001110011001010200000010100000110  
101310001010000000000000

*Hypostomus robinii*

1000002201100100110100001210010011010000000100000012200020000001010001000000010111100002011011001  
002000010000101000000111010000000011000012000001000020000010000011100110010102000000101000001101  
0131000101000000000000

*Hypostomus roseopunctatus*

001000220110010011010000021001001100000000020000001220002000000101011000000001012110000201101000  
200200001000011100000010201000000001100001200000100002000001000001110011001010200000010100000110  
101310001010000000000000

*Hypostomus sculpodon*

101000220110010011010000021001001101000000020100001220002000000101011000000001012110000201101100  
2002000010000111000000111010000000011000012000001000020000010000011100110010102000000101000001101  
0131000101000000000000

*Hypostomus spinosissimus*

1000002201000100110100100110010011010000001100000012200020000001010100000000010111100002012011001  
0120000100001110000001A0010000000000000012000001000020000010100011100110010102001000111000101101  
0131010101000000000000

*Hypostomus squalinus*

0010002201000111110000100120010011010000001100000012200010000001010000000100010111100002012111001  
012000010000111000000100010000000011000012000001000020000010000011100110010102001000101000001101  
0131010101000000000000

Loricariidae-Hypostominae-Pterygoplichthyini

*Hemiancistrus panamensis*

1010002201100100110100000210010011010000001000000122000100000010101000000000012110000301101100  
1002000010000111000000111010A0000000000001200000100002000000000001110011001010200000012200000110  
10131000101000000000100

*Hemiancistrus holostictus*

101000220110010011010000021001001101000000110000001220002000000101000100000001012110000301101100  
1002000010000111000000111010000000001000012000001000020000000000011100110010102000000122000001101  
0131000101000000000100

*Hemiancistrus maracaiboensis*

101000220110010011010000021001001101000000110000001220002000000101000000000000012110000301101100  
1002000010000111000000111010000000001000012000001000020000000000011100110010102000000122000001101  
0131000101000000000100

*Pterygoplichthys multiradiatus*

002000210100010011010000A02001001101000000110000001220011000000101000000010000012110000301201100  
101200002000010000000011201000000000000001200100000002000000000001110011001010200000010200000110  
10131000101000000000100

*Pterygoplichthys pardalis*

002000210100010011010000002001001101000000110000001220011000000101000000010000012110000301201100  
100200002000011000000011201000000001000001200100100002000000000000110011001010200000010200000110  
10131000101000000000100

*Pterygoplichthys gibbiceps*

101000210110010011000000002001001101000000110000001220012000000101000000000000012110000301201100  
100200001000011000000111201000000000000001200100A00002000000000000110011001010200000012200000110  
10131000101000000000100

*Pterygoplichthys lituratus*

101000210100010011000000002001001101000000110000001220011000000101000000000000012110000301201100  
100200001000011000000111201000000000000001200100000002000000000001110011001102000000122000001101  
0131000101000000000100

*Pterygoplichthys punctatus*

00100022010001001101000000200100110100000010000001220001000000101000100010000112110000301201100  
100200001000011000010011201000002000000001200100000002000000000000110011001010200000012200000110  
10131100101000000000100

*Pterygoplichthys etentaculatus*

101000220100011011010000002001001101000000110000001220001000000101000000010000012110000301101100  
1002000020000110000000112010000000001100001200100A00002000000000001110011001010200000012200000110  
10131000101000000000100

*Pterygoplichthys zuliaensis*

0020002201100100110000000020010011010000001100000012200110000001010000000100000121100003011011001  
00200002000011000000011201000000000000001200100000002000000000001100110010102000000122000001101  
0031000101000000000100

Loricariidae-Hypostominae-Rhinelepidini

*Pogonopoma wertheimeri*

1020002201000100111100001010011000110000000100000012210010101101000000001000000101000002011011001  
0120000210001000000000111100000101000000120000010000100000101000011002110111120000001200001001011  
131000101000000130000

*Pogonopoma parahybae*

002000220100010011010000101001100010000000010000001221001010110100000000100000011100000201101100  
10120000210001000000000?1110000010100010112000001000010000010100100100211011112000000100000001101  
1131000101000000130000

*Pseudorinelepis genibarbis*

00200022011001001101000000200110A011000000010001001220002010000200000000010000010110000201101100  
10020000210001000000000?201000001000000011200000100001000000000010010011101110200000012000010010  
10131000101000000110000

*Rhinelepis aspera*

10200022010001001111001010100110000100000001000000122000201011010000000010000010120000201101100  
1012000021000000000000120100000100000101120000010000100101001000011001110101020000010000000010  
11131000101000000120000

Loricariidae-Lithogeninae

*Lithogenes villosus*

00??00000000000000000000110000010100000002100010100000000000100000001000001000??000021100001  
101000000001000001000001000100200100000121000021?1?00010001201010110011001002100000100000000101  
0120000000000000000000

Loricariidae-Loricariinae

*Crossoloricaria venezuelae*

0001000011111200000001000101000001010000000?00001120010200100010000100100000010110000201110002  
101001011010100000000?0101101020000010112010010001?1001010020001100000?000000001001000000100010  
021000101001000000000

*Crossoloricaria* sp.

0001000011111200000000000101000001010000000?000011200102001000100001001010000010110000201110002  
1020010110101000001000?0101101020000010112010010001?1001010120101100000?0000000001001000000100010  
021000101001000000000

*Harttia* sp.

