

Two new species of *Hyphessobrycon* (Pisces: Characiformes: Characidae) from Putumayo River, with keys to the Colombian *Hyphessobrycon heterorhabdus*-group species

Carlos A. García-Alzate¹, César Román-Valencia¹ & Donald C. Taphorn²

¹Universidad del Quindío, Laboratorio de Ictiología, A. A. 2639, Armenia, Quindío, Colombia. cagarcia@uniquindio.edu.co, ceroman@uniquindio.edu.co

²UNELLEZ, BioCentro, Museo de Zoología, Colección de Peces, Guanare, Portuguesa, 3310, Venezuela. taphorn@gmail.com

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ABSTRACT. Two new species of the *Hyphessobrycon heterorhabdus* group are described from the Putumayo River, Colombian Amazon. *Hyphessobrycon amaronensis* sp. n. is distinguished from other species of this group by the following combination of characters: three simple and eight branched dorsal-fin rays; three to five pored scales in the lateral line; lateral scales 27–28; three scales between the lateral series and the anal fin; two simple and 14–16 branched anal-fin rays; mean caudal peduncle length mean=26.75% SL; upper jaw length mean=15.66% SL and ventral margin of anal fin in males convex. *Hyphessobrycon taguae* sp. n. is distinguished by having five to six pored lateral-line scales, conical teeth on the maxilla, five infraorbitals, depth of body mean=29.65% SL, upper jaw length mean=18.94% SL; a dark red band present along the lateral series of scales; and males with spines on all fins. A key to the Colombian members of the *Hyphessobrycon heterorhabdus*-group is presented.

RESUMEN. Se describen dos nuevas especies de *Hyphessobrycon* grupo *heterorhabdus* del río Putumayo, Amazonia, Colombia. *Hyphessobrycon amaronensis* se distingue de las especies descritas de este grupo por la siguiente combinación de caracteres: tres radios simples y ocho ramificados en la aleta dorsal, por presentar tres a cinco escamas con poros en la línea lateral, 27 a 28 escamas en la serie lateral, tres escamas entre la serie lateral y la aleta anal, dos radios simples y 14 a 16 radios ramificados en la aleta anal, por la longitud del pedúnculo caudal $\mu = 26,75\%$ LE, por la longitud de la mandíbula superior $\mu = 15,66\%$ LE, y por presentar el margen ventral de la aleta anal en machos convexa. *Hyphessobrycon taguae* se distingue por presentar cinco a seis escamas con poros en la línea lateral, dientes cónicos en el maxilar, cinco infraorbitales, por la profundidad del cuerpo $\mu = 29,65\%$ LE, por la longitud de la mandíbula superior $\mu = 18,94\%$ LE, por la presencia de una banda roja sobre la línea lateral oscura en la serie lateral y machos con espinas en todas las aletas. Se incluye clave taxonómica de las especies de *Hyphessobrycon* grupo *heterorhabdus* presentes en Colombia.

KEY WORDS. Teleostei, taxonomy, characid fish, Amazon, South America.

Hyphessobrycon is one of the largest characid genera with about 125 valid species. They can be found from southern Mexico to the Rio de la Plata in southern South America; southern boundary of the genus in Argentina stands in Mar Chiquita lagoon (Miquelarena & López 2006). The genus was proposed by Durbin in Eigenmann (1908) with the following combination of characters: incomplete lateral line, adipose fin present, few or no maxillary teeth, third infraorbital not in contact with the preopercle, two rows of premaxillary teeth, the in-

ner with five or more teeth, and caudal fin without scales. García-Alzate (2009) reported to *Hyphessobrycon heterorhabdus*-group is monophyletic based in two synapomorphies: 13 to 15 epipleurals and metapterygoid without a ventral projection and not in contact with the symplectic.

Species have been grouped using pigmentation patterns (Géry 1977, Weitzman & Palmer 1997). Although it is generally recognized that such characters or not usually informative for characid phylogenetics, they provide a convenient starting

place for additional study. Recently attempts have been made to better define *Hyphessobrycon* taxonomy (García-Alzate & Román-Valencia 2008, García-Alzate et al. 2008a, b, García-Alzate 2009), however, these have mostly addressed alpha taxonomic problems. We are currently engaged in a detailed redescrptions of the type species in the hope that this will allow a better definition of the genus.

Sixteen species of *Hyphessobrycon* have been reported from Colombia: *H. bentosi* Durbin, *H. columbianus* Zarske & Géry, *H. condotensis* Regan, *H. minimus* Durbin, *H. loretoensis* Ladiges, *H. ecuadorensis* Eigenmann, *H. erythrostigma* Fowler, *H. panamensis* Durbin, *H. saizi* Géry, *H. sweglesi* Géry, *H. heterorhabdus* (Ulrey), *H. metae* Eigenmann & Henn, *H. ocaseensis* García-Alzate & Román-Valencia, *H. oritoensis* García-Alzate, Román-Valencia & Taphorn, *H. poecilioides* Eigenmann and *H. proteus* Eigenmann. The last six are members of the *Hyphessobrycon* *heterorhabdus*-group, or group "e" of Géry (1977).

The objective of this study is to describe two new species, members of the *Hyphessobrycon heterorhabdus* group, from the middle Rio Putumayo drainage of the Colombian Amazon River Basin and provide a taxonomic key to the Colombian species of that group, as part of a systematic revision of *Hyphessobrycon*.

MATERIAL AND METHODS

Standardized collections were made with a small meshed seine (3.85m long, 1.65 m high, mesh size 6.0 x 3.5 mm). Sampling was carried out in only one biotope: quiet backwaters along shore, and passes were made in the direction of the flow. Live colors were recorded and then fish were fixed in 10% formalin, and later preserved in 70% ethanol. Specimens were deposited in the Laboratorio de Ictiología, Universidad del Quindío, Armenia, Colombia (IUQ), Collection of freshwater fishes of the Alexander Von Humboldt Institute (IAVHP) Collection of Fishes the Museum History Natural Javeriana (MPUJ) and the Fish Collection, Auburn University Museum (AUM). Comparative material from the following institutions was also examined: Academy of Natural Sciences of Philadelphia (ANSP), The Natural History Museum, London, formerly British Museum (Natural History) (BMNH), Colección de peces del Instituto de Biología de la Universidad Nacional Autónoma de

México (IBUAM-P), Museo de Ciencia y Tecnología, Pontificia Universidad Católica de Rio Grande del Sur, Porto Alegre, Brasil (MCP), California Academy of Sciences, San Francisco (CAS), Field Museum of Natural History, Chicago (FMNH), Museum of Comparative Zoology, Harvard, Cambridge (MCZ), Instituto de Ciencias Naturales-Museo de Historia Natural, Universidad Nacional de Colombia, Bogotá (ICNMNH), Colección Ictiológica, Instituto de Biología de la Universidad de Antioquia, Medellín, Colombia (CIUA) and the Museo de Ciencias Naturales, del Instituto para la Investigación y la Preservación del Patrimonio Cultural del Valle del Cauca, Cali, Colombia (IMCN). Acronyms are as in <http://www.asih.org/codons.pdf> with the addition of CIUA, IBUAM-P, IMCN, MPUJ and IUQ.

