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A new species of *Hyphessobrycon* (Teleostei: Characiformes: Characidae) from the San Juan River drainage, Pacific versant of Colombia

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Abstract

We describe a new species, *Hyphessobrycon sebastiani*, from the San Juan River drainage of the Pacific versant of Colombia. This new species of *Hyphessobrycon* is distinguished from all congeners that share two humeral spots and no caudal blotch by having: five unbranched and 25 to 28 branched anal–fin rays; 12–13 branched pectoral–fin rays; 35–37 scales in the longitudinal series; eight scales between the lateral line and the dorsal–fin origin; 12–13 predorsal scales; 13–18 pored lateral–line scales and three pairs of large bony hooks on anal fin of mature males.

Key words: *Hyphessobrycon*, new taxon, Neotropical fish, South America

Resumen

Se describe *Hyphessobrycon sebastiani* de la cuenca del río San Juan, en el pacifico colombiano. La nueva especie de *Hyphessobrycon* se distingue de las otras especies descritas con dos manchas humerales y sin mancha caudal por presentar: cinco radios simples y 25 a 28 radios ramificados en la aleta anal; 12 a 13 radios ramificados en la aleta pectoral; 35 a 37 escamas en la línea longitudinal del cuerpo; ocho escamas entre la línea lateral y la aleta dorsal; 12 a 13 escamas predorsales; 13 a 18 escamas con poros en la línea lateral y tres pares de ganchos en la aleta anal en machos maduros.

Introduction

The genus *Hyphessobrycon* Durbin consists of small-sized species that do not surpass 70 mm SL. Traditionally this genus was defined by the following combination of features: incomplete lateral line, adipose fin present, few if any teeth on the maxilla, third infraorbital not in contact with the preopercle, two series of premaxillary teeth, the internal row with five or more teeth, and the caudal fin without scales. García-Alzate (2009) used osteological characters, to suggest possible monophyletic units within *Hyphessobrycon* and to support the monophyly of the genus with five synapomorphies.

Hyphessobrycon contains 120 species that are widely distributed from southern Mexico to the La Plata River drainage in Argentina (Laguna de Mar Chiquita in Buenos Aires), and reach their greatest diversity in rivers of cis-Andean South America (García-Alzate *et al.* 2008a). Fifteen *Hyphessobrycon* species have been reported from Colombia: *H. bentosi* Durbin, *H. columbianus* Zarske & Géry, *H. condotensis* Regan, *H. diancistrus* Weitzman, *H. ecuadorensis* Eigenmann, *H. erythrostigma* Fowler, *H. heterorhabdus* (Ulrey), *H. metae* Eigenmann & Henn, *H. ocasoensis* García-Alzate & Román-Valencia, *H. oritoensis* García-Alzate *et al.*, *H. panamensis* Durbin, *H. poecilioides* Eigenmann, *H. proteus* Eigenmann, *H. saizi* Géry and *H. sweglesi* Géry, one of which pertains to the group 'b' as defined by Géry (1977): *H. columbianus* Zarske & Géry, and occurs in the Pacific drainages of Colombia.

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The objective of this work is to describe a new species of *Hyphessobrycon* from the San Juan River drainage, from the Pacific versant of Colombia.

Material and methods

Institutional abbreviations follow standard ASIH abbreviations listed at http://www.asih.org/codons.pdf , with addition of the following institutions: Ichthyology collection of the Instituto de Biología de la Universidad de Antioquia, Medellín, Colombia (CIUA), the fish collection of the Instituto de Biología de la Universidad Nacional Autónoma de México (IBUAM–P), the Museo de Ciencias Naturales INCIVA, Cali, Colombia (IMCN) and collection of the Ichthyology Laboratory of the Biology Department of the Universidad del Quindío, Armenia, Colombia (IUQ). Counts and measurements were taken on the left side when possible (Table 1) and follow Fink and Weitzman (1974). They are expressed as hundredths of standard length (SL), or head length (HL). Measurements of the type material of *Hyphessobrycon compressus* (Meek), *H. condotensis*, *H. ecuadorensis* and *H. panamensis* were taken from digital photos, using the Scion Image, program for Windows version 4.0.3.2. The 21 morphometric characters used in this work (Table 1) were analyzed with principal component analysis using the Burnaby method to eliminate the influence of overall size, using the Past program, version 1.81, for Windows (Hammer *et al.*, 2008). Observations of bone and cartilage were made on cleared and stained specimens (C&S) prepared using techniques modified from those of Taylor & Van Dyke (1985). Bone nomenclature follows Weitzman (1962) and Vari (1995). Vertebral counts were obtained from cleared and stained specimens and radiographs. Stomach contents from two specimens that were cleared and stained were studied using numeric methods (Hyslop, 1980; Hynes, 1950), and volumetric methods (Capitoli, 1992).