1000001101100000110100000101110000010000001000000122000200000010000000100000011100000101110001  
0020010100001100000000?010110100000010011200000000101000001021111010021001000200000100000000001  
0021000101000000000000

*Ixinandria montebelloi*

000000000000000000100001001010000000100000001000001100000000101010000100101000001010000010111000  
2102000010010000000000?010110100000000011200001000101000011020101010011001000300000011000011000  
1002200010100000000000

*Lamontichthys llanero*

010000110110000011000000010101001001000000010000001221002000000100000000010000011100000201110001  
0020010100001000000000?010110100000010011200001000101000000020010010021000000200000100000000001  
0021000101000000000000

*Loricaria cataphracta*

0000000011111200000001000101000000010000000?00001120010200110010000100100000010110000201110002  
102000011010100000000?0101101000000010112010011001?1001010020111000000?0100030001001000000100010  
021000101001000000000

*Loricariichthys brunneus*

0000000011000200010001001101000001010000000100000112001100011101000010010000000101100001012110002  
1020000110101000001000?0101101000010000112010010001?100101002011101001100001000000001000000100010  
022000101000000000000

*Rineloricaria rupestris*

00000000100002000100001001010000000100000001000001100000000111000000100101000001010000010111000  
2102000010010000000000?010110100000000011200001000101000011020101010011001000300000011000011000  
1002200010100000000000

*Sturisoma festivum*

00000011011001001100000002010100000100000011000000122000200000010000000001000001010010010111000  
20020001100001000000000?010110100001000011201001000101000001020010000011000010300000011000010000  
1002200010100000000000

*Sturisomatichthys citreus*

00000011011001001100000002010100000100000011000000122000200000010000000001000001010010010111000  
20020001100001000000000?010110100001000011201001000101000001020010010021001010200000011000010000  
1002200010100000000000

Loricariidae-Neoplecostominae

*Neoplecostomus microps*

002000110000000111000010001000000001000000020000001000001000001100000000100001011100010101101000  
2102000010000000000010001A10010010000011001201000100101110000120101100001100110101000110000000010  
1012200010100000000000



*Neoplecostomus paranensis*

002000110000000111000010001000000A0100000002000001220002000001100000000100001011100011101101000  
210200001000000000010001A10010010000011001201000100101110000120101100001100110101000110000000010  
11122000101000000000000

*Pareiorhaphis bahianus*

1020002100000101110100100010110000110000000100000012200010000011000000000000000111001101011010012  
1020000100001000000000111001100000001100120100010010100000002011101000100010020000001100011001010  
122000100000000000000

*Pareiorhaphis cameroni*

1010002100000101110100000010110000110000000100000012200020000011000000000100000101101101011010012  
10200001000000000000000111001101000001100120000010010101000002010110000100010020100011100011001010  
122000100000000000000

*Pareiorhaphis nudulus*

1020001100000101110100110010110000010000000110000012100020000211001000000100000001001100011010012  
10201001000000000000000?2000100020000010100??00021?1?C00000102010111001100001020100001100011001010  
130000100000000000000

*Pareiorhaphis splendens*

1020002100000101110100000010110000110000000100000012100020000011001000000100000011101101011010012  
10201001000000000000000110001100000001100020000010010101000102010111000100000020100011100011001010  
122000100000000000000

*Pareiorhaphis sp.*

1020002100000101110110000010110000110000000100000012200020000011000000000100000111101100011010012  
00200001000000000000000111001100000001100120000010010101000002010111000110010020000011100011001010  
122000100000000000000

*Pareiorhaphis?*

102100210000000111010010002011000011000000110100001210101000001100000000010000000100000201101001  
21020000100001000000000111001000000001100120100010010100000012011101000110010020100001?000?000101  
01320001000000000000000

*Isbrueckerichthys alipionis*

0021001100000101110000000010110000010000000210000012100010000011000000001000000111200111011010012  
1020000100000000000000011100110000000110012010001001?101000012010110000110010020100011100011001011  
132000101000000000000

*Isbrueckerichthys duseni*

0021002100000101110000000010110000010000000210000012100010000011000000000100000111200111011010012  
102000010000000000000000100110000000110012010001001?101000012010110000100010020100011100011001011  
132000101000000000000

*Kronichthys sp.1*

102000110000010111010000002011000001000000010000001210002000001100000000010001000100000101101001  
21020000100001000000A001110011000000011001201000A00101000001020101110000?00100201000010000000010  
10122000100000000000000

*Kronichthys sp.2*

102000210000010111010010002011000001000000010000001210002000101100000000010001000100000101101001  
210200001000010000001001110011000000011001201000100101000001020101110000?00100201000010000000010  
10122000100000000000000

*Pareiorhina rudolphi*

1020001100000001110100100010110000010000001100000012200020000011000000000100010001201011011010012  
10200001000000000000000?11001100000001101120100010010100000102010111000100010020100001000000001011  
122000100000000000000

*Pareiorhina sp.*

10200011000001011101001000201100000000000002A000001220002000101100000000010001001100010101101001  
21020000100000000000000?110011000000011011201000100101011000120101101000?001002010001100000000101  
11220001000000000000000

**Appendix 2.** Character state changes plotted on a random tree. Only unambiguous changes noted. Clades named based on the flanking taxa in figures 22–25 of the clade or by taxon name when appropriate. NUC = no unambiguous changes, NA = not available because the species is part of a polytomy in the tree. Only nodes present in the strict consensus tree (Figs. 22–25) are detailed.