Points to point measurements were taken to the nearest tenth of a millimeter with digital calipers. Counts of rays, scales and teeth were made with a stereomicroscope and dissecting needle. Counts and measurements, taken on the left side of specimens when possible (Tables 1 and 2), follow Fink & Weitzman (1974), and are expressed as percentages of standard length (%SL) or head length (%HL) as noted. Measurements of type specimens of *Hyphessobrycon compressus*, *H. poecilioides*, *H. proteus*, *H. metae* and *H. diancistrus* were recorded from digital photographs using the Scion Image, version 4.0.3.2. for Windows software. The 21 morphometric characters analyzed in this study (Tables 1) were evaluated by Principal Component Analysis (PCA) using the Burnaby method to eliminate the influence of size with the PAST program, version 1.81 for Windows (Hammer et al., 2008). Minimum and maximum values for each lot examined are given in parentheses. Bones and cartilage were examined in cleared and stained specimens (C&S) using modifications of methods described by Taylor & Van Dyke (1985) and Song & Parenti (1995), each species was used in 5 examples C&S. Bone names follow Weitzman (1962), Vari (1995) and Ruiz-Calderón & Román-Valencia (2006).

At the type locality, daytime values were recorded for dissolved oxygen, percent oxygen saturation, temperature of surface water and air with an electronic oxygen meter, pH and conductivity were recorded with a potentiometer, and substrate, water color and habitat parameters were recorded by direct observations. Numeric (Hyslop 1980, Hynes 1950), and volumetric methods (Capitoli 1992)

were used to evaluate stomach contents of specimens used for clearing and staining. Geographic coordinates were recorded with a GPS unit.

Comparative Material. *Hyphessobrycon compressus* (Mexico): FMNH 4641, Holotype, Obispo, Vera Cruz; BMNH 1905.12.6.4-5, Paratypes (2) (30.6-31.6), Obispo, Vera Cruz; ANSP 124774, (12) (30.3-35.6), Rio Usumacinta casi unido con Pasión, cerca Sayache, 18 Aug. 1961; ANSP 124774, (3 C&S) (30.6-35.6), Rio Usumacinta casi unido con Pasión, cerca Sayache, 18 Aug. 1961; IBUAM-P 8538, (2) (24.48-31.24), Trinitaria, Flor de Café, Chris, 03 Jul. 1993. *Hyphessobrycon poecilioides* (Colombia): CAS 77396, Paratypes (5) (37.5-54.4), Pequeña quebrada cerca a Cali, Cuenca del rio Magdalena, 03 Feb. 1912; IUQ 300, (33) (27.3-55.8), Quebrada el Indio en la vía Corozal-Alambrado, Valle; IUQ 517, (33) (29.9-64.7), Valle, quebrada El Indio, 100 m. en el peaje vía Alambrado-Corozal, 12 Sep. 04; IUQ 519, (46) (27.1-70.7), Valle, quebrada El Indio, 100 m. en el peaje vía Alambrado-Corozal, 5 Dec. 03; IUQ 718, (1) (48.6), Quebrada La Picota, afluente del Rio Barragán, en la vía Barragán-Quindío, 29 Sep. 04; IUQ 719, (12) (33.2-71.4), Quebrada Naranjal, Vallejuelo, Valle. 28 Jun. 94; IUQ 885, (40) (35.6-70.4), Quebrada El Indio en peaje vía alambrado, Corozal, Valle. 2 Feb. 03; IUQ 1304, (1) (35.6), Rio La Paila, finca la India, Sevilla, Valle. 7 Apr. 98; IUQ 1934, (1) (45.6), Rio La Vieja. 27 Feb. 05; IUQ 1664, (2 C & S), Valle, quebrada El Indio, 100 m. en el peaje vía Alambrado-Corozal, 12 Sep. 04; IUQ 1959, (2 C & S) (39.4-40.7), en el peaje vía alambrado-Corozal, Quebrada el Indio, Valle, 25 Sep. 03; MCNG 55351, (4) (32.4-68.7), quebrada El Indio, 100 m. en el peaje vía Alambrado-Corozal, Valle, 5 Dec. 2003. *Hyphessobrycon proteus* (Colombia). CAS 60478, Syntypes (1) (26.1), Creek near Apulo, 1913; CAS 60479, Syntypes (3) (23.8-36.5), Bernal Creek, 1913; CAS 60480, Syntypes (1) (31.3), Puerto Wilches, 1913; CAS 60479, Syntypes (3) (32.0-36.6), Bernal Creek, 1913; CIUA 296, (38) (47.1-53.8), Estuario del Rio San Juan, San Juan de Uraba, Antioquia, 23 Nov. 2005; CIUA 694, (10) (33.6-37.4), Laguna Los Deseos, La Jagua de Ibirico, Cesar, 22 Mar.07; CIUA 694, (2 C & S) (34.6-35.6), Laguna Los Deseos, La Jagua de Ibirico, Cesar, 22 Mar. 07; CIUA 790, (8) (35.8-40.6); Laguna Villa Sonia, area de conexión minera carbones de la Jagua, Cesar, 27 Aug. 07; CIUA 805, (3 C & S) (34.2-37.3); Complejo lagunar del bajo Sinú, Cordoba, 1 Aug. 06;