Hyphessobrycon sebastiani, new species

Table 1, Figures 1–4

FIGURE 1. *Hyphessobrycon sebastiani*, IUQ 1942, holotype, 39.5 mm SL; Patecucho Creek, San Juan River drainage, Pacific versant, Istmina, Chocó, Colombia.

Holotype. IUQ 1942, (39.5 mm SL, male) Colombia, Pacific versant, Chocó, Istmina, San Juan River drainage, Patecucho Creek, approximately 5°09'N & 76°40'W, 7 August 2002, T. Silirio.

TABLE 1. Morphometric and meristic data of *Hyphessobrycon sebastiani* **sp. n.** Standard length given in mm. Mean given in parentheses. Standard deviation = SD and Mode.

MORPHOMETRICS	Holotype	Paratypes	SD
Standard length	39.5	34.1–46.4 (39.7)	4.05
Total length	51.7	44.7–61.1 (52.4)	4.72
Percent SL:			
1. Body depth	43.8	40.1–43.8 (42.1)	1.23
2. Snout to dorsal origin length	53.7	51.4–55.6 (53.1)	1.21
3. Snout to pectoral–fin origin length	28.4	26.5–31.1 (28.5)	1.15
4. Snout to pelvic–fin origin length	47.2	44.8–51.8 (47.5)	1.96
5. Snout to anal fin length	61.1	58.8–66.3 (62.4)	2.42
6. Dorsal fin–hypural length	51.9	47.6–52.4 (50.1)	1.62
7. Dorsal fin–anal fin length	43.1	39.2–43.1 (40.8)	1.60
8. Dorsal fin–pectoral fin length	44.7	39.9–45.5 (43.6)	1.48
9. Dorsal–fin length	32.1	30.9–32.1 (31.1)	1.39
10. Pectoral–fin length	25.1	22.9–27.2 (25.3)	1.30
11. Pelvic–fin length	17.8	17.4–19.2 (18.4)	0.56
12. Anal–fin length	20.1	17.9–24.4 (20.5)	1.93
13. Caudal–peduncle length	12.1	10.4–12.5 (11.5)	0.61
14. Caudal–peduncle depth	9.34	8.8–13.7 (10.7)	1.19
15. Head length	28.4	25.8–29.4 (27.7)	1.10
Percent HL:			
16. Snout length	15.1	13.4–25.8 (18.8)	1.62
17. Eye diameter	41.5	31.2–53.6 (43.0)	2.53
18. Postorbital head length	40.7	33.4–46.4 (41.6)	1.10
19. Maxilla length	30.6	30.6–50.0 (39.7)	1.61
20. Interorbital width	34.3	32.9–40.0 (35.8)	1.63
21. Upper jaw length	29.6	15.3–31.1 (25.2)	1.56
MERISTICS			Mode
Lateral scales	35	35–36	36
Pored lateral–line scales	13	13–18	14
Scales from lateral line to dorsal fin	8	8	8
Scales from lateral line to anal fin	5	5–6	6
Scales from lateral line to pelvic fin	5	5	5
Predorsal scales	12	12–13	12
Dorsal–fin rays	ii, 9	ii, 9	ii, 9
Anal–fin rays	iv, 25	iv–v, 25–28	v, 27
Pelvic–fin rays	ii, 7	ii, 7	ii, 7
Pectoral–fin rays	ii, 13	ii, 12–13	ii, 13

Paratypes. IMCN 0429, (2, 41.3–41.8 mm SL) collected with holotype; IMCN 2193 (5, 34.2–46.0 mm SL) Colombia, San Juan River drainage, Pacific versant, Istmina, Chocó, 12 July 2003, T. Silirio; IUQ 1943 (2 C&S, 41.1–46.0 mm SL) Colombia, San Juan River drainage, Pacific versant, Istmina, Chocó, 12 July

2003, T. Silirio; MCNG 54650 (3, 34.1–46.4 mm SL) Colombia, Waguaral Creek, San Juan River drainage, Pacific versant, Istmina, Chocó, 10 August 2002, T. Silirio.