<i>Corydoras</i>	<i>Isbrueckerichthys alipionis</i>	43: 0->1
1: 1->0	NUC	78: 0->1
58: 0->3		83: 0->2
131: 0->1	<i>Isbrueckerichthys duseni</i>	87: 0->1
	74: 0->1	194: 0->1
<i>Dianema</i>	120: 1->0	
35: 0->1	121: 1->0	<i>Hypoptopoma</i> sp.
		109: 2->0
<i>Hoplosternum</i>	<i>Pareiorhaphis bahianus</i>	129: 0->1
17: 0->1	110: 0->1	137: 1->0
93: 0->1	161: 0->1	145: 1->0
	163: 1->0	
<i>Astroblepus</i>	177: 1->0	<i>Nannoptopoma spectabila</i>
21: 0->1		23: 0->1
23: 0->1	<i>Pareiorhaphis cameroni</i>	29: 1->0
24: 0->1	3: 2->1	30: 1->0
27: 1->0	23: 1->0	174: 0->1
44: 1->0	83: 0->1	
67: 0->1	128: 0->1	<i>Otocinclus vestitus</i>
74: 0->1	141: 1->0	NUC
96: 0->2		
167: 0->1	<i>Pareiorhaphis nudulus</i>	<i>Otocinclus vittatus</i>
174: 0->1	24: 0->1	7: 1->2
175: 2->4	45: 0->1	
196: 2->0	53: 2->1	<i>Hisonotus</i> sp.
	62: 0->2	145: 1->0
<i>Lithogenes villosus</i>	67: 0->1	197: 2->1
1: 1->0	88: 1->0	
28: 0->1	102: 0->1	<i>Parotocinclus britskii</i>
34: 0->1	121: 1->2	61: 0->1
44: 1->2	122: 1->0	85: 0->1
49: 0->1	126: 1->0	128: 0->1
73: 0->1	129: 0->2	137: 1->0
92: 0->1	134: 1->0	148: 1->0
97: 0->1	138: 1->0	
110: 0->1	139: 2->0	<i>Schizolecis guentheri</i>
116: 0->1	145: 1->2	29: 1->0
126: 0->1	146: 0->1	30: 1->0
132: 0->1	150: 1->2	111: 0->1
169: 0->1	167: 0->1	126: 1->0
	172: 1->0	152: 0->1
<i>Neoplecostomus microps</i>	173: 0->1	
52: 2->0	196: 2->3	<i>Kronichthys</i> sp.
53: 2->0	197: 2->0	78: 0->1
		137: 1->0
<i>Neoplecostomus paranensis</i>	<i>Pareiorhina rudolphi</i>	
57: 1->2	14: 1->0	<i>Crossoloricaria venezuelae</i>
		100: 2->1
		160: 1->0

<i>Crossoloricaria</i> sp.	<i>Corymbophanes kaiei</i>	68: 0->1
22: 1->0	128: 0->1	183: 0->1
74: 0->1	150: 1->2	188: 0->1
116: 0->1	167: 1->0	
157: 0->1		<i>Hypostomus villarsi</i>
	<i>Pogonopoma wertheimeri</i>	25: 0->1
<i>Loricaria cataphracta</i>	137: 1->0	70: 0->1
145: 0->1	183: 0->2	97: 1->2
	188: 0->1	
<i>Loricariichthys brunneus</i>		<i>Hypostomus cochliodon</i>
25: 0->1	<i>Pogonopoma parahybae</i>	15: 0->1
56: 0->1	1: 1->0	68: 1->0
91: 1->2	36: 1->0	74: 0->1
116: 0->1	81: 0->1	136: 0->1
132: 0->1	161: 0->1	
173: 0->1	163: 1->0	<i>Hypostomus plecostomoides</i>
	190: 0->1	NUC
<i>Ixinandria montelbelloi</i>		<i>Hypostomus hemicochliodon</i>
14: 2->0	<i>Rhinelepis aspera</i>	NUC
	23: 0->1	
<i>Rineloricaria rupestris</i>	110: 1->0	<i>Hypostomus roseopunctatus</i>
64: 1->0	153: 0->1	1: 1->0
	155: 0->1	36: 1->0
<i>Harttia</i> sp.		46: 1->0
1: 0->1	<i>Pseudorinelepis genibarbis</i>	94: 1->0
20: 0->1	1: 1->0	120: 1->0
29: 0->1	11: 0->1	121: 1->2
73: 0->1	27: 1->2	
74: 1->0	48: 0->1	<i>Hypostomus sculpodon</i>
111: 0->1	64: 1->2	NUC
144: 1->0	158: 1->0	
159: 0->1	161: 0->1	<i>Hypostomus plecostomus</i>
	163: 1->0	111: 1->0
<i>Lamontichthys llanero</i>	183: 0->2	
2: 0->1	188: 0->1	<i>Hypostomus cordovae</i>
33: 0->1		134: 0->1
54: 0->1	<i>Hypostomus ammophilus</i>	
88: 1->2	NUC	<i>Hypostomus albopunctatus</i>
		NA
<i>Sturisoma festivum</i>	<i>Hypostomus unicolor</i>	
164: 1->0	NUC	<i>Hypostomus bolivianus</i>
175: 2->3		NA
	<i>Hypostomus emarginatus</i>	
<i>Sturisomatichthys citrensis</i>	15: 0->1	<i>Hemiancistrus panamensis</i>
NUC	97: 1->0	68: 0->1
	158: 1->0	
<i>Corymbophanes andersoni</i>		<i>Hemiancistrus holostictus</i>
29: 0->1	<i>Hypostomus squamosissimus</i>	70: 0->1
44: 1->2	3: 1/2->0	78: 0->1
102: 0->1	26: 2->1	
135: 0->1	43: 0->1	