IUQ 96, (3) (37.3-43.9), Compuertas, entrada del agua al embalse del Guájaro, Atlántico, 15 Apr. 90; IUQ 508, (3) (26.4-27.3), Arroyo frente a Santa Lucia, Atlántico, 11 Dec. 99; IUQ 583, (3) (33.2-49.7), frente a Santa Lucia, Atlántico, 5 Aug. 91; IUQ 714, (14) (27.7-44.8), Pozeta rio Duata, la troje, 100 mt arriba, via Quibdo-Tutunendo, Choco, 23 Dec. 98; IUQ 736, (2) (46.1-52.8), Jagüey frente izquierdo de Puerto Colombia, Atlántico, 15 May. 1990; IUQ 1009, (2 C & S) (35.6-38.8), Ciénaga de capote, en Soplaviento, bajo Magdalena, 31 May. 2003; IUQ 1965, (36) (35.6-54.8), Ciénaga de capote, en Soplaviento, bajo Magdalena, 31 May. 2003. *Hyphessobrycon heterorhabdus*: CAS 44415, Syntype, (1) (16.9 mm SL), Brazil, Para, 1894; ICNMNH 5063, (10) (17.8-23.9), Colombia, Amazonas, Río Puré, Leticia 02° 07' 05" S, 69° 37' 50" W, 8 Jan. 2000; MCP 41577 (5) (19.5-23.6), Brazil, Para, Igarapé Acuí, 01° 35' 46" S, 48° 44' 26" W, 21 Oct. 2006; IUQ 1961, (3 C & S) (28.3-34.6), Colombia, Río Puré, Leticia, Amazonas, 02 07' 05" S, 69 37' 50" O, 8 Jan. 00; IUQ 1963, (1 C & S) (33.1), Brazil, Para, Igarapé Acuí Igarapé Acuí, 01° 35' 46" S, 48° 44' 26" W. *Hyphessobrycon diancistrus*: BMNH 1977.1.12.1-2, Paratype (2) (23.1-23.5), Colombia, Rio Vichada. MBUCV-V 902, (3) (C & T) (23.5-24.3), Venezuela, Río Cataniapo, aguas abajo del caño Colorado, río abajo de la comunidad de San Pedro, Amazonas, 26 Apr. 2002. MBUCV-V 14065, (2) (21.6-35.7), Venezuela, Caño Las Pavas, afluente del río Cataniapo, Amazonas, 05°34'00" N y 67°30'36" W, 25 Jul. 1982; MBUCV-V 24479, (17) (22.5-34.7), Venezuela, Río Cataniapo, raudal Rabipelado, carretera Puerto Ayacucho-Gavilán, Amazonas, 05° 33' 08" N y 67° 20' 52" W, 29 Mar. 1993; MBUCV-V 30867, (6) (25.6-26.5), Venezuela, Caño Gavilán, laja en Cucurital, aproximadamente 1/2 hr. de Gavilán, Amazonas, 30 Apr. 2002. *Hyphessobrycon metae*: CAS 61751, Holotype (24.7); Colombia, Río Meta en Barrigona cuenca del Rio Orinoco, 1914; IMCN 3751, (15) (28.1-34.4), Colombia, Caño Payara, afluente de Caño Negro, Puerto Carreño, Vichada, 27 Apr. 05; MCNG 32469, (19) (29.8-35.5), Venezuela, Parque Nacional Aguaro Guariquito, Río San José, Guárico, 13 Jan. 95; IUQ 1964, (2 C & S) (28.1-30.4), Colombia, Caño Payara, afluente de Caño Negro, Puerto Carreño, Vichada, 27 Apr. 05. *Hyphessobrycon oritoensis*: see García-Alzate et al. (2008). *Hyphessobrycon ocaseensis*: see García-Alzate & Román-Valencia (2008). *Hyphessobrycon vilmae*: MCP 38881 (5) (28.0-30.6), Brasil, Rio Papagaio en frente al bal-

neario do pubi, Mato grosso 13°33'35"S, 58°24'31"W, 13 Jul. 2004. *Hyphessobrycon coelestinus*: MCP 27216 (1) (27.5), Brasil, Distrito Federal, Alto Parana Banhado afluente da lagoa Bonita, Próximo a planaltina 15°34'19"S, 47°41'08"W, 13 Jul. 1998. *Hyphessobrycon melanostichos*: MCP 39808, (5) (20.7–25.7), Brasil, Rio Doze de Outubro, entre Comodoro e Vilhena, 12°35'46"S, 60°00'30"W, 14 Jul. 2004. *Hyphessobrycon notidanus*: MCP 38676 (2 paratypes) (24.8–25.7), Brasil, rio Doze de Outubro, entre Comodoro e Vilhena, 12°58'39"S, 60°00'30"W, 14 Jul. 2004; MCP 38676 (1) (C&S) Brasil, rio Doze de Outubro, entre Comodoro e Vilhena, 12°58'39"S, 60°00'30"W, 14 Jul. 2004.

Hyphessobrycon amaronensis sp. n.

Table 1; Figures 1–3 and 6.

Holotype: IUQ 2286, male, 26.5 mm SL, Colombia, Caño Amaron, tributary of Río Putumayo, Puerto Leguizamo, Putumayo, (0° 11' 2"S, 74° 53' 14"W), 30 Mar. 2008.

Paratypes: IUQ 2166, (95) (22.7–27.4) collected with holotype; IUQ 2287, (5 C&S) (24.2–26.5) collected with holotype; AUM 50026, (10) (24.4–26.3); collected with Holotype; IAvHP 11239, (6) (22.3–26.1), collected with holotype; IUQ 2162, (1) (25.1), Colombia, Río Tucunare, tributary of Río Putumayo, Puerto Leguizamo, Putumayo (0° 9' 42"S, 74° 52' 40"W), 30 Mar. 2008.

Diagnosis: *Hyphessobrycon amaronensis* is distinguished from other species of the *H. heterorhabdus* group by the following: three simple and eight branched dorsal-fin rays (vs. two simple and nine branched rays, except in *H. oritoensis*, *H. notidanus* and *H. ocaseensis* that have iii, 8; three to five pored lateral line scales (vs. 7–23); scales in the lateral series 27–28 (vs. 29–35, except in *H. proteus* which has 27–30); three scales from lateral series to anal fin (vs. 4–7); two simple (vs. iii–iv) and 14 to 16 branched anal-fin rays (vs. 18–27) except in *H. diancistrus* which has 14–16 branched anal-fin rays); length of the caudal peduncle, mean = 26.75% SL (vs. 8.84–15.89% SL); upper jaw length, mean = 15.66% SL (vs. 22.70–30.51%); males with a convex modification at base of anal fin in the anterior anal-fin rays (vs. no modification) (Fig. 3).

Description: Morphometric and meristic data are in Table 1. Body long, not deep. Dorsal head profile straight from snout to supraoccipital spine, then oblique to dorsal-fin origin; slightly concave

from base of last dorsal-fin ray to base of caudal fin. Ventral body profile convex from snout to anal-fin base; convex from base of last anal-fin ray to base of caudal fin. Head and snout short; jaws equal; mouth terminal; lips soft and flexible, not externally covering outer premaxillary tooth row; posterior tip of maxilla reaches lower margin of orbit.

Osteology: Premaxilla with short lateral process and with upper margin rounded and inserted over the lateral surface of the ethmoid, two foramina present in antero-ventral region. Premaxillary teeth in two rows (Fig. 2), those of outer row tricuspid, arranged in straight line; inner row with five pentacuspids, with teeth diminishing gradually in size from largest near symphysis. Maxilla elongate, anteriorly convex, with two or three hectacuspids, posterior tip reaching ventral margin of second infraorbital. Dentary with ventral and antero-dorsal margins straight, postero-dorsal margin convex; ten or eleven teeth present along supero-anterior margin; six largest front teeth pentacuspids, followed by four smaller tricuspid teeth and then one even smaller conical tooth. The second tooth is out of line with others (Fig. 2).

Five infraorbital bones present, the third largest and widest, not in contact with the sensory canal of the preopercle. The fifth infraorbital is smallest of series. The latero-sensory canal of the infraorbitals surpasses the first infraorbital and continues in the antorbital. Lateral ethmoid long and concave, connected via cartilage with lateral margin of frontal; with a bony laminar prolongation extending towards vomer.