Diagnosis. *Hyphessobrycon sebastiani* differs from all congeners, except *H. bifasciatus*, *H. balbus*, *H. colombianus*, *H. flammeus*, *H. griemi*, *H. itaparicensis*, *H. savagei*, *H. togoi* and *H. weitzmanorum* by possessing two humeral spots and no caudal blotch. *Hyphessobrycon sebastiani* is distinguished from those species by possessing: a higher number of branched pectoral–fin rays (12–13 vs. 10–11); a higher number of branched anal–fin rays (25–28 vs.17–24); a higher number of lateral scales (35–37 vs. 30–32); a higher number of scales between the lateral line and the base of the dorsal fin (eight vs. five to seven); a higher number of unbranched anal–fin rays (five vs. three to four unbranched); by the presence of three pairs of large bony hooks on anal fin of the mature males (vs. one or two pairs) and by a higher number of pored lateral–line scales (13–18 vs. 8–13, except *H. balbus* with 11–22 and *H. togoi* with 8–14).

Description. Morphometric and meristic data are given in Table 1. Body short and deep. Dorsal profile concave from snout to supraoccipital, then convex to dorsal-fin origin; straight from base of last dorsal-fin ray to base of caudal fin. Ventral profile of body convex from snout to base of anal fin, more pronounced behind pectorals, and from there straight to base caudal peduncle, but base of the anal fin is convex.

Head and snout long, jaws equal, mouth terminal, lips not covering externally the outer row of premaxillary teeth. Ventral part of upper jaw straight. Posterior tip of maxilla reaching the anterior margin of second infraorbital. Premaxillary teeth in two rows; outer row with four tricuspid teeth, arranged in zigzag line; inner row with six teeth diminishing gradually in size, the first four (innermost) pentacuspid and the fifth and sixth tricuspid (Fig. 2). Maxilla long and narrow with anterior margin convex and undulated; with two tricuspid teeth; its upper tip inserts laterally to the margin of the premaxilla. Dentary elongate with the poster-dorsal border partly convex, the ventral margin straight, with ten teeth on its upper-anterior border, the first four (front) teeth large and heptacuspid, followed by one smaller tricuspid tooth, and six small conic teeth that diminish in size moving away from symphysis (Fig. 2).

Metapterygoid widened with the inferior border concave, and with small foramen in its postero-medial region. A small band of cartilage present on anterior margin uniting it with the quadrate and ventro-posteriorly to join with the hyomandibular. Ectopterygoid elongate and wide, not in contact with the quadrate. There are six narrow infraorbital bones, the first elongate, the second and fifth the longest of the series, the second with four small foramina in the middle anterior region; the third and widest of the series is not in contact with the preopercle. The ventral-anterior region of antorbital overlays the upper portion of the maxilla. Supraorbital absent. Nasal bone elongate, in contact with upper margin of premaxilla. Rhinosphenoid bony, united to orbitosphenoid by band of cartilage, with a bony projection towards ventral region of frontal. Orbitosphenoid bony, elongated anteriorly with a widened tip. Parasphenoid not divided, united to ventral surface of vomer by cartilage; posterior tip of parasphenoid in contact with basioccipital and the prootic by band of cartilage. Basihyal cartilaginous and divided. Pharyngeal plate elongate and convex, with cartilage on the dorsal and ventral margins. First gill arch with two gill rakers on hypobranchial, ten gill rakers on ceratobranchials and six gill rakers on epibranchial.

Margin of dorsal fin oblique. Proximal pterygiophores of the dorsal-fin rays inserted between neural spines 5 to 13. Dorsal fin with a small vestigial ray located anterior to base of first normal ray. Anal fin with 27 proximal radials, the first three inserted between hemal spines 11 and 12, the last modified with a small apophyses. Five elongate supraneurals, with cartilage on upper tips, inserted above the first to fourth neural spines. Pectoral girdle with a sharp dorsal process above cleithrum. Cleithrum elongate, its posterior border thickened and with rounded margin, located beneath ventral margin of opercle. Postemporal with the upper tip pointed, extrascapular elongate with the ventral margin ovoid. Postcleithrum 1 ovoid, the upper region narrow and not in contact with postcleithrum 2, postcleithrum 3 thickened and curved with a convex, bony, laminar prolongation on the antero-medial border. Three proximal radials on the pectoral girdle. Pelvic fin long, its depressed tip surpassing anal-fin origin. Pelvic bone elongate, straight and narrow, situated parallel to central axis of body. Ischial process elongate, with cartilaginous apophyses. Caudal fin bifurcate with long pointed lobes. Principal caudal rays 9/8 and with 10/9 procurrents, the first three procurrents rays of the lower caudal fin lobe modified, with elongate apophyses on upper margin. Anterior border of dorsal fin rounded, the