<i>Hemiancistrus maracaiboensis</i>	<i>Megalancistrus gigas</i>	57: 2->0
NUC	36: 0->1	97: 1->0
	53: 2->0	107: 0->1
<i>Pterygoplichthys multiradiatus</i>	55: 0->1	109: 0->1
99: 0->1	74: 0->1	116: 0->1
111: 1->0	98: 0->1	120: 1->0
162: 0->1	134: 1->0	131: 0->1
		160: 0->1
<i>Pterygoplichthys pardalis</i>	<i>Pseudacanthicus leopardus</i>	203: 1->0
132: 0->1	15: 0->1	215: 0->1
145: 0->1	88: 3->2	
	160: 0->1	<i>Panaque albomaculatus</i>
<i>Pterygoplichthys zuliaensis</i>		121: 1->2
11: 0->1	<i>Leporacanthicus galaxias</i>	
91: 2->1	7: 2->1	<i>Panaque changae</i>
195: 1->0	11: 1->0	61: 0->1
	17: 1->0	81: 1->0
<i>Pterygoplichthys gibbiceps</i>	23: 0->1	120: 1->0
11: 0->1	30: 1->0	
57: 1->2	57: 2->1	<i>Panaque maccus</i>
	67: 0->1	NUC
<i>Pterygoplichthys lituratus</i>	71: 0->1	
162: 0->1	83: 1->0	<i>Panaque nigrolineatus</i>
172: 0->1	90: 1->2	11: 1->0
	92: 0->1	20: 1->0
<i>Pterygoplichthys punctatus</i>	118: 0->1	61: 0->1
70: 0->1		89: 0->1
79: 0->1	<i>Spectracanthicus murinus</i>	90: 1->2
116: 0->1	33: 1->0	107: 0->1
129: 0->2	53: 2->3	130: 0->1
198: 0->1	67: 0->1	215: 0->1
	71: 0->1	
<i>Pterygoplichthys etentaculatus</i>	75: 1->0	<i>Panaque aureatus</i>
15: 0->1	78: 0->1	52: 2->1
105: 1->2	85: 1->0	53: 2->0
132: 0->1	88: 3->2	81: 1->2
133: 0->1	111: 1->0	126: 0->1
	150: 2->3	133: 0->1
<i>Acanthicus hystrix</i>	183: 2->0	158: 0->1
8: 1->2	184: 2->1	169: 0->1
23: 0->1	203: 1->0	
49: 1->0		<i>Peckoltia bachi</i>
69: 1->0	<i>Spectracanthicus</i> sp.	3: 0->1
91: 2->1	11: 1->0	16: 1->0
92: 0->1	128: 0->1	20: 1->0
105: 1->0		26: 2->1
137: 0->1	New Genus 1	38: 0->1
159: 0->1	17: 1->0	44: 2->1
169: 0->1	51: 1->0	64: 1->2
205: 2->0	52: 2->1	70: 1->0
	53: 2->0	79: 1->0

<i>Peckoltia sabaji</i>	<i>Lasiancistrus caucanus</i>	45: 0->1
5: 0->1	120: 1->0	48: 0->1
11: 1->0		137: 0->1
21: 0->1	<i>Lasiancistrus guacharote</i>	138: 1->0
26: 2->1	NUC	150: 1->4
43: 0->1		167: 1->0
94: 0->1	<i>Lasiancistrus tentaculatus</i>	169: 1->0
	208: 1->2	192: 0->1
<i>Hemiancistrus landoni</i>		
16: 1->0	<i>Pseudolithoxus anthrax</i>	<i>Cordylancistrus torbesensis</i>
158: 1->0	NUC	29: 0->1
167: 0->1		91: 1->2
	<i>Pseudolithoxus dumus</i>	132: 0->1
<i>Hemiancistrus guahiborum</i>	1: 0->1	167: 1->2
77: 0->1	26: 2->1	
		<i>Exastilithoxus fimbriatus</i>
<i>Hemiancistrus micromattos</i>	<i>Chaetostoma anomala</i>	91: 1->2
94: 0->1	157: 0->1	121: 1->2
133: 0->1		190: 1->0
	<i>Chaetostoma sovichthys</i>	
<i>Hemiancistrus snethlageae</i>	64: 2->1	<i>Exastilithoxus</i> sp.
167: 0->1	135: 0->1	21: 0->1
<i>Hemiancistrus megalopteryx</i>	<i>Chaetostoma stannii</i>	<i>Lithoxus lithoides</i>
16: 1->0	167: 1->0	77: 1->2
20: 1->0		
197: 1->2	<i>Chaetostoma platyrhynchus</i>	<i>Lithoxus bovallii</i>
	11: 0->1	97: 2->1
<i>Baryancistrus demantoides</i>	150: 1/2->3	106: 0->1
44: 2->1	209: 0->1	
		New Genus 2
<i>Baryancistrus niveatus</i>	<i>Cordylancistrus platycephalus</i>	15: 0->1
81: 1->2	8: 2->1	27: 1->2
167: 0->1	30: 1->0	29: 0->1
	77: 1->2	54: 0->1
<i>Baryancistrus</i> sp.	120: 1->0	56: 0->1
36: 1->0	121: 2->1	81: 1->2
42: 0->1	134: 1->0	120: 1->0
54: 0->1	149: 1->0	129: 2->1
101: 0->1		150: 1->2
199: 0->1	<i>Dolichancistrus cobrensis</i>	156: 0->1
203: 1->0	2: 1->0	201: 1->0
	8: 2->1	
<i>Ancistrus pirareta</i>	21: 1->0	<i>Hopliancistrus tricornis</i>
116: 0->1		121: 1->2
	<i>Dolichancistrus pediculatus</i>	128: 0->1
<i>Ancistrus</i> sp.	NUC	172: 0->1
97: 1->2		196: 2->3
121: 1->2	<i>Leptoancistrus canensis</i>	210: 0->1
147: 0->1	1: 0->1	
	15: 0->1	