Rhinosphenoid osseous with a band of cartilage along margins. Parasphenoid not divided, united with ventral surface of vomer via cartilage; posterior tip of parasphenoid make osseous contact with prootic and basioccipital. Vomer absent.

Basihyal osseous, not divided. Pharyngeal plate elongate and curved, with cartilage in dorsal section. Gill rakers 20 the first epibranchial. Posterior dorsal-fin margin straight. Proximal pterygiophores of dorsal-fin rays inserted between neural spines 11 and 17; anal fin with 14 to 15 proximal pterygiophores, the first three inserted between hemal spines 16 and 17 and reaching ventral margin of centrum of hemal spine 16. Five or six elongate supraneurals, with cartilage on dorsal tips, inserted between the fifth to ninth neural spines. Cleithrum elongate with posterior margin straight, united

with ventral margin of posttemporal, forming an angle at posterior part, located beneath posterior margin of operculum. Scapula with straight anterior margin. First postcleitrum with straight anterior margin, posterior margin ovoid, in contact with second, third postcleitrum elongate and semi curved with a small osseous laminar prolongation on upper posterior margin. Four proximal radials.

Pelvic fin short, posterior tip not reaching anal-fin origin. Pelvic bone elongate, straight and narrow, located parallel to central horizontal axis of body, with cartilage on tip; ischial process long, curved and without cartilage. Caudal fin bifurcate with long pointed lobes. Principal caudal-fin rays 9/9, procurent rays 6/6, caudal fin not covered with scales. Total vertebrae 31–33 ($n = 5$).

Sexual dimorphism: Males have the region from anterior to anal-fin base to last anal-fin ray thickened (Fig. 3), row of twelve pairs of short spines present on third simple anal-fin ray and the first to seventh branched anal-fin rays, seven to nine spines on branched pelvic-fin rays located on the internal branch of each segment, with a pair of spines on each part.

Live colors: Body yellowish green over silvery base dorso-laterally; ventro-lateral region from head to anus yellowish; dark lateral band present. Dorsal margin of eye red. Small dark spot on caudal peduncle, not prolonged onto central caudal-fin rays. Small humeral spot dark and rounded. Pectoral, pelvic, dorsal and adipose fins yellow with dark tips; first anal-fin rays white, followed by small red blotch, tips of rays dark; caudal-fin lobes reddish. Posterior margins of dorsal and caudal fins dark, with a narrow dark band along base of first anal-fin rays.

Color in alcohol: Body mostly white, dark brown dorsally, with small dark, rounded spot on caudal peduncle. Lateral part of body with dark band, starting posterior to vertically elongate humeral spot, extending to caudal spot. Posterior margin of scales in dorsal region of body dark. Dorsal and caudal fins with dark margins, pelvic, anal and pectoral fins hyaline; anal fin with dark pigmentation between rays, opercular area silvery. Dorsal part of head dark.

Distribution: *H. amaronensis* has been found in Amaron and Tucunare Creeks and other small tributaries of the Río Putumayo in Municipio Puerto Leguizamo, Departamento Amazonia, Colombia.

Etymology: The name alludes to Caño Amaron,

where the first specimens were collected.

Ecological notes: Their habitat had a substrate of organic detritus and decomposing vegetation, apparent water color was brown to black, dissolved oxygen was low (0.42–0.75 mg/l), as was conductivity (42–43 μ S) and oxygen saturation (5.3–10 %), pH was slightly acidic (6.0–6.2). Data from five stomachs of cleared and stained specimens indicates a diet mostly composed of algae, Chlorophyta: Vlothix (47.72% N, 22.72%V), but Cladocera: Alonella (20.45% N, 13.63% V) were also present, as were Chlorophyta: Spirogyra (17.04%N, 9.09%V), insect parts (9.09%N, 18.18%V), Dipteran larvae: Tabaridae (5.47% N, 5.47% V), Ephemeroptera: Oligoneuridae (1.13%N, 4.54%V) and unidentified digested material (27.27%V).

Hyphessobrycon taguae sp. n.

Table 1; Figures 4–6.

Holotype: IUQ 2288, male, 23.5 mm SL, Colombia, Creek about two km from Puerto Leguizamo on road to La Tagua, Puerto Leguizamo, Putumayo (0°10'15"S, 74°46'23"W) 189 masl, 28 Mar. 2008.

Paratypes: (all from Colombia): IUQ 2182, (7) (24.0–29.7), collected with holotype; AUM 50027, (10) (19.5–25.3), Caño Tucunare, tributary of Río Putumayo, Puerto Leguizamo, Putumayo (0°09'42"S, 74°52'40"W) 122 masl, 30 Mar. 2008; IAvHP 11240, (10) (25.0–26.3), Caño Tucunare, tributary of Río Putumayo, Puerto Leguizamo, Putumayo (0°9'42"S, 74°52'40"W) 122 masl, 30 Mar. 2008; IAvHP 5877; (224) (24.0–30.5), river Caqueta, la Pedrera, Amazonas, (1°18'1"S, 69°33'50"W), 20 Feb. 83; IUQ 2177, (399) (19.6–27.4), Caño Tucunare, tributary of Río Putumayo, Puerto Leguizamo, Putumayo (00°09'42"S, 74°52'40"W) 122 masl, 30 Mar. 2008; IUQ 2289, (5 C&S) (26.8–28.9), Caño Tucunare, tributary of Río Putumayo, Puerto Leguizamo, Putumayo (0°09'42"S, 74°52'40"W) 122 masl, 30 Mar. 2008; IUQ 2186, (18.4–28.5), Caño Amaron, tributary of Río Putumayo Putumayo, (0°10'54"S, 74°49'52"W) 189 masl, 30 Mar. 2008; MPUJ 919, (49) (20.7–27.8), Caño Bagre, Tributary of Río Inirida, Puerto Inirida Guainia, 1 Jun. 1995; MPUJ 1508, (20) (16.2–25.2), Caño barranco del Tigre, Tributary of Río Inirida, Puerto Inirida Guainia, 15 Feb. 1996., Puerto Leguizamo, Putumayo, (00°11'02"S, 74°53'14"W) 191masl, 30 Mar. 2008; IUQ 2238, (1) (24.7), Caño Brazuelo, tributary of Río Putumayo, Puerto Leguizamo

Not types: MPUJ 932 (7) (17.3–24.5); Colombia, River Irinida, Puerto Inírida, Guainía, 8 Nov. 1995. MPUJ 943 (7) (18.45–23.34); Colombia, Caño Guamal, Puerto Inírida, Guainía, 29 May. 1995. MPUJ 1493 (13) (16.57–20.45); Colombia, Caño bocón, Puerto Inírida, Guainía, 9 Aug. 1995. MPUJ 1524 (2) (17.68–18.79); Colombia, Caño Guamal, Puerto Inírida, Guainía, 11 Nov. 1995.