depressed dorsal rays reach the anterior margin of adipose fin. Scales cycloid. Caudal fin without scales. Anal fin with three series of scales forming a sheath that covers the base of the first seven anal-fin rays. Total number of vertebrae 33.

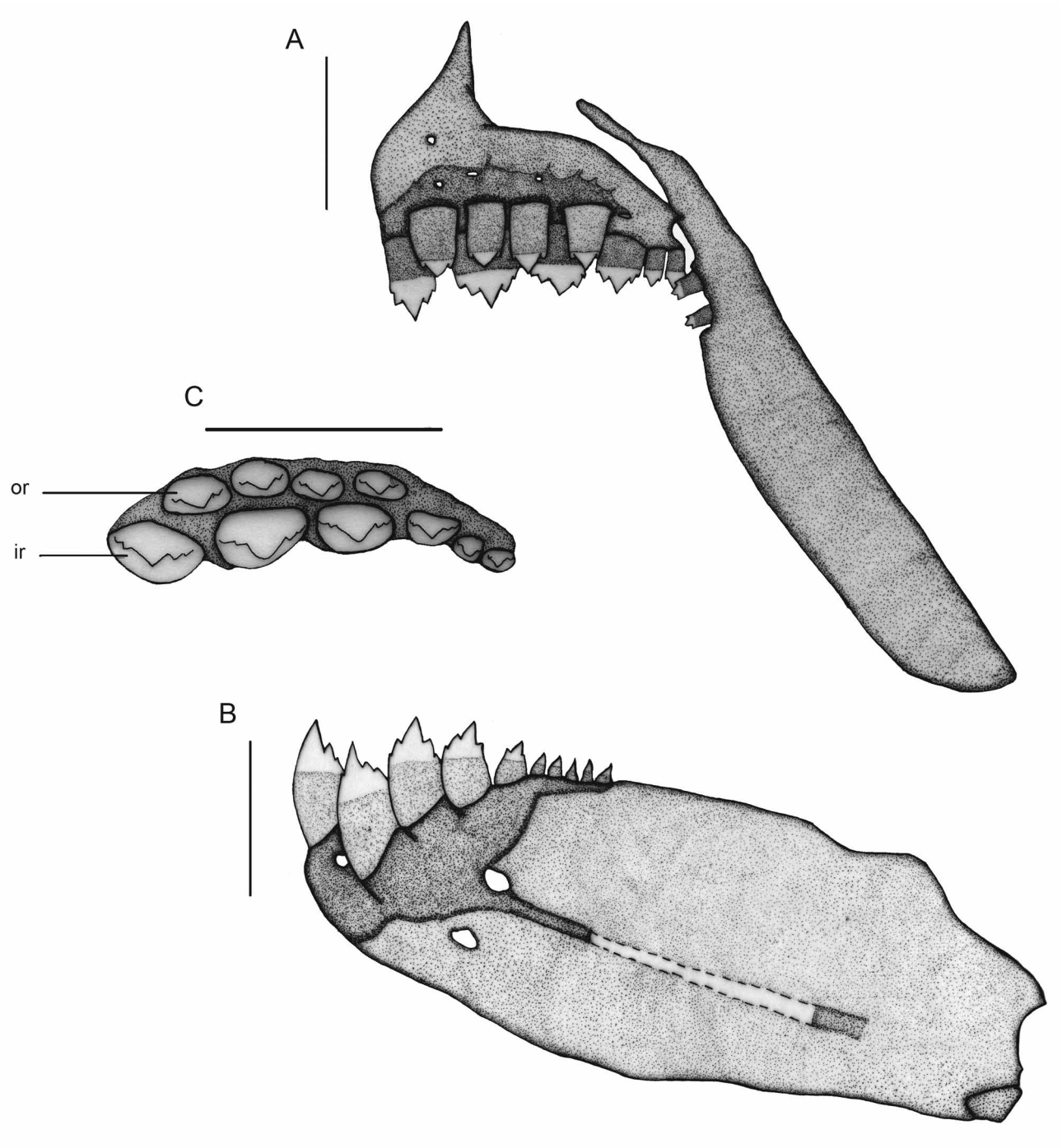

FIGURE 2. Jaws, upper (A), lower (B) right side, ventral view of premaxilla (C) of *Hyphessobrycon sebastiani*. IUQ 1943, Paratypes. Scale bar = 1mm, OR = outer row, IR = inner row.

Sexual dimorphism. Adult males have a pair of very large, dorsally curved, bony hooks on both sides of the fifth unbranched and first and second branched anal-fin rays (Fig. 3).

Color in alcohol. See Figure 1. Dorsal region and head dark brown. Dense concentration of chromatophores along dorsal profile, more conspicuous from end of supraoccipital spine to dorsal procurrent rays. Posterior margin of scales above lateral margin darkened by higher concentration of small

chromatophores. Anterior humeral spot rectangular, from second scale behind the opercle, above the perforated scales of the lateral line, extending to fourth scale. Frequently anterior and ventral part of this spot with a series of scattered melanophores extending horizontally, second diffuse spot separated from anterior spot by two scales. Fins translucent, with many melanophores on posterior margins. Snout, lips, and maxilla dark brown. Ventral body light yellow. Interradial membranes of paired and unpaired fins with small chromatophores, distributed along the rays. Anal fin with chromatophores more concentrated on distal end.