<i>Neblichthys pilosus</i>	<i>Pseudancistrus pectegenitor</i>	142: 0->1
97: 1->2	29: 0->1	143: 0->1
121: 1->2	46: 1->0	148: 1->0
160: 1->0	67: 0->1	
	117: 1->0	<i>Hemipsilichthys gobio</i>
<i>Neblichthys yaravi</i>	119: 1->0	21: 0->1
135: 0->1	134: 1->0	121: 1->0
	142: 0->1	126: 0->1
<i>Dekeyseria pulcher</i>	145: 1->0	132: 0->1
56: 0->1	158: 2->1	152: 0->1
81: 1->2		157: 0->1
172: 0->1	<i>Pseudancistrus brevispinnis</i>	172: 1->0
	11: 1->0	
<i>Dekeyseria scaphirhyncha</i>	16: 1->0	below <i>Corydoras</i> - <i>Hoplosternum</i>
20: 1->0	26: 2->1	26: 1<->0 *
64: 1->0	33: 1->0	62: 1<->0 *
91: 1->2	164: 1->0	91: 0<->1 *
102: 0->1		100: 0<->1 *
119: 1->0	<i>Pseudancistrus megacephalus</i>	109: 3<->0 *
121: 1->2	101: 0->1	139: 1<->2 *
	150: 1->2	145: 0<->1 *
<i>Pseudancistrus</i> sp.	160: 1->0	148: 0<->1 *
97: 2->1	167: 2->1	154: 1<->0 *
126: 0->1		158: 0<->2 *
	<i>Pseudancistrus sidereus</i>	160: 0<->1 *
<i>Pseudancistrus barbatus</i>	3: 1->0	162: 0<->1 *
85: 1->0	16: 1->0	168: 0<->1 *
91: 1->2	27: 1->0	175: 0<->2 *
167: 2->1	64: 1->0	182: 0<->1 *
	66: 1->0	193: 0<->1 *
<i>Pseudancistrus orinoco</i>	88: 3->2	195: 0<->1 *
2: 0->1	90: 1->2	196: 1<->2 *
5: 0->1	91: 1->2	
27: 1->0	102: 0->1	below <i>Dianema</i> - <i>Hoplosternum</i>
97: 2->1	112: 0->1	64: 1->2
128: 1->0		106: 0->1
167: 2->1	New Genus 3	119: 0->1
	29: 0->1	161: 0->1
<i>Pseudancistrus yekuana</i>	91: 1->2	172: 1->0
10: 1->0	117: 0->1	
11: 1->0	120: 1->0	below <i>Astroblepus</i> - <i>Hemipsilichthys</i>
21: 1->0	121: 1->2	<i>gobio</i>
33: 1->0	132: 0->1	26: 1<->0 *
34: 0->1	133: 0->1	62: 1<->0 *
44: 1->2	156: 0->1	91: 0<->1 *
50: 0->1		100: 0<->1 *
85: 1->0	<i>Delturus anguillicaudatus</i>	109: 3<->0 *
88: 3->2	11: 0->1	139: 1<->2 *
91: 1->2	91: 1->2	145: 0<->1 *
102: 0->1	97: 2->1	148: 0<->1 *
184: 2->1	121: 1->2	154: 1<->0 *

158: 0<->2 *	below <i>Neoplecostomus microps</i> -	below <i>Hypoptopoma</i> sp. - <i>Kronich-</i>
160: 0<->1 *	<i>Pareiorhina rudolphi</i>	<i>thys</i> sp.
162: 0<->1 *	23: 0->1	27: 1->2
168: 0<->1 *	85: 0->1	53: 2->1
175: 0<->2 *		168: 1->0
182: 0<->1 *	below <i>Neoplecostomus microps</i> -	<i>Hypoptopomatinae</i>
193: 0<->1 *	<i>Pareiorhaphis nudulus</i>	1: 1->0
195: 0<->1 *	86: 0->1	14: 1->0
196: 1<->2 *	183: 0->1	103: 0->1
	187: 0->1	109: 0->2
below <i>Astroblepus</i> - <i>Lithogenes vil-</i>	188: 0->1	131: 0->1
<i>losus</i>		154: 0->1
79: 0->1	below <i>Neoplecostomus microps</i> -	161: 0->1
121: 1->0	<i>Pareiorhaphis cameroni</i>	162: 1->0
140: 0->1	80: 0->1	163: 1->0
145: 1->2	137: 1->0	195: 1->0
146: 0->1	156: 1->0	203: 0->1
157: 0->1		
176: 0->1	below <i>Neoplecostomus microps</i> -	below <i>Hypoptopoma</i> sp. - <i>Parotocin-</i>
	<i>Isbrueckerichthys duseni</i>	<i>clus britskii</i>
below <i>Neoplecostomus microps</i> -	1: 1->0	15: 0->1
<i>Hemipsilichthys gobio</i>	20: 1->0	95: 0->1
7: 0->1	44: 1->2	97: 2->1
8: 0->1	85: 1->0	141: 1->0
14: 0->1	157: 0->1	154: 1->2
18: 0->1	203: 0->1	156: 1->0
30: 0->1		160: 1->0
52: 0->1	<i>Neoplecostomus</i>	172: 1->0
97: 0->2	14: 1->0	
100: 1->2	29: 1->0	below <i>Hypoptopoma</i> sp. - <i>Hisonotus</i>
105: 0->1	30: 1->0	sp.
120: 0->1	78: 0->1	43: 0->1
201: 0->1	96: 1->0	87: 0->1
	116: 0->1	202: 0->1
below <i>Neoplecostomus microps</i> -	126: 1->0	
New Genus 3	128: 0->1	below <i>Hypoptopoma</i> sp. - <i>Otocinclus</i>
17: 0->1	151: 0->1	<i>vittatus</i>
52: 1->2	173: 0->1	44: 1->0
53: 0->2	175: 2->1	57: 2->0
57: 0->2	183: 1->0	98: 1->0
74: 0->1	187: 1->0	105: 1->2
82: 0->1	188: 1->0	110: 1->0
93: 0->1		
137: 0->1	<i>Isbrueckerichthys</i>	below <i>Hypoptopoma</i> sp. - <i>Nannopto-</i>
	4: 0->1	<i>poma spectabila</i>
below <i>Neoplecostominae</i> + <i>Hypop-</i>	23: 1->0	54: 0->1
<i>topomatinae</i>	45: 0->1	88: 1->0
16: 0->1	53: 2->1	131: 1->0
63: 0->1	83: 0->2	141: 0->1
96: 0->1	196: 2->3	
126: 0->1		
141: 0->1		