Diagnosis: *Hyphessobrycon taguae* is distinguished from other members of its species group by the following characters: five to six pored lateral-line scales (vs. 7–23), conical maxillary teeth (vs. maxillary teeth tri- or multicuspid); five infraorbitals (vs. six, except in *H. heterorhabdus* and *H. amaronensis* which also has five); mean body depth 29.65 % SL (vs. 35.71–42.12%; except in *H. heterorhabdus* which has mean body depth 30.39 and *H. diancistrus* which has 23.70); by mean upper jaw length 18.94% SL (vs. 22.70–30.51%; except *H. amaronensis* with mean = 15.66%), by the presence of a red band above the dark lateral band (vs. without band), males with hooks on all fins (vs. spines not on all fins).

Description: Morphometric and meristic data are in Table 1. Body long, not deep. Dorsal profile oblique from snout to dorsal fin, mostly straight from base of last dorsal-fin ray to caudal fin. Ventral profile convex from snout to base of anal fin, straight from base of last anal-fin ray to caudal fin. Caudal peduncle not deep. Head and snout long; mouth terminal; lips soft and flexible, not covering the external premaxillary tooth row; posterior tip of maxilla reaching anterior margin of third infraorbital.

Osteology: Premaxilla with long pointed lateral process inserted on lateral surface of ethmoid that extends to middle region of that bone and with large foramen in middle section. Premaxilla with two rows of teeth, and with small bony apophyses on posterior region in lateral view where the antero-ventral process of the maxilla inserts (Fig. 5); external row with three tricuspid teeth arranged in straight line; internal row with five hectacuspids that diminish gradually in size. Maxilla elongate, reaching dorsal margin of retroarticular, anteriorly convex, with three tricuspid teeth and three small foramina in postero-medial section. Dentary with ventral and dorso-posterior margins convex, with twelve teeth located along supero-anterior margin; first four teeth large, pentacuspids, followed by one smaller tricuspid tooth and then

seven even smaller conical teeth. The second dentary tooth is out of line with the rest (Fig. 5).

Ectopterygoids long and narrow and not in contact with the quadrate, with a band of cartilage along dorso-anterior and dorso-posterior margins. Five infraorbitals, the second the widest of the series, the fifth is smallest and is not in contact with the preopercle, latero-sensory canal of infraorbitals not reaching first infraorbital. Lateral ethmoid long and concave, in contact with lateral margin of frontal and with a bony laminar prolongation that extends towards vomer. Frontals not in contact anteriorly. Supraoccipital spine short.

Rhinospheonoid bony, with band of cartilage along anterior and posterior margins. Orbitospheonoid with foramen in middle region and with long, pointed apophyses on postero-ventral section, and cartilage along posterior margin. Parasphenoid divided at middle region, united to ventral surface of vomer by cartilage; posterior tip of parasphenoid in contact with prootic and basioccipital via band of cartilage.

Basihyal cartilaginous and not divided. Pharyngeal plate long and curved, with cartilage in dorsal area. Gill rakers 15 in the first epibranchial. Posterior margin of dorsal fin oblique. Proximal pterygiophores of dorsal-fin inserted between neural spines 9–17; Anal-fin with 19 proximal pterygiophores, the first four inserted between hemal spines 16 and 17. Extrascapular reduced to only laterosensorial canal. Cleithrum long, with rounded posterior margin, located beneath posterior margin of opercle. Scapular straight anteriorly. First postcleithrum extremely reduced, not in contact with second. Third postcleithrum elongate, semi curved and with small bony laminar prolongation on postero-medial margin. Four proximal radials.

Pelvic fin long, its posterior tip reaching anal-fin insertion. Pelvic bone elongate, straight, narrow, located parallel to central axis of body and with cartilage on anterior tip; ischial process elongate, curved and with cartilaginous prolongation. Caudal fin bifurcate, with long pointed lobes. Principal caudal rays 8/8 procurent rays 10/10. Caudal fin without scales. Total vertebra 33–34 (n = 5).

Sexual dimorphism: Males have a row of between 30–35 small short spines on the third simple, and first to third branched anal-fin rays, 17–23 spines on the pelvic-fin rays along the internal ramus, 4–6 small short spines on the pectoral-fin rays along the internal ramus, 8–10 spines on the

posterior part of the branched dorsal-fin rays and 2–4 spines on the medial caudal-fin rays in the posterior margin.

Live colors. Body yellowish over silvery base dorso-laterally; latero-ventrally silvery from head to anus; dark lateral band present. Dorsal margin of eye yellow. Humeral spot small, dark with anterior, posterior and dorsal extensions forming star. Pectoral fins gray, pelvic hyaline, dorsal fin with anterior rays hyaline and distal tips dark gray, adipose fin yellow, anal fin hyaline with yellow pigment on anterior rays; caudal-fin lobes yellow. A red lateral band extends from above humeral spot to caudal peduncle.

Color in alcohol: Body yellowish green, dark brown on dorsum. Lateral parts of body with dark band behind humeral spot extending to caudal peduncle. Opercular spot dark and rounded. Posterior margins of scales on dorsal part of body dark. Fins hyaline; base of anal-fin with small dark blotch on anterior rays. Dorsal area of head dark.

Distribution: *Hyphessobrycon taguae* has been found from Amaron and Tucunare creeks, and other small tributaries of the Río Putumayo in the Tagua-Puerto Leguizamo sector, and tributary of river Irinida upper Amazon River.

Etymology: The name refers to La Tagua creek, which is near Puerto Leguizamo, Putumayo where the first specimens were collected.

Ecological notes: For a description of the habitat see ecological notes above for *H. amaronensis* sp. n. Data from five stomachs of cleared and stained specimens were recorded but three were empty. In the other two we found insects (100 %N, 85.71%V) and unidentified digested material (14.28%V).

Comments: Principal component analysis (Fig. 6) indicates that *Hyphessobrycon taguae* and *H. amaronensis* can be distinguished from *H. poecilioides*, *H. heterorhabdus*, *H. oritoensis*, *H. metae*, *H. ocaseensis*, *H. notidanos* and *H. diancistrus* on axis I by body depth as related to upper jaw length and head length; and along axis II by snout length and caudal peduncle depth. The first component explained 84.87% of total variation, and when combined with the second, 92.98%.