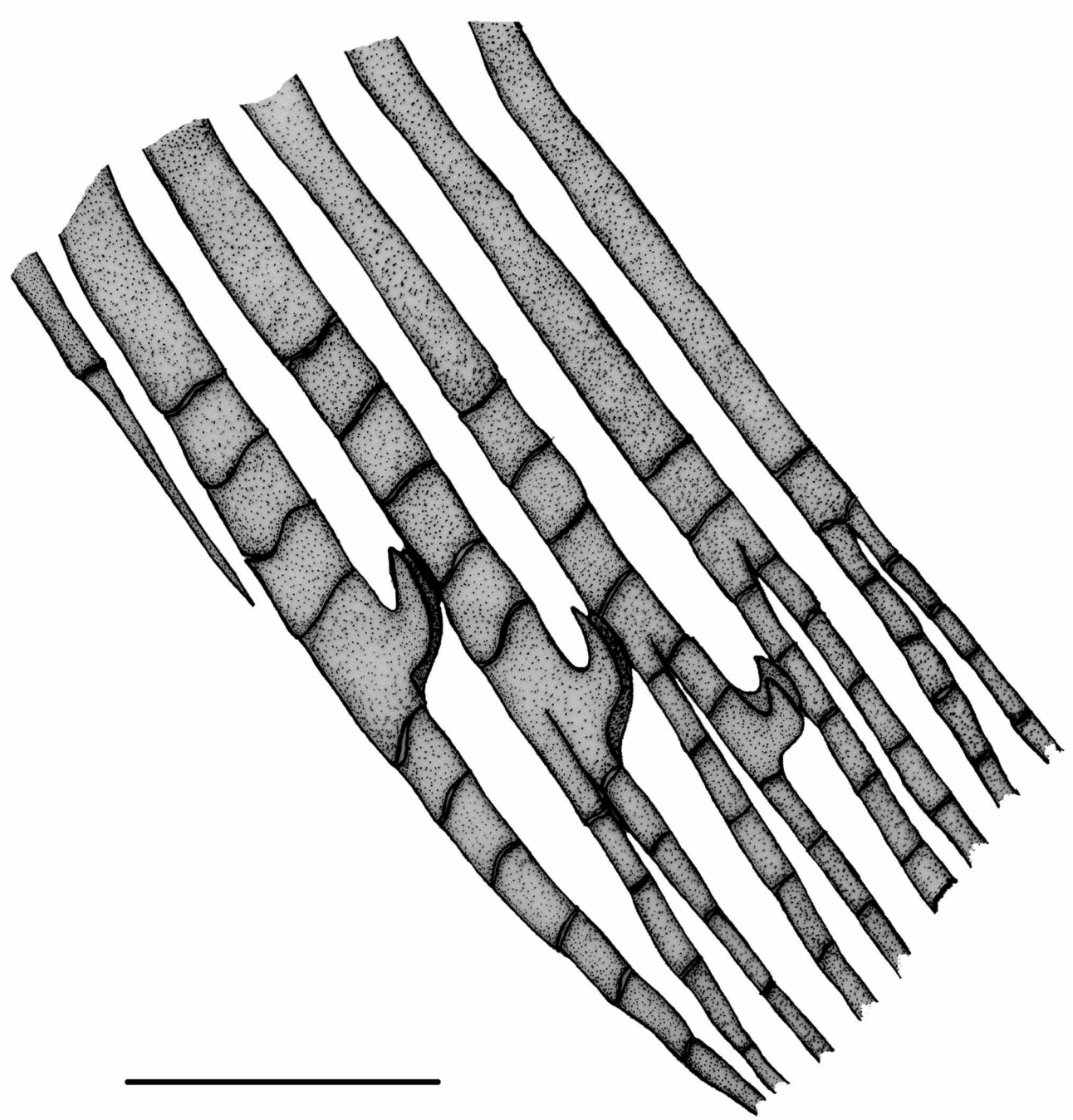

FIGURE 3. *Hyphessobrycon sebastiani*, IUQ 1943, paratype, 46.0 mm SL. Partial view of the anterior rays and spines of the anal fin. Right side, lateral view, Scale bar = 1 mm.

Distribution. Middle section of the San Juan River drainage, of the Pacific coast of Colombia (Fig. 5).

Etymology. This species is named for the younger brother of C.G-A, Sebastian.

Ecological notes. Data from three stomachs taken from specimens to be cleared and stained revealed a predominantly insectivorous diet: insect parts (69.56 % by number (N) of prey items and 34.24 % volumetric (V)), followed by Diptera, Ceratopogonidae (13.03 % N and 5.57 % V), Trichoptera, Hydropsichidae (8.69 %

N and 10.95 % V), ant heads (Formicidae) (4.34% N and 10.95% V). We also found Cyanophyceae, Spirogyra (4.34% N and 13.69% V) and unidentified digested material (20.54 %V).