<i>Otocinclus</i>		below <i>Sturisoma festivum</i> - <i>Sturiso-</i>
11: 0->1	74: 1->0	<i>maticichthys citrensis</i>
14: 0->1	83: 0->1	26: 1->2
51: 1->0	106: 0->1	43: 0->1
52: 2->0	141: 0->1	85: 0->1
53: 1->0	153: 0->1	104: 0->1
62: 0->2		132: 0->1
64: 1->2	below <i>Crossoloricaria venezuelae</i> -	141: 0->1
97: 1->0	<i>Loricaria cataphracta</i>	173: 0->1
128: 0->1	11: 0->1	183: 0->1
148: 1->0	12: 0->1	188: 0->1
156: 0->1	13: 0->1	
159: 0->1	18: 1->0	Hypostomiane
172: 0->1	44: 1->0	7: 1->2
210: 0->1	88: 1->2	83: 0->1
212: 0->1	135: 0->1	97: 2->1
	164: 1->0	123: 0->1
Loricariinae	167: 1->0	148: 1->0
1: 1->0	168: 1->0	173: 0->1
27: 1->0	179: 0->1	
28: 0->1	197: 2->1	Corymbophanini
92: 0->1	206: 0->1	15: 0->1
121: 1->0		16: 0->1
124: 0->1	Crossoloricaria	30: 1->0
127: 0->1	4: 0->1	46: 0->1
144: 0->1	103: 0->1	58: 0->1
145: 1->0	129: 0->2	62: 0->1
163: 1->0	163: 0->1	63: 0->1
191: 1->0		85: 0->1
195: 1->0	below <i>Ixinandria montelbelloi</i> -	100: 2->1
	<i>Rineloricaria rupestris</i>	138: 1->0
below <i>Crossoloricaria venezuelae</i> -	23: 0->1	192: 0->1
<i>Rineloricaria rupestris</i>	52: 2->0	
7: 1->0	110: 1->0	below <i>Pogonopoma wertheimeri</i> -
8: 1->0	183: 0->1	New Genus 3
14: 1->2	188: 0->1	8: 1->2
17: 1->0		88: 1->2
30: 1->0	below <i>Harttia</i> sp. - <i>Sturisomaticichthys</i>	94: 0->1
50: 0->1	<i>citrensis</i>	98: 1->0
53: 2->0	11: 0->1	122: 1->0
60: 0->1	98: 1->0	160: 1->0
69: 0->1		196: 2->3
72: 0->1	below <i>Harttia</i> sp. - <i>Lamontichthys</i>	197: 2->1
108: 0->1	<i>llanero</i>	
155: 0->1	14: 1->0	Rhinelepini
189: 0->1	81: 0->1	31: 0->1
	97: 2->1	59: 0->1
below <i>Crossoloricaria venezuelae</i> -	103: 0->1	105: 1->2
<i>Loricariichthys brunneus</i>	134: 0->1	106: 0->1
22: 0->1	197: 2->1	129: 0->1
55: 0->1		162: 1->0



210: 0->1	below <i>Hypostomus ammophilus</i> – <i>H.</i>	Pterygoplichthyini
211: 0->1	<i>unicolor</i>	81: 1->2
	4: 0->1	158: 1->0
below <i>Pogonopoma wertheimeri</i> –	8: 2->1	213: 0->1
<i>Rhinelepis aspera</i>	24: 0->1	
25: 0->1	26: 2->0	<i>Hemiancistrus annectens</i> group
61: 0->1	27: 1->2	74: 1->0
62: 0->1	90: 1->2	112: 0->1
99: 0->1	111: 1->0	
194: 0->1	120: 1->0	below <i>Hemiancistrus holostictus</i> –
211: 1->2	179: 0->1	<i>Hemiancistrus maracaiboensis</i>
	204: 0->1	133: 0->1
<b>Pogonopoma</b>		
54: 0->1	below <i>Hypostomus cochliodon</i> – <i>H.</i>	Pterygoplichthys
57: 2->1	<i>bolivianus</i>	26: 2->0
73: 0->1	NUC	27: 1->2
74: 1->0		121: 1->2
122: 0->1	below <i>Hypostomus cochliodon</i> –	142: 0->1
131: 0->1	<i>Hypostomus cordovae</i>	
156: 0->1	NA	below <i>Pterygoplichthys multiradia-</i>
167: 1->2		<i>tus</i> – <i>P. punctatus</i>
174: 0->1	below <i>Hypostomus cochliodon</i> – <i>H.</i>	91: 1->2
211: 2->3	<i>plecostomus</i>	162: 1->0
	68: 0->1	
below <i>Hypostomus ammophilus</i> –	158: 1->0	below <i>Pterygoplichthys multiradia-</i>
New Genus 3		<i>tus</i> – <i>P. zuliaensis</i>
33: 0->1	below <i>Hypostomus cochliodon</i> – <i>H.</i>	3: 1->2
81: 0->1	<i>sculpodon</i>	105: 1->2
111: 0->1	46: 0->1	
119: 0->1	69: 0->1	below <i>Pterygoplichthys multiradia-</i>
137: 1->0		<i>tus</i> – <i>P. pardalis</i>
150: 1->2	below <i>Hypostomus cochliodon</i> – <i>H.</i>	183: 2->0
184: 0->1	<i>plecostomoides</i>	
190: 0->1	36: 1->0	below <i>Pterygoplichthys gibbiceps</i> –
	70: 0->1	<i>P. lituratus</i>
<b>Hypostomini</b>	205: 0->1	74: 1->0
78: 0->1		118: 0->1
112: 0->1	below <i>Hypostomus hemicochliodon</i>	
156: 0->1	– <i>H. sculpodon</i>	Ancistrini
	11: 0->1	1: 1->0
below <i>Hypostomus ammophilus</i> – <i>H.</i>		16: 0->1
<i>villarsi</i>	below <i>Hypostomus roseopunctatus</i> –	62: 0->1
178: 0->1	<i>H. sculpodon</i>	75: 0->1
199: 0->1	25: 1->0	85: 0->1
		94: 1->0
below <i>Hypostomus ammophilus</i> – <i>H.</i>	below <i>Hemiancistrus aspidolepis</i> –	129: 0->2
<i>emarginatus</i>	New Genus 3	167: 1->0
16: 0->1	88: 2->3	
92: 0->1	183: 0->2	below <i>Acanthicus hystrix</i> – <i>Pseudan-</i>
132: 0->1	184: 1->2	<i>cistrus sidereus</i>
133: 0->1		