Taxonomic key to the Colombian the *Hyphessobrycon heterorhabdus*-group species (those with a dark lateral stripe)

1. Body with a dark lateral band and a dark spot on

caudal peduncle.....2
 1.1 Body with dark lateral band, but no caudal peduncle spot.....4
 2. Two unbranched and nine branched dorsal-fin rays; maxillary teeth with pointed cusps; outer premaxillary tooth row with 4–5 teeth; pored lateral-line scales 7–9; dark melanophores present on sides of body and between anal fin and lateral line.....*H. metae*
 2.1 Three simple and eight branched dorsal-fin rays; maxillary teeth with lobate cusps, or conic teeth; outer premaxillary tooth row with 2–3 teeth.....3
 3 Pored lateral-line scales 15–17; lateral series of scales 31–32; one maxillary tooth; six scales between lateral line and anal fin; predorsal scales 8; gill rakers 18; anal fin long and without any modifications in males.....*H. ocaseensis*
 3.1 Pored lateral-line scales 3–5; lateral series of scales 27–28; maxilla with 2–3 teeth; scales between lateral line and anal fin 3; predorsal scales 10–11; gill rakers 20; anal fin in males short, and males with convex modification at base of first rays.....*H. amaronensis* sp. n.
 4 Three simple and eight branched dorsal-fin rays; four simple and 26–27 branched anal-fin rays; predorsal scales 12–14; dentary with 19 teeth; seven scales between lateral line and dorsal fin; maxilla with 5–6 teeth.....*H. oritoensis*
 4.1 Two simple and nine branched dorsal-fin rays; three simple and fewer than 25 branched anal-fin rays; predorsal scales 9–11; fewer than 16 teeth on dentary; six or fewer scales between lateral line and dorsal fin; maxilla with four or fewer teeth.....5
 5 Maxilla without teeth; anal fin with 14–17 branched rays; ten or fewer teeth on dentary; six infraorbitals, gill rakers 18–20; dark blotch present on upper caudal-fin lobe; dark band extending to caudal peduncle; dentary with ten teeth.....*H. diancistrus*
 5.1 Maxilla with teeth; branched anal-fin rays 18–22; dentary with 17 or more teeth; five infraorbitals; gill rakers 17 or fewer.....6
 6 Pored lateral-line scales 23–24; two pentacuspoid maxillary teeth; branched anal-fin rays 21–22; lateral series with 35–37 scales; dentary with 16 teeth; gill rakers 17; live fish with continuous dark band from humeral spot and continuing onto central caudal-fin rays, and no red stripe present above dark lateral band; males with spines on the anal, pelvic and pectoral fins *H. heterorhabdus*
 6.1 Pored lateral-line scales 6–7; three conical maxi-

llary teeth; anal fin with 18–20 branched rays; lateral series with 29–31 scales; dentary with 12 teeth; gill rakers 15; live fish with discontinuous dark lateral band, absent from humeral spot to vertical through anterior dorsal-fin rays, a red stripe present above dark lateral band; males with spines on all fins *H. taguae* sp. n.

DISCUSSION

Géry (1977) presented a key to the species of *Hyphessobrycon* and distinguished groups of species using color patterns. *Hyphessobrycon amaronensis* and *H. taguae* belong to the *H. heterorhabdus* group because they have a dark lateral stripe. *Hyphessobrycon amaronensis* is similar to *H. notidanus* and *H. oritoensis* but differs in addition to the characters used in the diagnosis in the number of branched anal-fin rays (14–16 vs. 19–20 in *H. notidanus* and 26–27 in *H. oritoensis*), in the number of branched pelvic-fin rays (7 vs. 6), in the number of branched pectoral-fin rays (11 vs. 10 in *H. notidanus* and 13 in *H. oritoensis*), in the number of teeth on the dentary (10 vs. 7 in *H. notidanus* and 19 in *H. oritoensis*); in having conical maxillary teeth (vs. tricuspid), by the length between dorsal and anal fins (27.30–32.17 % SL vs. 34.85–43.67 % SL), by body depth (25.60–31.51 % SL vs. 36.84–45.59 % SL), and by the length of the upper jaw (12.81–20.43 % SL vs. 26.42–36.69 % SL). *Hyphessobrycon taguae* differs from *H. heterorhabdus*, *H. metae* and *H. oritoensis* in the number of lateral scales (29–31 vs. 35–37 in *H. heterorhabdus*, 32–33 in *H. metae* and 35 in *H. oritoensis*), in the number of branched anal-fin rays (18–20 vs. 21–22 in *H. heterorhabdus*, 16–17 in *H. metae* and 26–27 in *H. oritoensis*), in the number of dentary teeth (12 vs. 16 in *H. heterorhabdus*, 17 in *H. metae* and 19 in *H. oritoensis*) and the number of vertebra (33 vs. 32 in *H. heterorhabdus*, 31 in *H. metae* and 34–35 in *H. oritoensis*), and differs from *H. heterorhabdus* and *H. oritoensis* in the number of predorsal scales (10 vs. 9 in *H. heterorhabdus* and 12–14 in *H. oritoensis*) and finally from *H. metae* by the length of the upper jaw (16.20–22.86 % HL vs. 29.49–34.78 % HL). *Hyphessobrycon amaronensis* and *H. taguae* are sister species and close relationship by one synapomorphy: with two or more foramina in lateral surface of premaxilla and relationship with *H. heterorhabdus* by postcleithrum 1 not in contact with Cleithrum (García-Alzate 2009)

It was thought that a count of (iii, 8) dorsal-fin

rays was rare among species of *Hyphessobrycon* (Carvalho & Betarco 2006), and although it is infrequent, it is found in *Hyphessobrycon amaronensis*, *H. notidanus* (Carvalho & Betarco 2006), *H. oritoensis* (García-Alzate et al., 2008a), *H. fernandezi* (García-Alzate et al. 2008b), *H. paucilepis* (García-Alzate et al., 2008b), *H. ocaseensis* (García-Alzate & Román-Valencia 2008) and in some individuals of *H. weitzmanorum* (Lima & Moreira 2003); this suggests a possible close relationship between these taxa, and this character merits further consideration in phylogenetic studies, since it may be useful to delimit the *H. heterorhabdus* group, as well as having the second dentary tooth out of line, noted by García-Alzate et al. (2008a, b) as synapomorphy for the group.

Five species of *Hyphessobrycon* have been reported from the Putumayo River drainage: *H. bentosi*, *H. minimus*, *H. loretoensis*, *H. heterorhabdus* and *H. oritoensis*, the last recently described from the upper part of that drainage. These species, along with a new *Bryconamericus* recently recognized from that drainage, indicate that the characid fauna has many undescribed forms, many of which may prove to be endemic. This elevates the number of endemic species known from the Amazon River from 8 to 11 (Hubert & Reno 2006, in this work).

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Table 1. Morphometric and meristic data for *Hyphessobrycon amaronensis* and *H. taguae* Standard and total length given in mm. Means in parentheses. SD = Standard deviation.