Remarks. Principal component analysis (PCA) detected differences among the new species and *Hyphessobrycon panamensis, H. columbianus, H. savagei, H. condotensis* and *H. tortuguerae*. For the first component, body depth, anal-fin length and pectoral-fin length were the most important variables. For the second component, dorsal-fin length was most important. The first component explained 90.97% of total variation, and combined with the second this rose to 94.51% (Fig. 4).

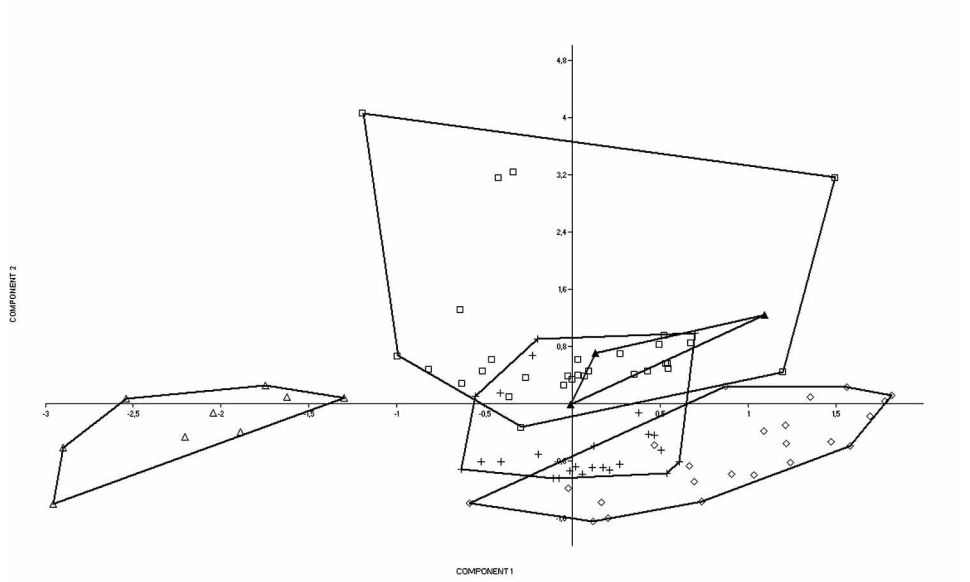

FIGURE 4. Principal component analysis for morphological data of *Hyphessobrycon sebastiani* (Δ), *H. panamensis* (+), *H. columbianus* (■), *H. savagei* (□), *H. condotensis* (▲) and *H. tortuguerae* (◊); component 1 on X axis and component 2 plotted on Y axis.