61: 0->1	199: 1->0	below <i>Panaque albomaculatus</i> -
111: 1->2	205: 0->2	<i>Peckoltia furcata</i>
		3: 1->0
<i>Panaque</i> clade	below <i>Acanthicus hystrix</i> - <i>Spectra-</i>	121: 2->1
44: 1->2	<i>canthicus</i> sp.	
65: 0->1	29: 1->0	
79: 0->1	79: 1->0	below <i>Panaque albomaculatus</i> -
	111: 2->1	<i>Panaque aureatus</i>
below <i>Acanthicus hystrix</i> - <i>Hemian-</i>	134: 0->1	36: 1->0
<i>cistrus megalopteryx</i>		62: 0->1
68: 0->1	below <i>Acanthicus hystrix</i> - <i>Lepora-</i>	67: 0->1
156: 0->1	<i>canthicus galaxias</i>	99: 0->1
	3: 1->0	112: 0->1
below <i>Acanthicus hystrix</i> - <i>Hemian-</i>	8: 2->1	
<i>cistrus snethlageae</i>	42: 1->0	<i>Panaque</i>
42: 0->1	66: 1->0	97: 1->2
91: 1->2	74: 1->0	117: 0->1
	142: 0->1	
below <i>Acanthicus hystrix</i> - <i>Hemian-</i>	150: 2->1	<i>Panaque (Panaqolus)</i>
<i>cistrus landoni</i>	188: 0->1	3: 0->1
65: 1->0		53: 2->1
70: 0->1	below <i>Acanthicus hystrix</i> - <i>Pseuda-</i>	136: 0->1
	<i>canthicus leopardus</i>	
below <i>Acanthicus hystrix</i> - <i>Hemian-</i>	10: 0->1	below <i>Panaque albomaculatus</i> -
<i>cistrus sabaji</i>	109: 0->1	<i>Panaque changae</i>
61: 1->0	135: 0->1	132: 1->0
62: 1->0		
	below <i>Acanthicus hystrix</i> - <i>Megalan-</i>	below <i>Parancistrus auarantiacus</i> -
below <i>Acanthicus hystrix</i> - <i>Hypan-</i>	<i>cistrus gigas</i>	<i>Peckoltia caenosa</i>
<i>cistrus zebra</i>	61: 0->1	57: 2->1
29: 0->1	81: 1->2	116: 0->1
69: 0->1	107: 0->1	
121: 1->2	111: 1->2	<i>Hypancistrus</i>
	128: 0->1	16: 1->0
below <i>Acanthicus hystrix</i> - <i>Peckoltia</i>	130: 0->1	49: 0->1
<i>caenosa</i>	131: 0->1	51: 1->0
101: 0->1	167: 0->1	52: 2->1
158: 1->0	197: 2->1	53: 2->0
	215: 0->1	64: 1->0
below <i>Acanthicus hystrix</i> - <i>Peckoltia</i>		
<i>vittata</i>	<i>Spectracanthicus</i>	below <i>Hypancistrus contradens</i> -
46: 0->1	55: 0->1	<i>Hypancistrus furunculus</i>
	58: 0->1	36: 1->0
below <i>Acanthicus hystrix</i> - New	91: 2->1	57: 2->1
Genus 1	98: 0->1	
1: 0->1	143: 0->1	below <i>Hemiancistrus micromattos</i> -
10: 1->0		<i>Hemiancistrus snethlageae</i>
36: 1->0	below <i>Panaque albomaculatus</i> -	121: 1->2
70: 1->0	<i>Peckoltia vittata</i>	
158: 0->2	94: 0->1	
197: 1->2		