	H. amaronensis sp. nov.			H. taguae sp. nov.		
	Holotype	Paratypes	SD	Holotype	Paratypes	SD
Standard Length	26.48	22.72–27.37 (25.74)	1.11	23.45	18.40–29.67 (24.37)	1.85
Total length	33.87	27.65–34.60 (32.15)	1.62	30.26	24.89–37.79 (31.92)	2.37
Percent SL						
1. Body depth	27.34	25.60–31.51 (27.73)	1.00	30.19	24.85–37.07 (29.65)	1.78
2. Snout–dorsal fin distance	50.64	49.81–54.15 (51.31)	0.81	49.30	45.43–53.22 (50.44)	1.27
3. Snout–pectoral fin distance	25.60	24.18–27.84 (26.07)	0.95	27.59	26.56–37.17 (29.83)	1.57
4. Snout–pelvic fin distance	48.26	43.60–53.57 (49.48)	1.78	45.07	41.60–50.83 (47.04)	1.88
5. Snout–anal fin distance	66.24	62.10–68.80 (66.26)	1.42	61.54	52.00–65.36 (60.68)	2.03
6. Dorsal fin–hypurals distance	49.24	47.65–53.78 (50.04)	1.54	53.73	47.57–57.35 (52.75)	1.66
7. Dorsal fin–anal fin distance	28.74	27.30–32.17 (29.64)	1.23	31.22	25.79–36.63 (30.49)	1.69
8. Dorsal fin–pectoral fin distance	36.56	32.05–37.49 (34.45)	1.44	32.62	28.45–36.38 (32.49)	1.66
9. Dorsal–fin length	27.53	23.65–33.10 (27.60)	1.46	31.17	27.81–34.08 (30.37)	1.21
10. Pectoral–fin length	22.81	17.07–27.27 (21.56)	1.63	22.17	17.27–29.81 (20.64)	1.93
11. Pelvic–fin length	17.64	13.26–25.70 (16.62)	1.84	19.28	14.29–21.41 (17.44)	1.26
12. Anal–fin length	15.03	13.22–16.86 (14.85)	0.89	24.82	18.93–32.23 (26.44)	1.90
13. Caudal peduncle depth	8.31	6.89–14.63 (8.16)	1.13	9.94	7.54–10.36 (9.25)	0.46
14. Caudal penduncle length	28.02	23.14–30.24 (26.75)	1.83	9.81	7.49–12.41 (8.84)	0.82
15. Head length	24.96	23.38–28.76 (25.76)	1.01	29.47	27.47–35.22 (29.66)	1.17
Percent HL						
16. Snout length	22.24	17.30–32.89 (21.78)	3.24	25.76	23.18–33.15 (27.91)	2.12
17. Eye diameter	39.64	33.37–45.68 (38.93)	2.01	27.64	22.82–43.23 (33.70)	3.52
18. Post–orbital head length	41.60	37.21–44.61 (41.57)	1.87	36.76	29.69–49.10 (38.54)	3.71
19. Maxilla length	44.18	30.30–45.06 (36.52)	3.85	31.69	27.34–37.79 (31.79)	1.82
20. Interorbital width	34.19	31.71–43.36 (34.19)	1.82	37.63	27.47–40.29 (33.90)	2.01
21. Upper jaw length	17.25	12.81–20.43 (15.66)	1.63	19.83	16.20–22.86 (18.94)	1.15
MERISTICS						
Scales:						
Lateral series	27	27–28		29	29–31	
Pored lateral–line scales	5	3–5		6	5–7	
Between lateral line and dorsal fin	5	5		5	4–5	
Between lateral line and anal fin	4	4–5		4	4–5	
Between lateral line and pelvic fins	3	2–3		4	3–4	
Predorsal scales	10	10–11		10	10	
Rays						
Dorsal	iii, 8	iii, 8		ii, 9	ii, 9	
Anal	ii, 15	ii, 14–16		iii, 19	iii, 18–20	
Pelvic	ii, 7	ii, 7		ii, 6	ii, 6	
Pectoral	ii, 11	ii, 11		ii, 11	ii, 11	



Figure 1. *Hyphessobrycon amaronensis*. Holotype; IUQ 2286, 26.48 mm SL. Colombia, Caño Amaron, tributary of Putumayo River, Putumayo, Colombia.

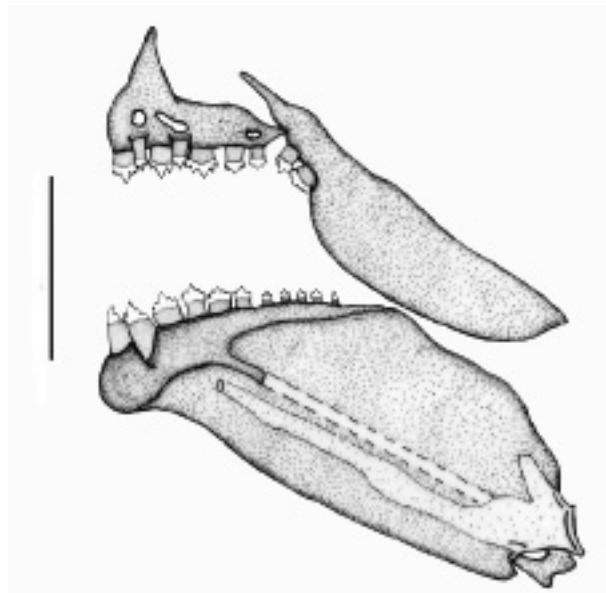


Figure 2. Upper jaw (A) and lower jaw (B) of *Hyphessobrycon amaronensis*. IUQ 2287, Paratypes. Scale bar = 1 mm.

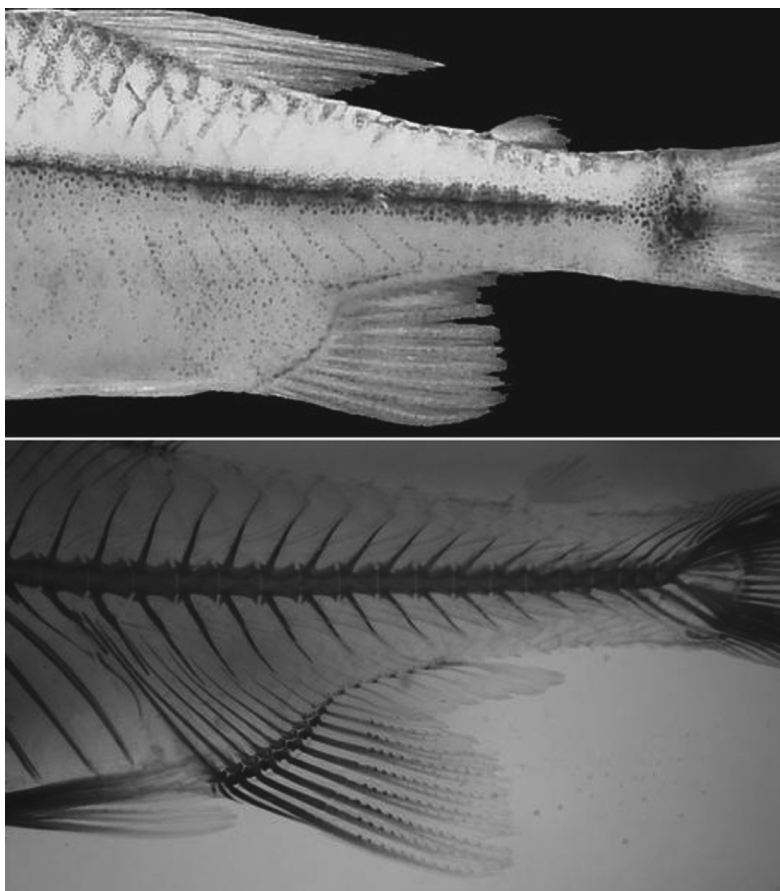


Figure 3. Sexual dimorphism in paratypes of *Hyphessobrycon amaronensis*.