FIGURE 5. Map showing the type locality of *Hyphessobrycon sebastiani*.

Discussion

According to Eigenmann (1913; 1918) *Hyphessobrycon* differs from *Hemigrammus* only by the absence of scales at the base of the caudal fin. He at first considered *Hyphessobrycon* to be only a subgenus of *Hemigrammus*. Böhlke (1955) and Weitzman (1977) both suggested as well that these genera cannot be separated into distinct taxa, based only on that character. However, they, we and other authors continued to describe new species of *Hyphessobrycon*. The non-monophyletic nature of *Hyphessobrycon* has long been assumed and discussed by many authors; however, Garcia-Alzate (2009) found the following characters, results of his phylogenetic analysis, as possible synapomorphies exclusive to *Hyphessobrycon*, and not present in other species of tetras: 1) transformation process of tripus not extending to ventral margin of third centrum, 2) claustrum without osseous apophysis, 3) six or fewer hypurals, and 4) a band of cartilage present at base of procurrent caudal-fin rays in both lobes. It must be stated, though, that we have found these character states, so far, in only a small subsample of *Hyphessobrycon* species: *H. sebastiani* new species, *H. bifasciatus*, *H. balbus*, *H. colombianus*, *H. flammeus*, *H. griemi*, *H. itaparicensis*, *H. savagei*, *H. togoi* and *H. weitzmanorum.*

Hyphessobrycon sebastiani can be further distinguished from *H. colombianus* and *H. togoi* (in addition to the diagnostic characters listed above) by dorsal-fin length (30.9–32.2 % SL vs. 33.1–42.2 % SL in *H. colombianus* and 24.5–28.3 % SL in *H. togoi*), greater pectoral–fin length (23.0–27.3 % SL vs. 15.5–21.7% SL in *H. togoi*) and can be distinguished from *H. columbianus* by dorsal fin–anal fin length (39.3–43.2% SL vs. 44.0–46.1% LS), dorsal fin–pectoral fin length (40.0–45.5%SL vs. 45.5–49.9% SL) and caudal-peduncle depth (10.5–12.5%SL vs. 13.7–17.8%SL) caudal-peduncle depth (10.5–12.5 % SL vs.13.7–17.8% SL) and body depth (40.2–43.8% SL vs. 43.9–49.7% SL).

Although Weitzman & Fink (1983) stated that the taxonomy proposed by Géry (1977), which was based mostly on similarities of pigmentation patterns, is unacceptable because the characters he used cannot be expressed or analyzed phylogenetically, Lima & Gerhard (2001) and Garcia-Alzate (2009) stated that coloration patterns present in *Hyphessobrycon* might prove to be of some use to order the complex systematic relationships within this and related genera and could be used as a starting point from which to explore relationships within *Hyphessobrycon.*