<i>Baryancistrus</i>	<i>Ancistrus pirareta</i>	below <i>Chaetostoma anomala</i> -
121: 1->2	88: 3->2	<i>Cordylancistrus torbesensis</i>
143: 0->1	101: 0->1	3: 1->0
	105: 1->2	6: 0->1
below <i>Baryancistrus demantoides</i> -	150: 1->2	27: 1->0
<i>B. niveatus</i>	188: 1->0	32: 1->0
91: 1->2	201: 1->0	38: 0->1
112: 0->1	208: 1->3	40: 1->0
120: 1->0		84: 0->1
	<i>Lasiancistrus</i>	121: 1->2
<i>Ancistrus</i> clade	5: 0->1	142: 0->1
98: 0->1	89: 0->1	149: 0->1
134: 0->1	98: 1->0	177: 0->1
150: 2->1	114: 0->1	196: 2->3
158: 1->2	117: 0->1	
160: 0->1	186: 0->1	below <i>Chaetostoma anomala</i> - <i>Lep-</i>
203: 1->0		<i>toancistrus canensis</i>
	below <i>Lasiancistrus guacharote</i> -	2: 0->1
below <i>Ancistrus pirareta</i> - <i>Dekeyse-</i>	<i>Lasiancistrus tentaculatus</i>	21: 0->1
<i>ria scaphirhyncha</i>	11: 0->1	55: 0->1
39: 0->1	121: 1->2	
42: 0->1	128: 0->1	below <i>Chaetostoma anomala</i> -
75: 1->2		<i>Cordylancistrus platycephalus</i>
76: 0->1	<i>Pseudolithoxus</i>	64: 1->2
188: 0->1	11: 0->1	180: 0->1
196: 3->2	115: 0->1	
208: 0->1	120: 1->0	<i>Chaetostoma</i>
209: 0->1		10: 0->1
	below <i>Chaetostoma anomala</i> - <i>Hop-</i>	15: 0->1
below <i>Ancistrus pirareta</i> - <i>Neblin-</i>	<i>liancistrus tricornis</i>	34: 1->0
<i>ichthys yaravi</i>	119: 1->0	42: 1->0
32: 0->1	135: 0->1	111: 1->0
	167: 0->1	116: 1->0
below <i>Ancistrus pirareta</i> - <i>Hoplian-</i>		135: 1->0
<i>cistrus tricornis</i>	below <i>Chaetostoma anomala</i> - New	
40: 0->1	Genus 2	below <i>Chaetostoma sovichthys</i> -
77: 0/1->2	88: 3->2	<i>Chaetostoma stannii</i>
	164: 1->0	77: 1->0
below <i>Ancistrus pirareta</i> - <i>Pseudo-</i>	188: 1->0	121: 2->1
<i>lithoxus dumus</i>	208: 1->0	
48: 0->1		below <i>Dolichancistrus cobrensis</i> -
81: 1->2	below <i>Chaetostoma anomala</i> -	<i>Leptoancistrus canensis</i>
156: 0->1	<i>Lithoxus bovallii</i>	157: 0->1
160: 1->0	10: 1->0	185: 0->1
	77: 2->1	188: 0->1
below <i>Ancistrus pirareta</i> - <i>Lasiancis-</i>	97: 1->2	
<i>trus tentaculatus</i>	116: 0->1	below <i>Dolichancistrus cobrensis</i> -
29: 0->1	197: 1->2	<i>Dolichancistrus pediculatus</i>
64: 1->0	209: 1->0	10: 0->1
197: 1->2		122: 0->1
209: 1->2		

125: 0->1	46: 0->1	below <i>Pseudancistrus orinoco</i> – <i>P.</i>
166: 0->1	128: 0->1	<i>yekuana</i>
177: 1->0	197: 1->2	81: 1->0
	199: 0->1	135: 0->1
below <i>Exastilithoxus fimbriatus</i> –	200: 0->1	164: 1->0
<i>Lithoxus bovallii</i>		
7: 2->1	Dekeyseria	Delturinae
8: 2->1	26: 2->0	23: 0->1
14: 1->0	125: 0->1	27: 1->0
17: 1->0	155: 0->1	28: 0->1
23: 0->1	156: 0->1	64: 1->2
30: 1->0	198: 0->1	66: 0->1
41: 0->1		73: 0->1
48: 0->1	<i>Pseudancistrus</i>	81: 0->1
52: 2->1	34: 1->0	115: 0->1
57: 2->1	35: 0->1	128: 0->1
68: 0->1	58: 0->1	147: 0->1
69: 0->1	105: 1->0	167: 0->2
71: 0->1	117: 0->1	170: 0->1
100: 2->1	172: 0->1	183: 0->1
122: 0->1		188: 0->1
125: 0->1	below <i>Pseudancistrus</i> sp. – <i>P. mega-</i>	192: 0->1
157: 0->1	<i>cephalus</i>	196: 2->3
167: 1->0	21: 0->1	
173: 1->0	121: 1->2	
205: 0->2		
	below <i>Pseudancistrus</i> sp. – <i>P.</i>	
<i>Exastilithoxus</i>	<i>brevispinnis</i>	
42: 1->0	46: 0->1	
65: 1->0	97: 1->2	
81: 1->0		
100: 1->0	below <i>Pseudancistrus</i> sp. – <i>P. pecte-</i>	
168: 1->0	<i>genitor</i>	
171: 1->0	61: 1->0	
207: 0->1	62: 1->0	
	128: 0->1	
<i>Lithoxus</i>	188: 0->1	
3: 1->2	208: 0->1	
44: 2->1		
47: 0->1	below <i>Pseudancistrus</i> sp. – <i>P. barba-</i>	
58: 0->2	<i>tus</i>	
93: 1->0	1: 0->1	
128: 0->1	184: 2->1	
153: 0->1		
155: 0->1	below <i>Pseudancistrus orinoco</i> – <i>P.</i>	
210: 0->1	<i>pectegenitor</i>	
214: 0->1	180: 0->1	
	197: 1->2	
<i>Neblinichthys</i>	209: 0->1	
1: 0->1		
37: 0->1		