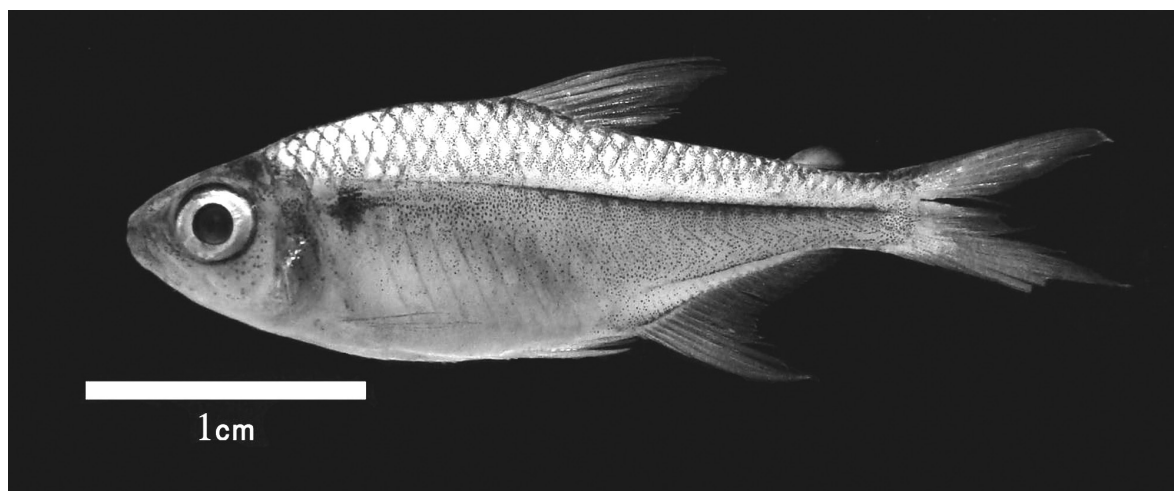


Figure 4. *Hyphessobrycon taguae*. Holotype; IUQ 2288, 24.45 mm SL. Colombia, Caño la Tagua in La Tagua, Puerto Leguizamo, Putumayo, Colombia.

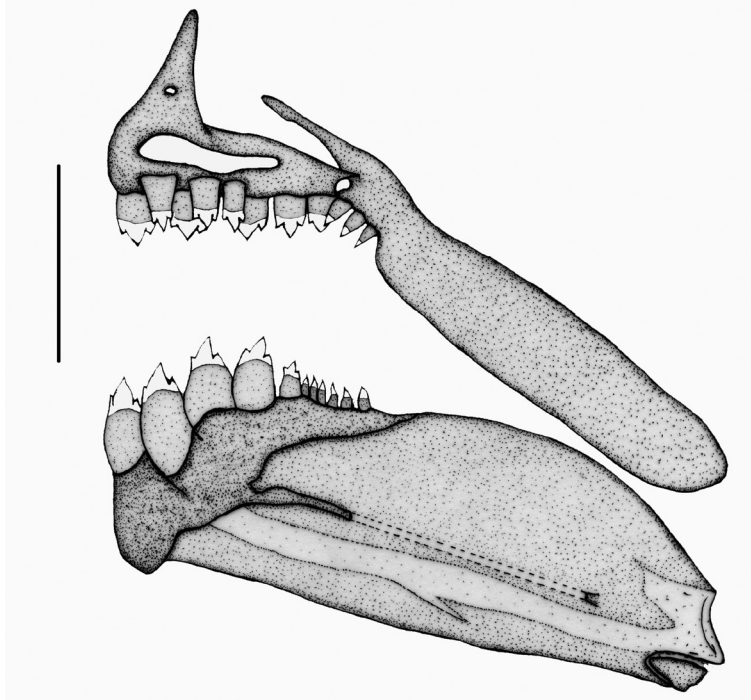


Figure 5. Upper jaw (A) and lower jaw (B) of *Hyphessobrycon taguae*. IUQ 2289, Paratypes. Scale bar = 1 mm.

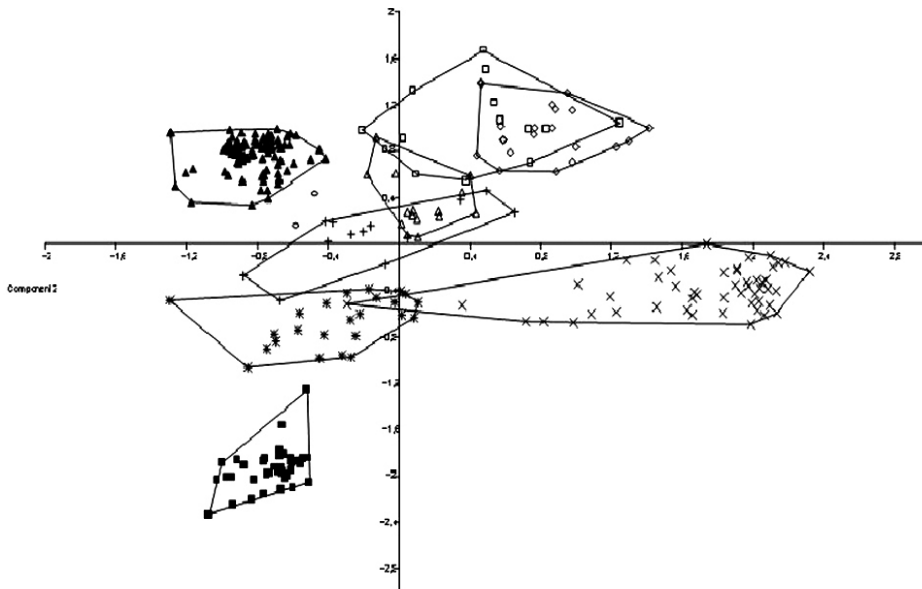


Figure 6. Principal component analysis (Component 1 on X axis, component 2 on Y axis), for morphometric data of *H. amaronensis* sp. nov. (■) and *H. taguae* sp. nov. (▲), *H. poecilioides* (x), *H. heterorhabdus* (+), *H. oritoensis* (□), *H. metae* (Δ), *H. ocaseoensis* (◇), *H. notidanos* (○) and *H. diancistrus* (*).