Comparative material examined

Hyphessobrycon compressus: FMNH 4641, holotype, México, Obispo, Vera Cruz; FMNH 4662, paratypes (1 C&S, 29.2 mm SL) collected with holotype; BMNH 1905.12.6.4–5, paratypes (2, 30.6–31.6 mm SL) México, Obispo, Vera Cruz; IBUAM–P 8538, (2, 24.5–31.2 mm SL) México, Trinitaria, Flor de Café, Chris, 3 July 1993; ANSP 124774 (12, 30.3–35.6 mm SL) México, Río Usumacinta casi unido con Pasión, cerca Sayache, 18 August 196; ANSP 124774, (3 C&S, 30.6–35.6 mm SL), México, Río Usumacinta casi unido con Pasión, cerca Sayache, 18 Aug. 1961. *Hyphessobrycon savagei*: IUQ 2310, (30, 25.5–39.9 mm SL) Costa Rica, Quebrada Puntarenas, 200m SE del Río Nuevo Salama, 5 January 1967. *Hyphessobrycon tortuguerae*: IUQ 2284, (23, 22.4–36.4 mm SL) Costa Rica, Río Muerto, Alajuela S., Upala, 25 April 1968. *Hyphessobrycon columbianus*: IMCN 242, (5, 29.8–39.8 mm SL) Colombia, Río Guati, Acandí, Chocó, 1 August 1995; MCNG 47820 (1) Colombia, Río Guati, Chocó, 15 August 1995. *Hyphessobrycon condotensis:* BMNH 1913.10.1.19–21, syntypes (3, 25.9–31.2 mm SL), Colombia, Río Condoto and Río San Juan, 1913. *Hyphessobrycon ecuadorensis*: BMNH 1924.3.3.44–45 (2, 22.6–25.5) paratypes, Ecuador, Los Ríos, cerca a Vinces; CAS 61602, holotype (24.3 mm SL) Ecuador, Los Ríos, cerca a Vinces. *Hyphessobrycon panamensis*: AMNH 31802 (13, 27.6–33.4 mm SL) Panamá, Zona del canal de Panamá, Quebrada Juan Grande Cerca a Gamboa, 1978; IUQ 601 (1C&S, 25.5 mm SL) Colombia, Nariño, Tumaco, El Pinde, afluente río Pianurbi en la vía Llorente–Guayacana, 19 July 2000; IUQ 605 (6, 32.7–35.7 mm SL) Colombia, Pequeña quebrada, afluente caño ciénaga Bellavista, 1km antes, 20 February 1988; IUQ 782, (4, 39.59–40.46 mm SL), Colombia, Nariño, Tumaco, quebrada El Pinde, afluente río Pianurbí en la vía Llorente–Guayacana, 19 July

2000; IUQ 2274 (40, 22.7–42.0 mm SL) Colombia, Nariño, alto río Yamunde, afluente del río Telembi, en Barbacoas, 16 July 2008; IUQ 2275 (10, 20.3–37.7 mm SL) Colombia, Nariño, Quebrada la Tundera, afluente del rio Quigualpi, en Barbacoas, 16 July 2008; IUQ 2285 (19, 26.5–34.3 mm SL) Costa Rica, Limón, río Cocolis, 35 km SE de Shiroles, 6 October 1979. IUQ 2311 (25, 14.8–35.9 mm SL) Colombia, Quebrada en la finca la Hacienda, afluente del río Telembi, 16 July 2008; MCZ 20688, syntype, (1,23.5 mm SL) Río Boquerón, vertiente Atlántico, Panamá. *Hyphessobrycon poecilioides*: CAS 77396, paratypes (5, 37.5–54.4 mm SL) Colombia, sistema del río Magdalena, Alto Cauca, pequeña quebrada cerca a Cali, 3 February 1912; IUQ 517 (33, 27.1–75.8 mm SL) Colombia, Valle del Cauca, quebrada El Indio, 100 m en el peaje vía Alambrado–Corozal, 12 September 2004; IUQ 519 (46, 54.7–61.7 mm SL) Colombia, Valle del Cauca, quebrada El Indio, 100 m. en el peaje vía Alambrado–Corozal, 5 December 2003; MCNG 55351 (4, 28.3–71.4 mm SL) Colombia, quebrada El Indio, 100 m. en el peaje vía Alambrado–Corozal, Valle del Cauca, 5 December 2003. *Hyphessobrycon proteus*: CAS 60479, syntypes (3, 23.8–36.6 mm SL) Colombia, Chocó, Quebrada Bernal, Alto Atrato 1913; CAS 60483, syntypes (5, 32.0–36.6 mm SL) Colombia, Soplaviento, 25 May 1913; IUQ 249 (5, 52.7–62.9 mm SL) Colombia, Atlántico, Jagüey Parrish, cerca del arroyo hondo, a un lado de Barranquilla, 4 March 1990; IUQ 508 (2, 33.2–44.8 mm SL) Colombia, Atlántico, arroyo frente a Santa Lucia, 11 December 1999; IUQ 520 (5, 27.9–30.6 mm SL) Colombia, Atlántico, compuertas entrada del agua al embalse del Guájaro,15 April 1990; IUQ 1009 (25, 31.7–54.1 mm SL) Colombia, bajo Magdalena Bolívar, Ciénaga de Capote en Soplaviento, 31 May 2003.

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